NASSCOM®

Gamechangers

AI GAMECHANGERS: ACCELERATING INDIA WITH INNOVATION

COMPENDIUM OF 50 AI INNOVATION STORIES

2021 EDITION

INNOVATION PARTNER

Microsoft

KNOWLEDGE PARTNER

Deloitte.

LeaderSpeak

Debjani Ghosh
President, NASSCOM

A general-purpose technology has the potential to alter societies and economies, over a significantly long period of time. Artificial Intelligence is widely considered as a general-purpose technology. Unlike a decade ago when its use was relatively unknown, AI today is pervasive across industries such as healthcare, education, retail, governance, agriculture, and manufacturing. Even the pandemic did not deter India's upward curve in AI adoption and innovation. Last year, India outpaced countries such as Japan, the US, and the UK to become the largest adopter of AI, exacerbated by the pandemic with applications seen in drug discovery, telemedicine, and vaccine development.

As part of the NASSCOM AI for India mission, the AI Gamechangers Awards Programme was conceptualised to generate awareness on adoption and innovation spurred by AI today. Open to start-ups, government, academia, and enterprises, AI Gamechangers Awards is a substantial measure of the quantum of innovation and impact that AI has on our economy.

This compendium celebrates the best of India's tech sector by showcasing the most impactful and creative uses of AI to solve important challenges in business and society today. The versatility of solutions accurately gauges India's appetite for AI, and the hunger that exists to further innovate.

I hope you enjoy reading these stories and understand a little better how well entrenched India's tech sector is to place the country on the world AI map.

LeaderSpeak

Anant Maheshwari
President, Microsoft India

AI Gamechangers is a path-breaking awards programme. We know that AI has the potential to transform and solve some of the most urgent and important issues for the planet. But technology does not change the world, people do! That is why AI Gamechangers is so important. It is the meeting point between inspirational ideas and innovative technologies!

The programme has proven to be a platform that creates awareness around cloud-led data and AI innovation, promotes impactful and scalable AI-based innovation in the country, recognises thinkers, innovators, and creators, and spurs the larger tech ecosystem to adopt AI-led innovation.

My heartiest congratulations to all the finalists! The very first edition of the awards received more than 300 applications across start-ups, enterprises, academia, governments, and NGOs, proving that AI-based products and solutions have already reached a stage of maturity and scale in the country.

Microsoft is honoured to be the 'Innovation Partner' and participate in NASSCOM's AI for India mission. We want to help reimagine what is possible with AI, help every organisation in every industry turn meaningful innovation into actionable results, and give the power of AI to everyone.... and therefore, empower every person and every organisation to achieve more!

LeaderSpeak

Prashanth Kaddi
Partner, Deloitte India

Organisations are acclimatising to the ways of thriving in the Age of With, where intelligent machines or technologies augment human capabilities to achieve transformation in every aspect of life − business, society, and environment. Artificial Intelligence (AI) is one such impactful technology that if used smartly, has the power to address the trickiest problems of the world and add value to business.

The COVID-19 crisis has presented India an opportunity to acknowledge and realise the full potential of AI. The government used AI to contain the virus spread (tracing contacts, spreading awareness, etc.) and accelerate crisis response. Moreover, it is fostering an AI-focused, start-up ecosystem and considering building more AI-powered smart cities that keep a tab on crime rate, carbon emission, traffic jams, etc.

In India, AI is still in its nascent stage. However, it has made rapid advances in the past few years and has the potential to rewrite the success stories of Indian businesses. Well thought-out investments in building a skilled talent base will go a long way in harnessing the full potential of this disruptive technology.

This compendium, based on NASSCOM's AI Gamechanger Awards Programme, is a treasure trove of the best AI-powered innovations recently seen in the country. I believe these tales of innovations will leave you in awe of the phenomenal AI technology and motivate you to embrace it.

This compendium will let you comprehend how translating business problems into right AI solutions can help you win in the Age of With.

Have an insightful yet fun reading!

INTRODUCTION

Over the past decade, AI has stood out as a transformational technology of the digital age, with its applications leaping out of science fiction into our daily lives. However, we are still just scratching the surface when it comes to the technology's overall economic potential. A 2020 NASSCOM report pegged this number at ~ $ 500 billion for India's GDP by 2025, with a breakdown of the estimated impact across sectors.

Data and AI economic value add by 2025 - Analysis by sector (Numbers in $ billion)

Consumer Goods and Retail

90-95

Telecom, Media and IT

50-55

Auto Manufacturing and Assembly

40-45

Agriculture

60-65

Energy and Industrials

50-55

Public Sector

25-30

Banking and insurance

60-65

Transport and Logistics

50-55

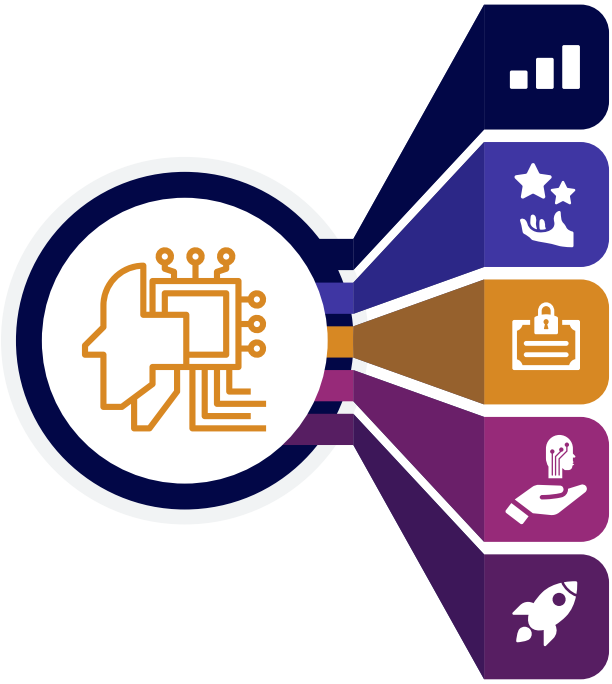
Healthcare

25-30

Source: NASSCOM Report– Unlocking Value from Data and AI – The India Opportunity

The current state of AI in India is testimony to the ripening landscape that will spur the country's growth towards becoming the AI hub for the world.

Current state of AI in India



Global position

India is at position **#6 on Stanford's Global AI Vibrancy ranking and aces the 'Inclusion' parameter**

Talent

Burgeoning AI Talent - 500,000+ workers in AI, ML, and analytics employed by the industry

Patents

India secures **rank #8** in terms of **AI patent filing #4 in AI scholarly papers**

Enterprise AI adoption

45% organisations in India have increased AI adoption due to COVID-19

Start-up ecosystem

AI penetration rising in the start-up ecosystem with **>50% Indian start-ups using AI**

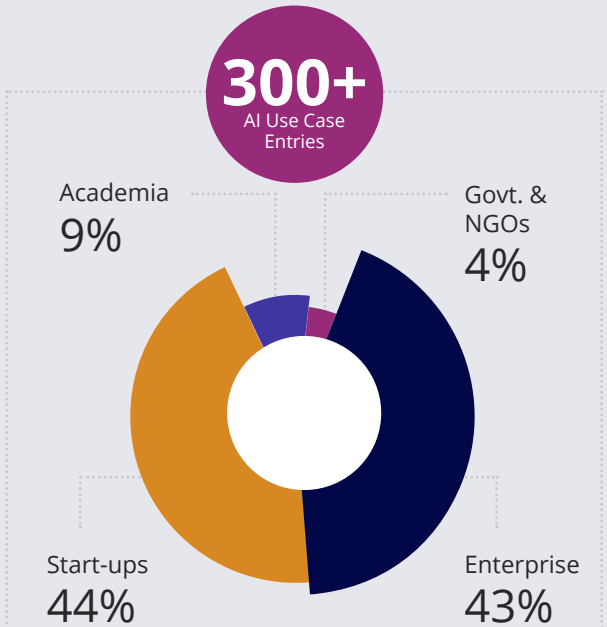
Source: Stanford University, Artificial Intelligence Index Report 2021, NASSCOM Report– Unlocking Value from Data and AI – The India Opportunity, NASSCOM AI Patents Report 2021, PwC Report - AI: An opportunity amidst a crisis, NASSCOM Strategic Review 2021

NASSCOM recognises this tremendous potential and therefore, has charted out its 'AI for India' mission that focuses on key drivers of change that are needed as we move ahead. 'AI adoption' is an important pillar of the mission, from which the 'AI Gamechangers' programme has spawned.

AI Gamechangers was conceptualised to seed awareness and enthusiasm around this wonderful technology and encourage others to emulate the successes in the ecosystem. The idea behind the programme is to recognise innovative and impactful use cases that solve an important problem. For a thorough view of the landscape, entries across enterprises, start-ups, government bodies, academic institutes, and NGOs, were invited.

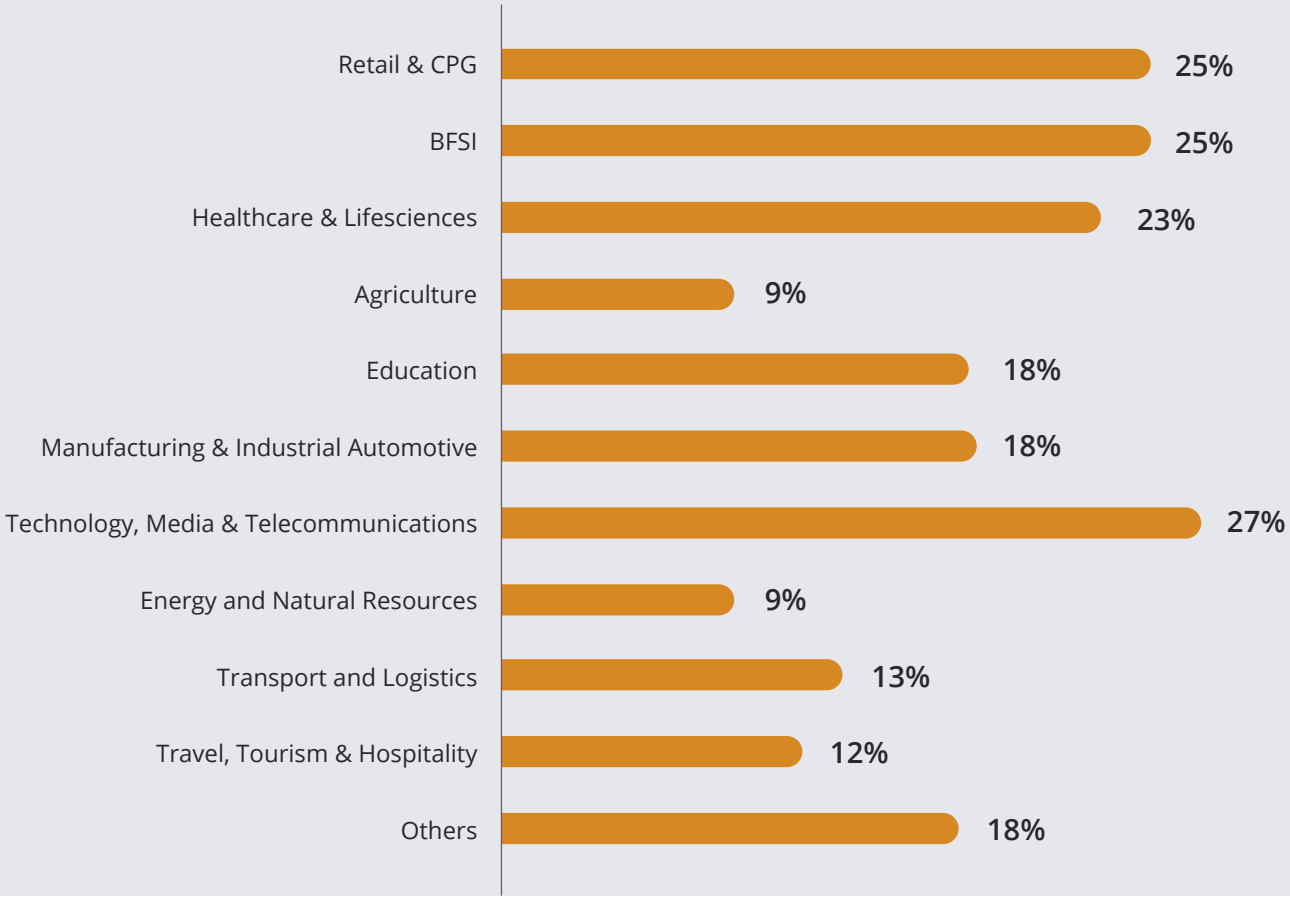
The programme received considerable traction with 300+ AI use cases from multiple stakeholders. Enterprises and start-ups became the major contributors.

Applicant snapshot – Entity type



Many use cases submitted have applicability across multiple industry verticals as depicted.

Applicant snapshot - AI use case applicability



A total of 15 awards categories emerged along the sectoral, topical, and technological lines.

01

Sectoral: Healthcare & Life Sciences, Education, Transport & Logistics, Manufacturing & Industrial Automotive, Retail & CPG, BFSI, and Agriculture

02

Topical: AI for COVID-19, AI for enabling Contactless World, AI for Sustainability, AI for Inclusion, AI for Public Services, and AI Adopters

03

Technological: Natural Language Processing (NLP), Computer Vision (CV)

This compendium focuses on highlighting the top 50 AI use cases across 15 categories. These use cases have been classified as 'Gamechangers', 'Challengers,' 'Exemplars', and 'Innovators'. The first three have been covered as featured stories while the Innovator use case details have been tabulated at the end. Moreover, two 'Special Mentions' have also been featured.

50 AI Use Cases*

AI Gamechangers Compendium overview

32 Featured Stories

15 Gamechangers

7 Sectoral

Manufacturing
SwithOn

BFSI
Capital Quant

Education
Jungroo Learning

Healthcare
Onward Assist

Logistics
EXL

Retail
Tredence Analytics

Agriculture
Agnext Technologies

6 Topical

Enabling Contactless World
Jotter.AI

AI Adopters
Aditya Birla

COVID-19
IBM India

Inclusion
SM Learning

Public Services
Wadhwani AI

Sustainability
VigyanLabs

2 Technological

Natural Language Processing
IIT Madras

Computer Vision
Toch.AI

12 Challengers

6 Sectoral

Manufacturing
Eugenie

BFSI
Karza Technologies

Education
Learning Matters

Logistics
Maersk

Retail
Applicate AI

Agriculture
RMSI Cropalytics

5 Topical

Enabling Contactless World
eClerx

AI Adopters
Max Life

COVID-19
IISc Bangalore

Inclusion
Continual Engine

Sustainability
Mahindra Teqo

1 Technological

Natural Language Processing
Extractful.AI

3 Exemplars

TNeGA
MyGov
Govt. of Telangana

2 Special Mentions

IIIT Hyderabad
Minus Zero

*Click on the entity name for more details of the use case

18 Innovators

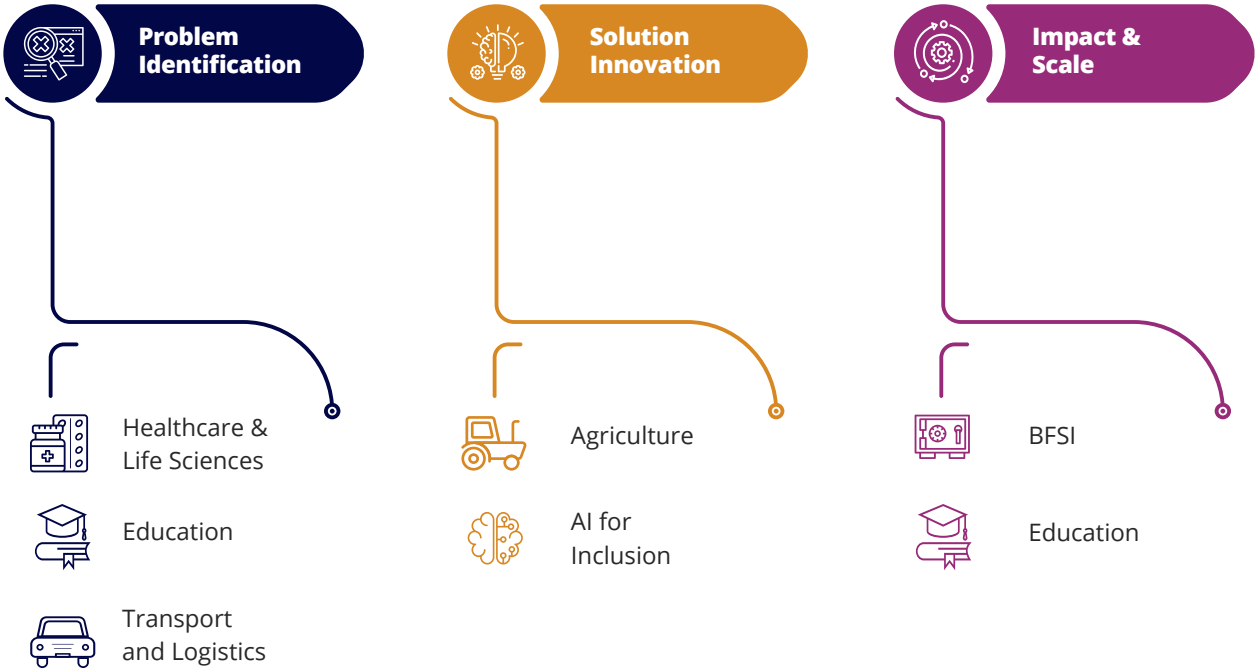
- **MANUFACTURING & INDUSTRIAL AUTOMOTIVE -** *Tiger Analytics*
- **BFSI -** *Wright Research*
- **EDUCATION –** *Devnagri*
- **HEALTHCARE & LIFE SCIENCES -** *Wipro Limited*
- **HEALTHCARE & LIFE SCIENCES -** *In-Med Prognostics Pvt Ltd*
- **TRANSPORT & LOGISTICS -** *Locus.sh*
- **RETAIL & CPG –** *Streamoid*
- **AGRICULTURE -** *SatSure Analytics India Private Limited*
- **AI FOR ENABLING CONTACTLESS WORLD -** *AuthBridge Research Services*
- **AI ADOPTERS -** *ICICI Bank*
- **AI FOR COVID-19 -** *DocketRun Tech Private Limited*
- **AI FOR COVID-19 -** *Indegene Pvt Ltd*
- **AI FOR INCLUSION -** *Achala Health Services*
- **AI FOR PUBLIC SERVICES -** *Tata Consultancy Services*
- **AI FOR SUSTAINABILITY -** *Aquaconnect*
- **NATURAL LANGUAGE PROCESSING –** *TheMathCompany*
- **NATURAL LANGUAGE PROCESSING –** *Policybazaar.com*
- **COMPUTER VISION -** *Affine Analytics Pvt. Ltd.*

Top scoring categories

From a problem identification perspective, the leading sector is Healthcare that includes COVID-19-focused use cases, followed by Education, and Transport & Logistics (including use cases that focus on solving problems for an increasingly contactless world).

From a solution innovation perspective, Agriculture is the leading sector, followed by Inclusion as the next focus area.

Top scoring categories - By selection criteria

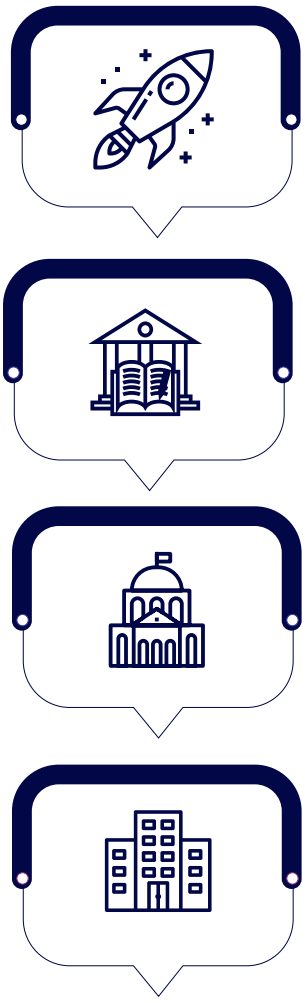


Impact and scale are tough nuts to crack and BFSI is one sector that has been able to realise the impact and achieve scale to an extent that is marginally better than other categories. Although the use cases received in the sector do not rate very high on problem identification and solution innovation metrics, these solutions are implemented at scale. Education is another sector that has seen AI-led, at-scale impact.

Topical categories: A majority of the shortlisted use cases across the topical categories catered to the Healthcare & Life Sciences, Education, and BFSI sectors. The problem identification scores for these use cases have been above average, given their topical nature. The impact has also been revolutionary, although the solutions are yet to attain the desired scale to be able to unlock the true value.

Technological categories: In addition to machine learning, Natural Language Processing and Computer Vision have been prevalent across implementations, either individually or in combination. The high data requirements specific to geographies, across both of these technological categories make use cases challenging. However, the applicability of such use cases spans across sectors.

Entity focused insights



Start-ups – Pole bearers: At the forefront of India's AI revolution are AI start-ups that through their innovation and improving technology are solving problems at an exponential pace. AI start-ups have become the pole-bearers of innovations, solving many problems plaguing humanity. Amongst the AI Gamechangers shortlisted entries, ~50% use cases are by start-ups, strongly highlighting the innovation quotient of AI implementations across sectors in India.

Academia – Research powerhouses: The academic entries demonstrated strong potential and focused on critical use cases, backing their problem-solving approach with research-based evidence. If provided with the right platform and resources, these use cases would be able to scale from proof of concepts to commercialised implementations in the future.

Government & NGOs – Citizen-centric innovators: Next, AI-powered use cases by government, NGOs, and related bodies are nothing but revolutionary, specifically in areas such as Agriculture and citizen services. These use cases are worthy of recognition − identifying critical problems at the grassroots level, ensuring that the solution has an impact on the right beneficiaries, developing and deploying at-scale AI solutions, and ensuring the desired benefit is reaped.

Enterprises – Resilient pioneers: Final yet important, the Indian tech industry, represented by enterprises, reported scalable, impactful use cases catering to both domestic and global clients. Representing more than 30% of the shortlisted entries, enterprise-led AI use cases made their mark across sectors specifically in industry-led sectors, such as Manufacturing & Industrial Automotive and Transport & Logistics. Enterprises also led from the front when it came to topical use case categories that have been extremely relevant during the current times with the onslaught of the COVID-19 pandemic. A majority of the high-impact and at-scale use cases shortlisted in topical categories, including "AI for COVID-19" and "AI for enabling Contactless World," are by enterprises. These use-cases demonstrated the industry's resilience in these trying times.

The "Gamechangers" and "Challengers" demonstrate commonalities across selection criteria metrics that can act as guiding principles for other AI developments and deployments. The magic lies in adopting the right combination of the below mentioned practices relevant for the appropriate use cases.

The 'Exemplars' are AI implementations by government demonstrating tremendous potential and impact.

What makes the "Gamechangers" and "Challengers" stand out?

Problem

» **Conducting thorough research and analysis to identify the problem,** which is critical in the respective domains, at the grassroots level

Solution

» **Platform-based approach to solving the problem with data and AI** with the majority of entities building their own ML-powered platforms for data management and processing

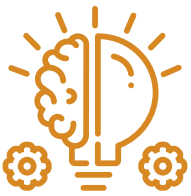
» **Owning the end-to-end data and AI life cycle** from data collection, data processing, AI model development to model optimisation, and deployment

» **Conceptualising the solution with convergence of relevant technologies,** wherever applicable including cloud, internet of things, big data analytics, and robotic process automation

» **Considering a holistic set of data attributes for building the AI model,** requiring heterogeneous datasets comprising text, images, speech, audio, and video wherever applicable

» **Deploying a combination of techniques to tackle different data aspects** by adopting Natural Language Processing and Computer Vision approaches wherever applicable

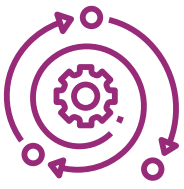
» **Addressing data security, explainability, and bias-related concerns** to ensure a more responsible AI implementation



Impact & Scale

» **Coupling the AI use case outcome with quantifiable impact metrics** at both the use case and organisation levels to ensure it is affecting one or more of the following: revenue, customer experience, and costs

» **Drafting vision and action plan to unlock the full potential of use cases** and ensuring future scalability of the AI solution across business functions



The AI Gamechangers compendium offers a sneak peek into the burgeoning Indian AI ecosystem. The collection will serve as a ready reckoner to know the pulse of India's AI maturity in 2021. The vast variety of use cases featured reflects the wide applicability of AI. This resource hopes to ignite further innovation in the space towards realising India's 2025 vision.

The way forward for AI in India

Companies have started acknowledging the power of AI and investing in the technology to gain an edge over competition. In addition to stepping up spending in AI capabilities, the following factors will shape the technology's future in India:

Promoting wider technology adoption: India's national AI strategy identifies agriculture, healthcare, education, smart city infrastructure, and mobility as key areas where AI can enable development and greater inclusion (according to a Deloitte report, Artificial intelligence: Augmenting human intelligence). This guidance is expected to encourage investment in AI innovations in these sectors.

Government's initiatives: Quite a few start-ups have come up in India in the past few years to get the early mover advantage in the AI domain; more are being established as we speak. The country has **more than 2,000 start-ups.**[1] Unlike start-ups elsewhere, AI start-ups in India have been successful in **raising US$ 836.3 million in funding.**[2] The government's focus on AI proliferation will give further impetus to the ecosystem.

Bridging the talent demand and supply gap: With more companies entering the AI space, the demand for AI-powered solutions is increasing at a breakneck speed. Organisations and the government need to invest in building a skilled talent pool. According to a NASSCOM report, the demand for highly-qualified, experienced, and technically-adept talent in the field of AI and BDA outstrips the current supply.[3] The government and industry bodies should take upskilling and training initiatives to bridge this gap.

With the efforts and initiatives in the right direction, AI can be the potential game changer for the Indian economy and industries.

1: https://tracxn.com/explore/Artificial-Intelligence-Startups-in-India
2: https://analyticsindiamag.com/indian-ai-startups-raised-836-3-million-in-2020-aimresearch/
3: https://nasscom.in/knowledge-center/publications/talent-demand-supply-report-ai-big-data-analytics

Screening framework

300+
solutions

Nomination submissions

- About 300+ nominations were received.
- The initial screening was done on the basis of quality and originality of the entry.
- Selected solutions advanced to the first round for further evaluation.

Round 1:
Initial scoring

- This round focused on assessing solutions against three parameters with varying contribution to the total score – problem identification, solution innovation, and impact and scale.
- High-scoring solutions were identified to be critically examined in Round 2.

Round 2:
Panel review

- Six expert panels were instituted. Each panel constituted three members, involving industry veteran or/and subject matter experts, for evaluating applications.
- As a part of this round, NASSCOM shared a presentation template with finalists to present their respective solutions to their assigned set of panel.
- This round also focused on assessing solutions against three parameters with equal contribution to the total score – problem identification, solution innovation, and impact and scale.
- Based on the assessment, 50 contenders were recognised under one of the following categories:
  - **Gamechangers**
  - **Challengers**
  - **Exemplars**
  - **Special Mentions**
  - **Innovators**

15	12	3	2	18
Gamechangers	Challengers	Exemplars	Special Mentions	Innovators

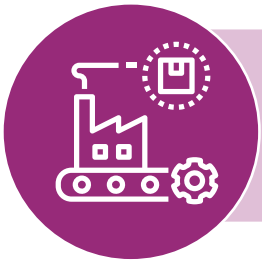
FEATURED STORIES

SECTORAL USE CASES

switchon
connect | compute | conserve

MANUFACTURING & INDUSTRIAL AUTOMOTIVE
GAMECHANGER

SwitchOn: Solving challenges in modern manufacturing



SwitchOn's humanised AI model helps industries predict hundreds of events to enable real-time manufacturing intelligence from the shop floor to the top floor.

A few decades ago, factories focused on manual labour with minimal reliance on machines. Today, the situation is inverse, as the reliance on machines is becoming absolute. With Industry 4.0 at the forefront, there is no doubt that smart factories are the future of manufacturing. Moreover, with the occurrence of the COVID-19 pandemic, the need for a digitised shopfloor has only increased. With reams of data being generated today, it is critical to have a set-up of connected machines, devices, and production systems.

There are several benefits of having a digitised shopfloor. Not only does it reduce the time, but also enhances efficiency and quality. But it is essential to remember that the manufacturing industry sometimes focuses more on quantity, which is when quality gets compromised. This is where SwitchOn steps in to guarantee its products' quality and machines' uptime using digital twins. These are created through high-frequency data and vision systems.

This industrial-tech company also helps manufacturing industries understand various challenges, and works towards resolving the problem effectively. It works by creating digital twins of heavy assets for industries, and then monitors and predicts availability and performance bottlenecks. With this approach, efficiency goes up by a notch. Its humanised AI model helps industries predict hundreds of events to enable real-time manufacturing intelligence from the shop floor to the top floor.

The solutions by SwitchOn are largely used by automotive, FMCG, pharmaceutical, and other manufacturing set-ups. Some of the top names they work for include TATA Motors, Brakes India, and multiple tier-1 suppliers of Toyota, amongst others. They also collaborate with companies such as ITC and TATA MD (COVID-19 testing kit inspection).

Solving the quality conundrum

Even today, quality inspection is an area that needs improvement when it comes to most precision manufacturing applications. The process is largely manual, which poses several challenges. Even in cases where there are automated visual inspection systems, the deployment is abysmally low, due to 12% false rejections. These systems are heavily dependent on hardware, and have high false-positive cases. In addition, they are difficult processes. Alarmingly, quality inspection is now 50x slower than the manufacturing process, which is a major obstacle to overcome.

In the current scenario, quality inspection is manual, slow, and prone to errors. This does not just lead to losses in time and effort, but companies bear heavy financial costs, to the tune of US$ 10 million (8% of overall production) per year in customer rejections and complaints. A case in point is that there are government-regulated mandatory recall norms for cars, in case the number of manufacturing defect-based complaints goes over 3% of the automobiles sold.

Using the power of AI, SwitchOn has built a DeepInspect, AI-based inspection software that helps conduct quality inspection, even in complex cases, in the manufacturing shop floor. High-frequency data and images are collected from the manufacturing shop floor. With the help of AI, new models of inspected models are automatically built. These models are then deployed on their Xavier Edge-Compute systems to identify defects and reject what does not fit within 50 milliseconds. This process paves the way for high-speed operations.

Through this technology, SwitchOn has been able to reduce batch wastage by 80% in leading manufacturing companies, such as ITC, TATA Motors, JBM, and others throughout India.

Delving deep into its benefits

There are a plethora of benefits that SwitchOn offers to its clients. To start off, it helps **increase the data transparency from the shop floor to the top floor**. Sometimes, the complexities of manufacturing assets can lead to data approximations. With this solution, all the assets are first digitised on to the final dashboard, so that the data is accessible to all. This ensures transparency in every possible way across levels.

The turnaround time in the shop floor will also be reduced, thereby enhancing operational excellence. Even today, there are various scenarios, in which capturing of data is done in a semi-manual manner. It goes through various levels, before it reaches the upper management. With SwitchOn, the process becomes much simpler, with real-time health and productivity data reaching stakeholders in an automatic way.

It also **reduces wastage by predicting equipment failure and automatic diagnosis**. The assets that are a part of the complex manufacturing processes do take some time to be diagnosed. The another concern is that these are only up for maintenance, either during a breakdown or other crucial issues. With SwitchOn, predicting failures and performance issues in complex manufacturing issues is far easier, and helps manufacturing industries avert the breakdown.

In a nutshell, SwitchOn provides:

- High-speed inspection (**Edge-based 100x** faster than competing cloud-based systems)
- Complete reliability (**10X** accuracy of analytics-based systems on same hardware)
- Zero-setup time (field-trainable AI system)

The last word

As a solution, SwitchOn fulfils the needs of a modern manufacturing set-up in the most seamless way possible. Its ever-growing clientele is a proof of its success - after all, from well-known domestic customers to international bigwigs like ABB and Panasonic, industries of all sizes are leveraging this solution to effectively deal with the challenges that are prevalent in manufacturing. SwitchOn also has enterprise partnerships with Tech Mahindra and Intel, amongst others.

MANUFACTURING & INDUSTRIAL AUTOMOTIVE

CHALLENGER

Eugenie AI: Reducing operational costs and carbon emission

Using AI-powered operational intelligence to predict failure probabilities of machines accurately and recommending risk mitigation plans.

Another machine has broken down. For Ajit, this means production in his process manufacturing plant will take a significant hit. It will take time, effort, and money to get the machine in working order once again.

This isn't the first time something like this has happened to Ajit. It is not that the network of machines is not serviced and maintained regularly. Many hours and dollars are spent on preventive maintenance. Even so, not every failure can be predicted. More maintenance and machines sub-optimally performing mean less process uptime and more significant greenhouse gas emission. Both are an anathema to heavy process manufacturing.

Ajit does, in theory, have the tools to predict which machines are most likely to fail. All his machines are connected to his data analytics platform, where readouts from various sensors are streamed every second. However, this comes with its own set of problems. The volume of data, the number of variables, and the speed at which the data streams are incredibly high. All this makes the data cumbersome to work with, and in its raw form, gives Ajit visibility but no insights and direction.

However, according to Eugenie AI founder, Soudip Roy Chowdhury, "this problem can be solved by artificial intelligence."

Eugenie AI is an AI-powered operational intelligence solution. Eugenie analyses streams of data from multiple sensors on multiple machines at huge volumes and speed. It can then use this data to predict accurate failure probabilities for each machine and recommend risk mitigation plans.

With Eugenie, Ajit does not have to pour over reams of data trying to diagnose his machines. Diagnostics are handled automatically and constantly by Eugenie, free from human intervention. Eugenie will tell Ajit which machine is likely to fail and what needs to be done to prevent failure.

Not only does this take the guesswork out of maintenance, but it also represents a considerable cost saving for Ajit. With Eugenie, none of his machines is over-maintained or under-maintained. With more intelligent risk management comes greater operational efficiency. In addition, as his machines can deliver more uptime, with greater efficiency and lower maintenance needs, his net greenhouse gas emission has significantly decreased.

For a manufacturing unit with thousands of machines such as Ajit's, this capability is a game-changer. If there is a probability of a malfunction in the future, Eugenie can predict it months ahead, that when failures are most likely to happen.

Dealing with AI black box

Coming to AI, most solutions implemented today are black boxes. An AI may predict something, but the operator or user has no insight into the logic behind the AI's prediction. This is a deal-breaker for many Eugenie AI's clients, such as Exxon and the Indian Navy. For example, the Navy has to monitor mission-critical missile systems. For the Navy, incorrect predictions represent potential heavy consequences. They need logic visibility.

> What sets Eugenie apart from its AI systems is its use of explainable AI. Explainable AI allows operators and users to take a deep dive into the logic of the AI's predictions and prescriptions. In the words of founder Soudip Roy Chowdhury," the black box turns into a glass box, giving users confidence in the insights generated.
>
> **Soudip Roy Chowdhury**
> Founder, Eugenie AI

Eugenie will first explain what possible problems might arise, and what needs to be fixed and when. If the operator wants to dig deeper, Eugenie shows how this potential issue might affect not only the machine in question but all other machines and processes in a production line.

Eugenie will also run a root cause analysis to show the engineer exactly why the machine is likely to fail, giving him complete clarity and understanding over the scenario, allowing him to control the probability and frequency of similar issues arising in the future.

Further, in the words of Soudip Roy Chowdhury "[the operator] knows where were the driving factors behind [a] recommendation, and [using this insight] he can [report] to his team and bosses accordingly."

In a nutshell, Eugenie AI enables

Eugenie is powered by two algorithm-based software – Ray-Finn and Papillon. They work in tandem to allow Eugenie AI to perform its tasks through these critical processes.

- **Upstream data extraction:** Eugenie can stream data from any upstream source, including sensors, DCS, SCDAs, and climate data.
- **Upstream data validation:** Ray-Finn then checks all the upstream data in real time, validating them by cross-checking against multiple variables. This is crucial to accuracy as garbage in leads to garbage out.
- **Data processing:** Papillon then receives the data from Ray-Finn and processes it to determine machine health.

All of the above is done in real time. Unlike other operational intelligence solutions, the data ingestion and analysis are not limited to in batches at a fixed time. It allows data to flow continuously through it.

Eugenie manages large upstream data throughput, data validation, data analytics, and output to its own platform and other downstream applications in one continuous data stream.

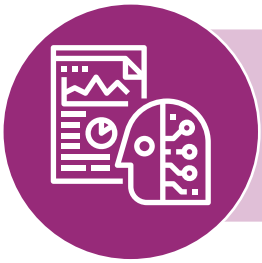
The business and environmental impact of a tool such as Eugenie AI cannot be overlooked. It is estimated that Eugenie Ai has an economic impact of US$ 150 million while reducing greenhouse gas emission by .56 million tons.

Today Eugenie AI has partnered with brands across industries, such as Exxon Mobil, Hindustan Petroleum, Fresnillo, and the Indian Navy.

Ajit no longer has to worry about constantly servicing his machines to prevent a possibility of a breakdown. Eugenie AI pinpoints where he can focus his maintenance efforts, markedly increasing operational efficiency.

BFSI
GAMECHANGER

Capital Quant: AI-enabled financial analysis for better decision making



We believe that the financial services sector is inundated with unstructured data and this deluge of information should be converted into strength of the industry and not a weakness because of overload.

With the advent of the internet, the world witnessed information presence anytime and anywhere. People no longer needed to be at a library skimming pages to seek information. Instead, most of the information is right there at arm's length.

On the other hand, hasn't it happened to all of us that at times this availability of a vast amount of information gets too overwhelming for us to even process, at times leaving us confused, and worried about the uncertainty or reliability of the information?

Information overload is a real problem in today's world. And like with many of the modern-day, man-made problems, we have come up with various names for it, such as infobesity, infoxication, information anxiety, and information explosion. This situation becomes more severe in sensitive areas of finance, management, and healthcare, where even a minor mistake can cause repercussions of catastrophic magnitude. However, as necessity is the mother of invention, there are many smart minds tirelessly working to solve these challenges, especially in the financial service domains (where a single bad decision is all you need to wipe away someone's life savings).

Capital Quant Solutions (CapQuant) is focused on solving this challenge by extracting structured data from unstructured financial documents. The company offers tools that leverage the power of machine learning (ML) and natural language processing (NLP) to identify relevant parts of the document and analyse it.

The financial services sector is inundated with unstructured data and this deluge of information should be converted into strength for the industry and not a weakness because of overload - Capital Quant.

The company is the brainchild of Pravin Lal, who is its founder and CEO. Pravin has over two decades of experience in the banking and capital markets tech with mainstream organisations, such as Citi Bank, Lehman Brothers, Nomura Holdings, Headstrong Inc, and Sapient.

IDC estimates that an average knowledge worker in the financial services industry spends around 2.5 hours per day searching for information from unstructured sources. This, according to IDC calculation, translates into cost of US$ 33 million per year for Goldman Sachs alone.

Currently, this process is done manually, where an analyst reads and scans documents, extracts relevant information, and then analyses it. Such analysts are hired across functions such as credit, risk, trade finance, equity, fixed income, etc. The manual process has many limitations, such as being expensive as it consumes expensive human bandwidth. They are often error-prone and not scalable. Today banks and financial institutions across the globe receive a high volume of complex and unstructured documents, such as financial

statements, news, corporate announcements, and research reports. As a result, many of the key financial decisions are made based on the information in these documents, raising demand for tools such as FinStinct. According to Research and Markets, the global business process automation market size is expected to reach US$ 19.4 billion by 2026, rising at a market growth of 13.2% CAGR during the forecast period.

> The global financial services industry will experience major disruption in the next decade in specific process areas that deal with decision-making based on information from unstructured documents. Currently, this industry hires intelligent resources, i.e., analysts who read such complex documents and manually identify relevant details that are extracted, structured, and analysed for decision-making.
>
> We believe with domain-specific AI solutions, such as FinStinct from Capital Quant, such processes will experience disruption as ROI gains are significant.
>
> **Pravin Lal**

CapQuant developed FinStinct as a comprehensive cognitive automation solution that uses the power of ML and Natural Language Processing for processing just about any financial document and pulls out the relevant information for analysis. FinStinct has pre-created models that are available off-the-shelf for generic documents, which almost all financial institutions use. It adapts to your information needs and helps you focus on more integral tasks for business growth.

For the financial service industry, many processes, such as underwriting, investment analysis, legal, KYC, and regulatory, require key details to be extracted from unstructured documents and then analysed.

According to company sources, 80% of the data in a financial services organisation comes from unstructured sources, yet less than 1% of this data is analysed and used. Working with unstructured documents requires an intelligent system that can understand the document's structure (document object model) automatically, even for previously unseen styles and layouts. It is expected to be capable of extensively using computer vision and deep learning to perform document structure analysis and extract text from irregular shapes, such as seals and stamps in legal documents. Identification of relevant portions of the document (which could be textual or tabular) for a specific use case and of specific key-value pairs that can come from a paragraph or free-flowing text, table, or form is critical. The solution is expected to understand the structure of non-uniform tables and accurately extract it.

While most of the solutions available in the market work on specific documents only, FinStinct can work on any document as it is a comprehensive cognitive automation solution.

Another distinguishing factor of FinStinct is that it offers strong DIY capabilities to a business user who is new to machine learning to build an ML model and extract key data points.

With the complex nature of the problem and lack of standardisation in the way the data is represented in documents, the detailed testing of the models becomes time consuming.

FinStinct is currently being used for over 25 use cases at NSE. In addition to that, over 35 different document types being processed at the exchange. At NSE, FinStinct is an integral solution for the digital transformation of the exchange. Documents from all divisions of the exchange covering regulatory compliance, clearing, collateral management, index management, member services, member compliance, listing compliance, etc., are being processed by FinStinct. A few other clients who are using the tool are IIFL, DMI Finance, and SmartStream.

BFSI
CHALLENGER

Karza Technologies: Getting KYC right

Karza has so far prevented fraud in BFSI institutions worth INR 25 billion by weeding out bad applications even before they enter the system, saving 70% processing time by digitising processes and realising a 7x increase in business.

One of the most popular trends on social media these days is the "before and after" physical transformation pictures of people. Everything from 10-year challenges and body fitness to hairstyles and 'beardo' looks are lapped up with great delight by netizens. But these same transformations are a nightmare for BFSI institutions and service providers when they need to verify user identity by comparing an 'after' pic with a 'before' pic.

Consider this example – every Indian knows that Ankit Sharma and Ankita Sharma are two completely different people of opposite genders. Ask a computer to make this differentiation and suddenly you will need AI to do the job.

Banks and financial institutions carry the onus of verifying identity, address, and other details at every step. However, this process is highly error prone and can lead to further errors and even fraud. In addition, customers have a poor digital experience because financial institutions' backends lack end-to-end digital processing. These are the problems that Karza Technologies is solving using AI, to create a dependable, automated and secure system to alleviate the strain of lengthy verification processes to decrease the danger of bank fraud.

Founded in 2015, Karza Technologies chose to develop anti-fraud solutions for KYC applications. With 200+ clients across BFSI, including the top private sector banks, NBFCs, fintech, and payment firms, they are revolutionising identity authentication and risk mitigation with quick and secure digital solutions that enhance transactions at each stage - from screening to monitoring.

They provide the most comprehensive suite of microservices for digital onboarding with two best-in-class solutions:

- Computer vision for Optical Character Recognition (OCR), face match, liveness, tamper checks, etc.
- Natural Language Processing algorithms for name match, address match, and related party identifications across millions of legal documents, etc.

While these can have multiple applications, Karza used it first to create the first-ever unified fraud risk score that considers identity, contactability, and employment risk assessment.

> Automation attempts of these processes are bottlenecked by the fact that inputs are non-standardised and document quality is extremely poor, wherein OCR and face-match solutions struggle to deliver reliable accuracy.
>
> **Alok Kumar**
> Co-founder and CTO of Karza

This solves a dual problem for the BFSI sector - frauds due to document falsification and customers experiencing a broken digital experience due to multiple manual interventions. In India, data sources are as varied and scattered as its geography. And just like there is no single language natively common to all regions, there is no single identifier of customer details across sources, which complicates search and compilation and renders "thin file" customers unviable (due to high processing costs), resulting in their financial exclusion.

Powering straight through processing of KYC process with advanced AI solutions

To fix these issues, Karza Technologies devised a process based on three primary solutions:

1. **OCR models –** Karza's OCR text detection and text recognition algorithms are trained on hundreds of various font families and background sounds tailored for the BFSI industry, allowing for smooth text detection and identification on any officially valid documents encountered during client onboardings. In addition, their card identification and parser models are retrained to accommodate different document formats; these parsers based on graph CNN use document topologies for better accuracy.

2. **Face-based models -** They use stitching methods across government data sets to mine appropriate training data sets (lower resolution, Indian faces, worn-out document faces, etc.) in a scalable manner and use face detection. Face similarity, combined with a face attribute model, provides a second line of defence in challenging circumstances – typically like the 'before-after example.

3. **Name analytics and similarity -** The gender classifier uses encoding methods to make training and generalisation easier. At the same time, a combination of IR approaches and special features gives previously unavailable token-wise uniqueness, as well as a given name and surname score that can be rolled up or drilled down demographically. Custom matching is also made possible – remember 'Ankit and Ankita'?

> We are using government data sources in real-time for the verification process. For name analytics and similarity mapping, we currently use a database of 200+ million individuals from across the country. We have our own proprietary encoding and embedding techniques, and a unique feedback loop between the rule-based engine and deep learning model, which makes the overall generalisation much better than other solutions in the market today. Another important feature is that we have made these solutions mobile-friendly to cater to remote areas where internet access cannot be taken for granted.
>
> **Alok Kumar, Co-founder and CTO of Karza**

AI and ML models get sharper with increasing volumes of data that can train them.

Take the example of a Payday Lender that wanted to reinvent client onboarding for personal loans. Karza's solution was a single interface for authenticating identity, contactability, and use of multiple APIs to help with end-to-end customer journey automation.

The result was incredible, as it sped up verification of loan approval applications, reducing approval time to less than 5 minutes per file while allowing for real-time filtering of fraudulent applications through digital screening of 100% of applications. This increased monthly application volume from 0.5 million to 2 million without sacrificing quality.

So what does Karza do differently?

- Hundreds of publicly available government data sources are automatically stitched together
- Adaptation across 200+ leading BFSI players ensures reliability at scale and diversity
- Data-driven preparation of training and evaluation data sets that minimise sampling bias
- Multiple models yielding interpretable features by name and address match like correctly spaced name or address string, given-middle-surname tokens, uniqueness score of each token and address buckets (such as house no, locality, building, and landmarks).
- Human-like cognitive skills to interpret Indian names, addresses, officially valid documents, faces, and liveness
- Data-driven approach taken to learn thousands of demographic quirks in a scalable manner continuously

The Karza impact

With technology and AI comes accountability, accountability for optimising resources, and securing data. Karza has made a mark by preventing fraud worth INR 25 billion by weeding out bad applications even before they enter the system, saving 70% of the processing time by digitising processes realising a 7x increase in business. Karza's technology can work not just with BFSI, NBFCs, fintech, and payment companies, but also with gaming, HR services, fleet aggregators, and other industries.

Interpreting and integrating data from an ecosystem as complex as India to drive digital inclusion through great consumer experiences is truly the holy grail that Karza Technologies is helping India Inc gun for.

EDUCATION
GAMECHANGER

Jungroo learning: Adaptive and personalised education

Using AI to help young learners tread the personalised learning path by identifying their needs at the micro level.

The story of the talented but tormented Ishan Awasthi from the film Taare Zameen Par makes a compelling case for customised learning at scale. Dyslexic but initially unaware of his condition, Ishan is unable to recognise similar sounding words, or similar looking letters, et al. and therein lies his learning challenge. It takes a dedicated teacher and multiple efforts by parents and teachers alike to recognise his specific challenges and help him learn better.

There are 37.4 million students in India.1 Unfortunately, most of them facing specific learning challenges, however big or small, cannot be allocated a dedicated mentor or teacher to first understand and then resolve their problem. This becomes a sweet spot for AI-learning solutions such as Jungroo, an AI-based adaptive platform for education, particularly assessments and practice. Founded in 2018 by a Teach for India alumni and software engineer turned entrepreneur, Sethuraman T and his colleague turned co-founder Cibe Hariharan, Jungroo helps young learners tread the personalised learning path by identifying learners' needs at the micro level. Upon identification of specific learner problems, it helps them draw the shortest learning path.

Do we know what we don't know?

The question arises thus, are we conscious of our inadequacies at a micro level, more so during early stages of learning?

First, we probably need to know what we do not know and why we do not know it.

> It took me 40 minutes of a one-on-one session with one of my students in a class of 40 to find out that he was grappling with three-digit subtractions. It was difficult for him to work with carryover digits during calculation," explains Sethuraman, who comes with an additional experience as a teacher in a government school and an experience of 7+ years in the education sector.
>
> Imagine understanding the specific needs and challenges of millions of students then! It is next to impossible at scale, physically or manually. So, we needed an AI-based approach.
>
> **Sethuraman,**
> **Co-Founder & CEO of Jungroo Learning**

This essentially meant, replicating the role of the personalised teacher or an oral examiner at scale, which Ishan Awasthi had the fortune to have in person!

According to an ASER Study, on an average, students function at almost two grades below their actual grade level and there are learning gaps across genders and domains. It becomes imperative then, to accurately predict their specific needs and challenges. One size cannot fit all.

The core essence of Jungroo's solution lies in its detailed identification through AI-based assessments. The questions asked to the learner are sequenced in a particular order through reinforcement learning-based MDP algorithms.

> It is important to present the right question at the right time to accurately detect the learning gaps of the student.
>
> **Cibe,**
> **Co-Founder, Jungroo**

GPS for education - The technology graph

Jungroo's knowledge graph-based Markov's decision process algorithm functions and adapts based on difficulty levels and knowledge levels of the learner. It is a decision process that takes into account the accuracy of the current question and the type of question asked to the learner, the time spent by them on the question, and the responses to the previous questions. The decision is made only thereafter leaving little or no scope for generalised judgement errors. "Our backend is strengthened by knowledge graphs that form the basis of AI algorithms. This helps us take into account carelessness, and guesswork if any by asking specific questions at the right time. Almost like how you would be able to predict traffic while using GPS to reach a particular location, the algorithm detects engagement, boredom, interaction metrics of the learners, etc., for deeper personalisation," smiled the new-age edupreneur.

Some essential features of the AI solution innovation include:

1. The Scala language and play framework
2. SQL, RDS, and Mongo DB as database
3. Grouping of students based on their knowledge and not their marks in assessments
4. Reinforcement learning algorithms for accuracy et. al.

Learning pace and customisation

Students' learning needs cannot be generalised in a highly customised world. No two students are alike even within same grades. The current standardised assessments and marks-based approach widen the gap as students move up grades. In the wake of Industry 4.0, education organisations need to be equipped with the tools that precisely cater to learners' unique needs. The Plug and Play approach of Jungroo's algorithm for organisations helps them create customisable content and make their existing content adaptive and intelligent.

Furthermore, the AI-based math practice app creates personalised math practice for grades 1-8. This helps students practice the right concepts at the right time and ensures learning gaps across grades and domains are remediated. It lets them practice at their own pace and a more individual level. "Amongst the pre-test and post-test conducted for 3,000+ students, the data provided by Jungroo helped in average growth of 25% in mathematics," confirms Sethuraman who has already piloted the test in a few partner schools and NGOs.

Learners need these little gestures of understanding. Providing growth opportunities help strengthen the psychological aspects of development. It also helps learners achieve:

With more than 80,000+ assessments and over 10,000+ students who have taken Jungroo's assessments through 5+ partner organisations, the founders concluded that 93 of 200 students who practiced via Jungroo showed 35% more growth compared with their counterparts. For its efforts, the team has won awards such as the AI for Good award from NASSCOM and grants from Government of Karnataka and Millennium Alliance (DST, Facebook, UK government, and USAID).

A sky full of opportunities

With a global pandemic pushing the world and the country to virtual and hybrid methods of learning and growth, it becomes even more essential to adapt and adopt AI-based methodologies that aid learning at scale.

In India particularly, the edtech penetration is at a nascent stage. According to a report by Redseer and Omidyar Network,2 a large untapped market, coupled with a burgeoning internet reach, awareness and digitisation of private education, yields a promising outlook for edtech in India. Furthermore, the K-12 market in edtech is projected to be valued at US$ 1.7 billion by 2022.

This makes for a very strong case for customised learning solution providers, such as Jungroo that work with schools, education organisations, and NGOs alike. The need to help learners with personalised assessments and painting a roadmap of the shortest path to mastery will hopefully eliminate many cases similar to Ishan Awasthi or at least, identify and aid in rectifying their learning-related challenges early on.

EDUCATION
CHALLENGER

Learning Matters: Harnessing AI for education

TARA, an easy-to-use assistive platform for teachers, can be placed in a classroom. It can guide teachers in their techniques and understanding their students' competency profiles.

India has the distinction of running one of the largest educational systems in the world – with nearly 25 crore students. According to the Annual Status of Education Report 2019, only 16% of children of Class 1 in the 26 surveyed rural districts can read the text at the prescribed level. 40% of students cannot recognise letters. The report also states that the lack of age-appropriate skills in the early years is alarming, and this can impact the entire education supply chain in India. Furthermore, according to DISE data, 18% teachers in India in 2016-17 had no professional qualification in teaching.

With one of the biggest educational systems, Indian students cannot read or write English too well. And they do not have enough qualified teachers to help them improve their skills.

Three friends – Ramamoorthy, Gowri Mahesh, and Saraswathy Ramamoorthy – all working in the EdTech sector, decided to bring in the much-required change. The EdTech industry at the time was largely focused on providing supplementary education to the top-tier schools. This meant that there was a large population in semi-urban and rural India that was left underserved and ignored.

There is a lot of unrealised potential in these school kids, some of whom are equally or more intelligent than their privileged counterparts. The welfare of these kids mattered to the friends. Hence, Learning Matters was launched in 2016.

> Only 1-2% of schools in India can be considered top of the pyramid and are consistent with producing results based on competency levels of students. For the rest of the 98%, it is a struggle.
>
> **Gowri Mahesh**
> **Co-Founder, Learning Matters**

Harnessing AI for education

One of the ways in which the company, headquartered in Bangalore, is tackling the problem of English language education in schools is through an AI-chatbot called Tara. Running primarily on Amazon Alexa, Tara enables voice-based education. This autonomous voice teacher is armed with AI capabilities such as Natural Language Processing, text-to-speech, and speech-to-text. It is poised to play a role in improving English language skills amongst teachers and students, and affect student learning outcomes in a significant way.

Another element of AI that is to be built into Tara is adaptive intelligence.

We decided to approach the problem from the point of view of a teacher – Tara is an assistive platform for teachers and requires no training. It can be placed in a classroom and can guide teachers in their techniques and understanding the competency profile of their students says. - Gowri

> Voice technology has allowed us to create natural, two-way communication mechanism, providing relevant and immediate feedback, create a non-judgemental, non-threatening learning environment. The fun element (voice technology) only adds to the excitement.
>
> **Ramamoorthy**

AI is used in two different ways in our solution: voice recognition technology and adaptive intelligence that helps the system set learning paths for student and the system can learn as more users get to use the system

The adaptive learning path has not been implemented yet as it in the design phase right now.

Adaptive learning paths that can be uniquely set for each student is an extremely useful tool where teachers can get reports and which student and what area needs improvement. Depending on various evaluation criteria, the student can be placed initially on a track, but the system can learn as more users use the system to learn and tweak the suggested paths. If necessary, the system can learn and modify the path for current and future users - Ramamoorthy

The road ahead for Tara

Tara currently runs on the AWS Cloud-based ecosystem. Commenting on the immediate plans, Ramamoorthy says, "We are working on containerisation to develop cloud agnostic products that can be deployed in any cloud-based environment with microservices-based architecture."

Furthermore, prototypes have been developed that run on Google Home and the open-source Almond. "We need to quickly create similar solutions on multiple voice platforms to remove dependency on one provider," says Ramamoorthy.

This product has been used by about 140 educational institutions to date. To keep up pace with the changed learning patterns during school lockdowns, Learning Matters, has also launched an app to facilitate at-home learning.

> Our users are in government institutions, private affordable schools in Tamil Nadu, Karnataka, Jharkhand, Orissa, Maharashtra, and Kerala. Our product is being used by skilling industry also to impart English language learning to learners. In future, this can be scaled for learners with disabilities such as blindness.
>
> **Ramamoorthy**

Many government and affordable private schools use our products and services. They find it extremely easy to use and effective. It is highly affordable too. We have affected about 15,000 students in rural and semi urban areas -Ramamoorthy

Moving the needle

"About 75% of our customers are from government or affordable private schools," says Ramamoorthy.

There are two main challenges in education that Learning Matters is solving - poor quality of education leading to dismal student learning outcomes and a huge shortage of qualified, trained teachers. Learning Matters provides comprehensive, scalable, and sustainable solutions to overcome both these challenges.

Education is the passport to the future, for tomorrow belongs to those who prepare for it today." A prepared mind can achieve a lot, and in today's competitive landscape, a nudge by technology in education is much needed to be well prepared for the future. - Malcom X

Onward Assist
www.onwardhealth.ai

HEALTHCARE & LIFE SCIENCES
GAMECHANGER

Onward Assist: A shot in the arm for cancer pathology with AI

India has only 500 cancer pathologists, while there are 2 million cancer patients reported annually. Per the latest National Cancer Registry Programme Report, cancer cases in India will increase by 12% in the next three years. Cancer intervention steps, such as pathology and histology, could greatly benefit from AI.

Cancer is one of the most prevalent lifestyle disorders today. According to the National Cancer Registry Programme Report of 2020, India can expect a 12% increase in cases to 15.6 lakh by 2025. Tobacco-related cancers, followed by gastrointestinal and breast are amongst the leading types of cancer in the country.

In the past few years, the market for deep-tech, start-ups in healthcare has expanded considerably. With the healthcare industry estimated to reach US$ 372 billion by 2022 and the exponential rise in emerging technologies such as AI, there is a case to be made for the application of advanced tech solutions to address the last mile in healthcare services and solutions delivery.

On one hand, the direct consumer is becoming more health-conscious and tech-savvy, made evident in the rise of wearables to monitor critical health parameters. Moreover, the ongoing COVID-19 pandemic has exacerbated the need for telemedicine and remote medical care. On the other hand, specialists such as radiologists, pathologists, and oncologists, who are in short supply and high demand in India, can be supported more competently with the use of technologies. This is what Dinesh Koka and Vikas Ramachandra realised was a sweet spot for techs such as AI and its various related applications.

What started as a patient intervention platform eventually morphed into a clinical decision support tool for oncology.

> There are only 500 cancer pathologists in India, who have the skill to report on a biopsy slide and give an accurate report. However, in India, there are about 2 million cancer patients being reported every year, leading to huge waiting times and sub-optimal outcomes.
>
> **Dinesh Koka**
> **Co-Founder, Onward Assist**

Early diagnosis and prognosis of a cancer type is critical, but the clinician is expected to look at a huge volume of data to get a clear understanding of how the disease has progressed. Imaging modalities such as pathology and radiology are complicated to report and time-consuming. Qualified pathologists and radiologists may not be available to report on the patient case immediately.

From image to analysis in minutes

Cancer intervention steps, such as pathology and histology, could use a shot in the arm with technologies such as AI. Onward Assist helps improve cancer treatment outcomes by solving the problem of accurate and timely cancer diagnosis and simplify the process. Cancer Pathology is a fairly complex reporting modality even for human pathologists. This involves processing gigabyte resolution images and then reporting these results that could take between 25-30 minutes. An analytics-based solution would not be able to perform because the problem is not as simple as pattern matching. The model needs to learn from multiple cases over different types of cells and cell structures and neighbourhood. No two tumour cells would look the same. So, the need for a multi-layered neural network is needed.

While Onward Assist starts with core concepts of machine vision, ML is required for the size of data and the complexity of the data features. Onward Assist's AI solution consists of computer vision-based deep learning tools that help automatically detect and analyse a few important cancer biomarkers, such as ER, PR, HER2, Ki67, and Nottingham's scoring. Onward's Telepath platform tech stack consists of an application server, database, and ML tools compute engine. The full-stack pathology AI solution combines advanced analytics with an easy-to-use telepathology platform, which pathologists can use to complete their slide reporting process faster, less error-prone, and reproducible.

It's all about quality images

This process requires high compute infrastructure to process and execute predictions on large multi-gigabyte whole slide image files. High-quality whole slide images of biopsies are challenging to acquire. "To train our AI models, we would need thousands of high-resolution whole slide images," adds Koka. The Pathology AI layer can integrate and work on images acquired both on high quality/high-cost whole slide image scanners and low-cost scanners. So far, the Pathology AI works only on a digital image of a biopsy slide. Hence, the image of the glass slide needs to be captured and converted into a digital image. This requires expensive slide scanners to scan the glass slides. To address this challenge, Onward Assist is collaborating with AIIMS New Delhi to develop a low-cost solution to capture biopsy slides in high resolution and feed them to the AI model for instant analysis.

Onward Assist is collaborating with eight leading cancer institutes, including HCG Bangalore, Tata Memorial Centre, Yale, and Weill Cornell Medicine. The pathology workflow software has been deployed on India's leading diagnostics network of 25 centres. The team plans to expand to 100 centres in a year. Onward Assist has also filed eight patents covering classification, segmentation, and imaging. The team has bagged several awards and gained accolades for their work in May 2021. It won the JanCare BIRAC Challenge, Amazon AI Conclave in January 2021, NASSCOM Emerge 50 in November 2020, and RICH Cancer Innovation Challenge in August 2018.

The success of a solution such as onward assist is a perfect example of addressing gaps in technical skills today. Specialists such as radiologists and pathologists are in limited numbers and no match to the exponential increase in prevalence of lifestyle diseases such as cancer. By harnessing AI and high compute infrastructure, a reliable, tech-driven intermediary ensures quality healthcare reaches all.

> Onward's AI tools are built in collaboration with leading cancer institutes in India and the US. The full-stack pathology AI solution combines advanced analytics with an easy-to-use telepathology platform that pathologists can use to complete their slide reporting process faster, and leverage some advanced tools that enable them to add a lot more relevant information in their reports, which will benefit oncologists during the treatment.
>
> **Dinesh Koka**
> **Co-Founder, Onward Assist**

TRANSPORT & LOGISTICS
GAMECHANGER

EXL: AI-makeover for logistics

Using AI to help trucking companies increase their revenue and profitability.

In today's world, logistics is no longer confined to the delivery of the finished product or services but deeply embedded in the operational stages of every business. Logistics is now a conceptual scientific process that moves both products and services from source to the endpoint, which is a consumer. It would not be wrong to compare a country's supply chain as its nervous system, and optimised logistics are the key to efficient supply chains. As a result, the economic prosperity of any country is highly dependent on logistics − internal or external.

Many logistics companies are now using technological advancements as a medium to have holistic improvisation. Sustainability is a big concern area, along with profitability for various logistics companies. Therefore, the stakeholders require ways to achieve profitability while adopting sustainable practices.

EXL Services is a leading operations management and analytics company that uses cross-industry expertise and emerging technologies, such as cloud, AI, ML, and Natural Language Processing to create and customise solutions for specific objectives. The company, headquartered in New York, has a global employee base of 31,600 members. It is a leader in operations management and analytics, serving clients in insurance, healthcare, banking, travel, transportation, and logistics, with its revenue standing at US$ 958.4 million in 2020.

Using AI, the company is mechanising solutions to help trucking companies in the US increase its revenue and profitability. EXL's EXLerator.AI framework helps clients digitise their inputs through AI, improve decision-making capabilities through data analytics, and transform their output through automation to realise the true benefit of digital transformation. EXL's cloud-native AI solutions drive end-to-end straight through customer journeys. However, it is also important to understand issues with logistics companies that need intervention. For example, in general, Less than Truck Load (LTL) carriers operate on very thin margins and cannot afford any revenue loss. LTL carriers perform many billable accessorial services to ensure safe and on-time delivery. However, they cannot invoice their customers 100% of their entitled revenue due to the involvement of multiple people, processes, and technological challenges

The challenges

Though there are many reasons for revenue leakage, the inability of LTL carriers to invoice their customers for all eligible accessorial services performed accounts for about 2% of this leakage.

The trucking business is a rugged profession that has limitations of odd hours, geographic constraints, and location-based challenges. There can also be dense unapproachable areas with poor in-field network connectivity. Such spotty network coverage leads to drivers using handheld devices to identify accessorial services performed. In addition, there are several system integration gaps, such as lack of integration between handheld devices and invoicing systems. The solution aims to resolve data extraction challenges around traditional OCR and ICR techniques as they are not effective in extracting data from proof of delivery (POD) documents.

To tackle these issues and increase profitability, the company created a solution named EXL Rev-Lift Solution Suite, which has both Analytics and AI components. Solution suite combines Computer Vision, Deep Learning, Natural Language Processing, ML to read, extract and standardise information, RPA to automate downstream activities, and multiple APIs/DBs to manage the entire workflow.

> Invoicing customers for all eligible accessorial services performed is absolutely vital for trucking companies. EXL's AI-infused cloud-hosted Rev-Lift Solution Suite uses computer vision and deep learning techniques to effectively capture and invoice these services.
>
> **Sanjay Reddy**
> Global leader for transportation and logistics EXL

Another product from EXL Rev-Lift Audit Based Accessorial Solution identifies potential revenue opportunities for trucking companies that receive a very large number of Delivery Receipts (DR) every day. These receipts are scanned by the terminals after drivers have completed their deliveries for the day. Some deliveries have unexpected additional charges that are not mentioned on the Bill of Lading. Truck drivers notate these additional services performed on DRs by either handwriting notes on them or marking certain checkboxes. The cloud-hosted solution leverages computer vision and deep learning algorithms, and robotics for ascertaining and applying the right accessorial charges. It also identifies check boxes and handwritten text using third-party cognitive services.

The solution affects both financial and non-financial metrics. The financial impact is around revenue upliftment, operating income upliftment, and collectability. While non-financial metrics include improved customer and driver satisfaction, smart reporting, improved operational agility, easy deployment, and scalability.

> The accuracy achieved with an AI-based solution can be seen with the stats where only 4% of reviewed receipts showed accessorial charges with analytics systems while using AI-based solution exhibited 50% of reviewed recipes showing accessorial charges.
>
> **Chaitanya Manda**
> Sr AVP, AI solutions at EXL

AI at the core

Rev-Lift's time and effort and location-based accessorial leverages EXL's proprietary and third-party databases and brings together algorithmic intelligence as well as Robotics Mainframe updates. The audit-based solution enables auditors to verify and validate more receipts than they could manually as the solution intelligently identifies receipts with accessorial revenue potential (curated set due to leveraging computer vision and neural network-based models).

The solution uses deep learning to identify check boxes and handwritten text using third-party cognitive services. With validation UI, auditors can clearly view receipts, and the AI system ensures that only the correct charge is added to the customer invoice. The model is trained on approximately 20,000-30,000 samples to capture a wide spectrum of variations, enabling the model to achieve and sustain a high level of accuracy.

EXL Rev-Lift Solution Suite is a great solution for trucking companies and logistics companies as EXL holds decades of experience applying automation to previously manual functions across several transportation and logistics clients. It is also the industry pioneer in the creation of a digital solution for the driver detention and audit-based accessorial and amongst major players for location-based Accessorials. The solution is conceptualised and created by a strong and experienced inter-disciplinary EXL team comprising global leaders in various fields. The solution is more comprehensive, accurate, and robust. It is a full-service provider for the full range of accessorial charges compared with data service competitors that typically specialise in a single type.

The solution suite is highly scalable and portable, which makes it easy to deploy too. More accessorials can be added to the suite, which widens the scope for impact and opportunities to increase revenue.

The solution hosting on the cloud makes the solution easy to integrate and sustainable.

The usage of AI undoubtedly looks promising for the future. However, the secret lies in taking care of aspects of responsible AI ie., explainability, unbiasedness, privacy, and security. Human intervention is critical as this intelligence is what provides the final validation to the AI judgments. "We have come far from just the research and conceptualisation phase and are currently looking at execution and adoption. At this stage, we shall ensure a stronger feedback system to improve future output."

Our vision is to continue to grow the solution by including additional accessorials and entering into adjacent high growth markets, such as Ocean Freight and Air Cargo. We are proud to see our solution play a critical role in enhancing revenue and profitability for our clients - Sanjay Reddy, Global leader for transportation and logistics EXL

TRANSPORT & LOGISTICS
CHALLENGER

Maersk: Order bookings made swift and easy with RPA

Maersk, one of the world's biggest shipping companies, has started making the critical pivot towards AI by integrating the technology into crucial on-ground support functions, such as managing order bookings and amendments.

Shipping is one of the oldest trades in the world, and one of the foremost measures of a country's economic growth and prosperity. Be it coffee from Africa, dark chocolate from Indonesia or the latest appliances and gadgets from China and Taiwan, your preferences and affinities rely more on shipping companies than you might imagine. About 80% of all goods today are carried via sea. Global maritime container trade accounts for 60% of all seaborne trade and was valued at US$ 14 trillion in 2019. Amongst several organisations that manage the flow of sea traffic is Maersk, a Danish shipping company - and the largest container shipping line and vessel operator in the world for nearly 25 years now.

In the past decade, shipping companies have begun using a host of AI technologies to make processes more streamlined and efficient. While ships - be it commercial or military vessels - themselves have evolved over time to become supremely sophisticated carriers, on-ground support functions and operations were still antiquated. But with the emergence and popularity of AI, critical support functions are getting a revamp.

For instance, take order handling and bookings. Maersk operates in 130 countries and specifically manages 150,000 booking requests in a month. Last year, Maersk Technology Centre in Bangalore carried out a hyper-automation initiative that saw the development of a homegrown, production system that streamlined order handling and bookings using AI and Robotic Process Automation.

> One of the main problems we faced was the flow of order requests through multiple channels. In addition to the Maersk website, customers would send queries to EDI and INTTRA – third-party websites for managing incoming orders. In addition to keeping track of multiple channels, customers would also make several amendments to order such as specifications of the vessel needed, the kind of cargo being transported, timelines, etc. These variables can be quite challenging to manually keep track of.
>
> **Sunil Kumar**
> Engineering director - Data Science, Innovation and Digital Automation, Maersk Technology Centre

Adding that reading-free text was the specifically challenging aspect of constantly amended requests, Kumar explained that this was the case not only because the text was in Natural Language but also steeped in business jargon - and unfamiliar for anyone outside the supply chain domain.

> There is a specific taxonomy associated with the domain we specialise in and highly trained operators manage these operations daily. Yet, there is scope for mistakes and errors as these are repetitive tasks.
>
> **Sunil Kumar**
> Engineering Director - Data Science, Innovation and Digital Automation, Maersk Technology Centre

So, the Maersk Technology Centre developed an AI module that integrated RPA, named entity recognition, BERT embedding, and Regular Expression (REGEX) to provide deterministic solutions to internal users. They used large volumes of training and historical data from booking amendments processed by teams, trained the Natural Language Processing model, extracted patterns, and hosted this on Azure as an API. Whenever a booking was made, it was routed to this production system where the APIs performed entity extraction and synthesis. This was converted into structured data for the benefit of other teams.

Primary challenges the team faced included data privacy, the scope of curation, scarcity of linguistic components, and addressing pre-conceived notions on the efficacy of intelligent automation. However, the benefits experienced from this upgrade were multi-fold. The AI module was processing about 17,000 transactions per week, saving nearly US$ 36,000 per year. In addition, with the AI module in place, the accuracy rate was 97.4% instead of the 88% that the teams would average, added Kumar. Moreover, the team involved in setting up this technology platform were software engineers who worked on automating systems, gaining valuable AI experience along the way. "Our team of developers grew from software engineers to data scientists. Many of their careers have changed due to projects like this," said Kumar. Currently, a team of 120 engineers in India, Copenhagen, and Chengdu work on order handling.

AI-based automation of bookings for transport and logistics was amongst many other projects taken on by Maersk to improve business efficiency across the board. Now, data scientists and engineers are analysing customer requests made in voice, developing vessel utilisation plans using AI and predicting container deployment based on customer requirements.

Industries such as shipping are powered by complex transactions daily, with little margin for error as even a tiny mistake can cost them millions. But these industries are also data-rich, process-driven and rely on automation to execute repetitive tasks with near-zero error. These are the right ingredients for an AI system to thrive, perform to its potential, and aid these industries with significant cost savings.

RETAIL & CPG
GAMECHANGER

Tredence: Autonomous management of machine learning model operations in CPG trade promotions management

A vision is to put meaningful analytics into the hands of every decision-maker through the last mile adoption of data science.

Walk into any supermarket or grocery store, and chances are that you will be greeted with an "irresistible offer" on everything from snacks to mobile recharges. So much so, that you may completely ignore these items, no matter how lucrative the offer. Driving consumer preference through promos is an industry norm. Consider this – US$ 1 trillion is spent every year globally by brands on trade promotions. Given such massive stakes, organisations are increasingly using data science to maximise RoIs on trade promotions.

But all that glitters is not gold.

Research shows that more than two-thirds of trade promotions every year in the US do not break even, despite big bucks spent on Big Data and AI sciences to drive them. AI holds tremendous potential to solve real-life problems, but as deployments of machine learning models increase, so do the possibilities of incorrect results arising, due to excessive data, failed algorithms or management inefficiencies.

Additionally, professionals can exacerbate the situation by not focusing on regular model upgrades and failing to understand business requirements fully, thereby resulting in an ineffective last mile – the crucial link required to bring the full force of data science to deliver on-ground business performance. The result is highly inefficient utilisation of available resources, such as the massive US$ 1 trillion spend on trade promotions.

This is where Tredence identified a massive opportunity.

> Our vision is to put meaningful analytics into the hands of every decision-maker through the last mile adoption of data science. Conquering the last mile can be a gargantuan task for many, but we go after it for our customers. Our clients in retail, CPG, TMT, healthcare, and industrials want us to operationalise their data science models and move them to production. The answer to operationalisation lies in the three Ops - MLOps, AIOps, and DataOps. Our clients profess that our approach has been key to powering decisions that uncover growth and drive competitive differentiation.
>
> **Shashank Dubey**
> Chief revenue officer and co-founder of Tredence

Named a "Dark Horse" amongst the top 13 AI consultancies in the world by Forrester Research, Tredence focuses on enterprise-grade, scalable AI for the retail, consumer packaged goods, healthcare, telecommunications, media, and technology industries. Its industrialised machine learning operations platform called ML Works intelligently automates and scales IT incident management, replaces manually created rules.

To understand what this means and how Tredence delivers value, let us consider the case of a Fortune 500 consumer packaged goods company in the US that Tredence worked with. The objective was to improve the efficacy of their Global Trade Promotion programme using Autonomous Machine Learning Operations to increase revenue. The client spends US$ 300 million yearly on its Global Trade Promotions (TP) campaigns, spanning 13 countries. This initiative, which is driven by 66K ML models that run monthly, relies on inputs from 56000 promotion managers from across geographies. The enormous trade marketing effort of the CPG leader is based on 1.5 million SKU-Distributor-Geography combinations.

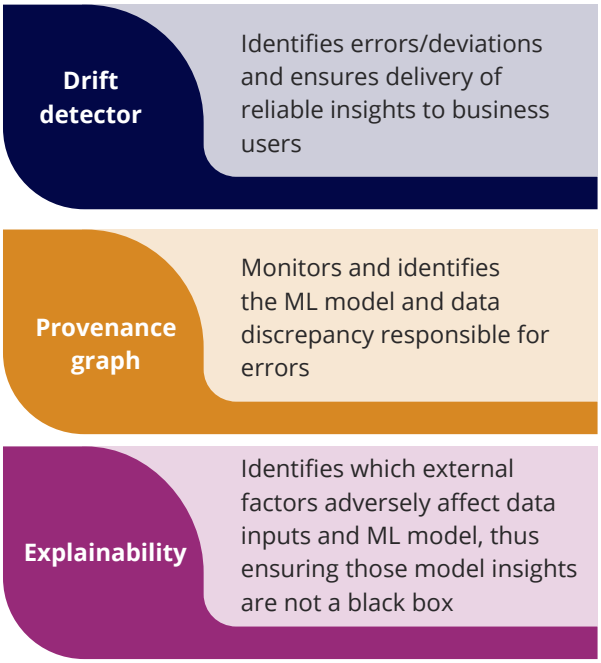
So what was preventing the client to turn this massive effort into profits?

- The client's model error had accumulated over time, thereby reducing ROI on TPs.
- The programme's massive scope, effect, and complexities were difficult to manage effectively, leading to revenue loss.
- The previous TP system had several flaws, preventing business managers from using machine learning to enhance business KPIs.

To add to this were more operational challenges:

- Massive data volumes spread globally, with some geographies having 500K+ rows in monthly forecasting
- High data processing time with the read/write time from DB constantly exceeding 60 sec, therefore time/cost-inefficient
- Time inefficient drift analysis where algorithm took about 7 hours to generate insights for 500K production data
- Inconsistent data quality led to a lot of production failures

Tredence had noticed similar challenges in a number of other companies as well. Based on these experiences, their solution set was based on three key pillars of Tredence's ML Works platform, which automates and scales IT incident management to deliver intelligent automation to lower operational costs, improve service availability, and lower IT risk:



ML Works effectively monitored for deviations in expected outcomes (accuracy, cadence, etc), identified what was causing them, and presented potential remedies – all without requiring any user interaction. As a result, the system has become more dependable, accurate, and intuitive, allowing for improved trade promotion planning and execution.

The MLOps pipeline in this trade promotion effort would not be intuitive or autonomous if it relied just on analytics. ML Works takes responsibility for recognising pipeline problems, issuing near-real-time alarms, and kicking off corrective steps by adding layers of iterative processing and machine intelligence to ensure robust model health and high prediction accuracy.

The impact and complications of the programme was so huge that it required an immediate intervention to stop revenue leakage.

The impact was massive. Sample this:

- 66K machine learning models every month managed effortlessly in production
- Reduction in data processing time from >60 sec to < 3 sec
- Reduction in time taken for insights analysis from 7 hours to 1.5 hours
- Improvement in data quality through a dashboard enabled RCA of data entry issues, data anomalies, data bloat, and hierarchy mapping issues.
- 20% increase in application usage, thanks to reliable and explainable insights
- Reduction in production downtime from 4-6 days to ~6 hours
- 3% increase in quarterly sales since go-live

What truly made a difference though was the sustainable ecosystem built by Tredence that complements their data science capabilities. From conducting listening tours to strategy workshops to co-create solutions, they bring analytical interventions throughout the customer lifecycle to drive scale and faster-value realisation.

This is just the beginning

The Tredence team believes that only the surface has been scratched so far. The focus is now on extending the explainability algorithm to include auto regressors in Time Series data for better model explanations. In addition, they are looking to deploy a testing framework to streamline ML model testing processes.

Tredence is adding intelligent virtual workers to teams of revenue managers who are continually monitoring performance and informing decision-makers of potential value-enhancing interventions. So, every time a customer decides to buy into that "irresistible offer", a Tredence virtual worker will get a little smarter and help brands improve performance.

RETAIL & CPG
CHALLENGER

Applicate AI: Welcome to the future of sales

As the world's first AI sales supervisor, Applicate AI's Sellina, supervises, and trains sales personnel to drive competency and behaviour with action plans at every step to achieve daily sales KPIs at an unprecedented speed.

Ajit's team has been behind on sales volume and up-sell KPIs. Ajit has almost a decade of experience in sales. He has been using all the tricks in the proverbial books. Ajit's team does have a Business Intelligence (BI) solution in place to help make the right decisions at the right time. However, while the BI system only shows data points - it does not give Ajit the complex insights or action plans to speed up sales. It is just too complex to predict a client's specific needs ahead of time.

This is not an isolated scenario. Sales teams across the world tend to lose out up to 35% in daily sales because of inefficiencies inherent in the complex sales processes.

With the help of Sellina, the world's first AI supervisor, this unnoticed sales loss is plugged.

With Sellina analysing every datapoint and possible scenario, Ajit has at his fingertips detailed actionable plans and insights that will allow his team to reach daily sales KPIs at inconceivable speed.

Every morning, Sellina informs Ajit and his sales team exactly which clients are most likely to buy, what they are most likely to buy, and how much they are most likely to buy. To top it off, Sellina gives every member of the sales team a detailed set of actionables that will allow them to efficiently achieve various KPIs such as upsells and cross-sells.

Ajit's team can also converse with Sellina, asking her questions and querying information they need for that day's sales.

This takes most of the guesswork out of Ajit's decision making, Sellina sifts through data, variables, and information at superhuman speed, making accurate predictions of client needs and behaviour. Sellina cuts the complexity out of the sales process, making Ajit's job far more efficient and increasing daily sales by 40%.

Sales execution happened at an unimaginable speed and scale, which is impossible by human efforts. Sales networks have access to actionable data insights at the touch of a button that help maximise each sales opportunity to cruise past KPIs consistently every time.

This is what Applicate AI's Sellina promises.

Applicate AI is a sales tech, start-up founded by Ranjeet Kumar and Deepak Rewadi, both experts with a combined 41 years of sales expertise, founded Applicate AI seven years ago. In fact, most of their advisors and investors have also been veterans of sales with decades of experience. In other words, Applicate AI has the pedigree and expertise crucial to studying complexities, requirements, and variables that go into sales.

The sales process is inherently highly complex. It is a web of scenarios, possible outcomes, and numerous data points. Even if data automation is commonplace today, it is often not utilised optimally, especially by sales teams. No matter how rich and deep the data is, it still requires further analysis to derive concrete insights. Then, additional input is needed to turn these insights into usable, actionable plans for sales personnel.

Meaning, even with all the richest data, it is nearly impossible for a person or even a small team to sift through all possible scenarios and options to come up with the most optimal plans for reaching required KPIs.

These inefficiencies in the data analytics and inefficiencies inherent to the complex sales process create losses that go unnoticed by the team and management. The silver lining to this is about 80% of the sales loss is logical and repeatable - meaning the right AI can handle it at a superhuman scale.

> "[Building] intelligent targets, intelligent actions, and intelligent engagement. It predicts what you can achieve, how you can achieve it, and then it keeps engaging [the salesperson] with nudges and triggers and positive reinforcement, like a human being would do."
>
> **Ranjeet Kumar**
> Founder, Applicate AI

As the world's first AI sales supervisor, Sellina supervises and trains sales personnel to drive competency and behaviour with ready action plans at every step to achieve daily sales KPIs at an unprecedented speed.

In other words, Sellina can-

- **Sets targets** - Using historical data and predictive models, the AI determines what KPIs are achievable on a particular day and how likely the team is to achieve it.
  Creates action plans - AI predicts sales requirements and other related sales opportunities for any particular outlet or client, and draws up detailed action plans for sales personnel to use.
  Nudges sales personnel - Sellina then, using natural language processing and conversational modules, engages with the sales personnel, like any other person would and nudges them to achieve the set KPIs

Sellina can also, for example, accurately predict -

- **Daily outlet need prediction -** Which clients are most likely running low on stock and which clients are most likely to make new orders every day
  Daily outlet demand prediction - What products are each client most likely to order on a given day
  Daily outlet quantity prediction - How much is each client most likely to purchase on any given day

Along with the probabilistic likelihood of those KPIs being achieved, Sellina generates a detailed set of plans using this data to allow sales staff to reach daily KPIs such as:

Sellina can even identify sales personnel underperforming in specific KPIs, recommending tips, training videos, and actionable to improve results.

This is possible as Sellina's AI has been trained on thousands of sales scenarios, and techniques and behaviour of the best sales people who have consistently achieved better results in all KPIs compared with their peers. This gives Sellina complex insights into the sales process unmatched by any individual person.

As a testament to how valuable Sellina has been to sales teams worldwide, sales personnel, instead of rejecting the new technology, have come to love it as an indispensable part of their sales process. For the salespersons, the solution is not another tech tool to be learned but a portal for exact information and insights needed at a moment's notice.

Today, Applicate AI's solution has over 27,000 users, used in 65 global brands across 9 industries in 18 countries and 12 languages. Their international partners include Shell, Mars, and Colgate.

Sellina, as an AI, tackles a problem that is far too vast and complex for an individual to solve. Her AI not only crunches numbers and data, but also delivers specific, actionable insights to the people who can benefit from them the most. This makes an organisation armed with an AI partner like Applicate AI's Sellina can gain unparalleled advantages over the competition.

With Sellina at his fingertips, Ajit feels as though he has an assistant with whom he can speak with at all times. Detailed insights, actional plans for each outlet and client, scenario-specific tips and tricks, are all just a tap away from Ajit.

Welcome to the future of sales!

AGRICULTURE
GAMECHANGER

AgNext: Solving centuries old challenges in agriculture

With an aim of having 5% of world food pass through its platform for AI-driven quality checks, AgNext is becoming a niche player in promoting sustainable food practices using emerging technologies.

Think agriculture in India, and instantly Punjab pops into one's mind. The land of five rivers and seat of India's Green Revolution, has earned many monikers over the years – ranging from 'Breadbasket of India' to 'Granary of India.' It has witnessed agricultural industrialisation in the 60s, setting a new precedent for India's agrarian roots.

India's agriculture sector has thrived in the past 50 years, but challenges have emerged along the way with adulteration and sub-standard quality of food produces being major one. A 2020 report in the news website Food Navigator stated that one in every four food samples from Haryana fails to pass the standard food quality tests. In Rajasthan, Gujarat, and Madhya Pradesh, milk adulteration is rampant where producers and distributors are known to mix detergent, urea, caustic soda, and palm oil in milk products, leading to long-term public health crises.

However, in recent times, agriculture is going through another revolution, powered by emerging technologies such as AI, data analytics, Spectroscopy, and computer vision, and may finally offer a solution for these long-lasting problems. And that is where start-ups such as Agnext and innovators such as Taranjeet Bhamra become important.

After graduating from IIT-Kharagpur with a degree in agricultural and food engineering, and a management degree from IIM, Calcutta, Taranjeet Bhamra – a native of Punjab – sought to build products using DeepTech that could analyse food produces with high accuracy. With this mission in mind, Bhamra started his company AgNext in 2016, which leverages AI and spectral analysis to analyse the quality of food and agricultural produce, such as beverages (tea, milk, coffee, and cocoa), grains (rice, wheat, maize, and barley), oilseeds (soybean and mustard), spices (turmeric, chilli, pepper, ginger, and menthol) and animal feed.

AgNext has built technologies that extract new data streams in agriculture and compile them into a singular platform for actionable insights. One could even say that AgNext is a category innovator as it provides a SaaS technology platform, Qualix, for rapid commodity assessment solutions across procurement, trade, production, storage, and consumption of food and agri value chains.

The Qualix AI engine uses spectrometry, computer vision, and IoT sensing solutions, delivered through an integrated hardware and software interface for accurate and instant quality analysis.

Technology Stack for High Accuracy Quality Analysis

With the aim of having 5% of world food pass through its platform for AI-driven quality checks, AgNext is becoming a niche player in promoting sustainable food practices using emerging technologies. It has a suite of products and solutions that carry out a series of quality checks on produce, using spectral analysis, image analysis, and sensor analytics. This includes the following:

AI-based spectral analysis

AgNext is one of the only companies to innovate and integrate portable, on-field devices connected with its platform. It helps in an instant spectral analysis of agri commodities in the form of liquids, solids, powders, grains, or leaves, to cover the whole spectrum that nature offers. This suite provides results using AI-based algorithms for instant quality analysis of composition and contamination, farmer-wise data for quality produce, and managing suppliers by lots and building business intelligence through quality maps.

AI-based image analytics

AgNext has built devices that work with on-premise embedded cameras for instant quality assessment using computer vision sciences. Across India, the majority of crops are assessed manually with naked eyes, leaving room for multiple inconsistencies, manual fatigue, and manipulations leading to losses across agriculture value chains. This solution removes subjectivity, digitises transactions, and encompasses traceability, all the while consistently providing an accuracy rate of more than 99% delivered at fractions of cost and time to stakeholders.

AI-based sensor analytics

AgNext pioneered the first applications for LoRA WAN based IoT applications in India that provides quality estimations in multiple agriculture processes in spatial arrangements, such as curing, food storage, warehousing, and logistics. AgNext has built STQC calibrated sensors for temperature, humidity, gaseous emission, and other parameters key for various agriculture industries, such as curing solutions, grain silos, warehouses, food processors, and storage services. These provide real-time alerts on control parameters and data analytics for actions to be taken as devised by research institutions for better management of food quality.

> With a singular platform and integrated analysis of all kinds of food quality, Qualix provides immensely critical insights to agriculture stakeholders to plan their procurement, operations, productions, and quality of output across seasons.
>
> **Bhamra**
> Taranjeet Bhamra

Decoding essential food using full-tech suite

Be it assessing tea leaves or analysing the level of adulteration in milk, AgNext deploys an integrated tech suite. Here's how it happens:

Tea leaf assessment

Of late, tea export from India has suffered a setback, while demand for tea from countries such as Kenya and Sri Lanka have been on the rise. Prices have seen a steady decline over time. Tea plantations are unable to oversee production costs and this has led to high losses for tea growers. Determining Fine Leaf Count (FLC) is imperative for the tea industry. AgNext deployed Qualix − a platform for rapid and accurate estimation of agri produce using hardware, software, and analytics. Using AI and Image Recognition Software, AgNext was able to identify leaves from various classes coming from garden harvest as leaves, buds, Banjhi, shoots, and the rest. Leaves are first dried and separated using a patented technology and then photographed with a high FPS camera. In the post-processed inverted binarised image, each component is identified and extracted separately using artificial intelligence, and then the images are processed for FLC per industry standards. A set of final stats show how many leaf and bud configurations are in every shoot, allowing for a percentage of FLC to be displayed on the device and mobile. All this gets done at a fraction of time, gives access to more sampling for better evaluation and removes subjectivity digitising the entire procurement and payment process from there on.

Milk assessment

Adulteration of milk is a rampant issue in India. Nearly 70% of the country's milk and its by-products have been found to have pollutants, according to the Animal Welfare Board. Some of these pollutants include palm oil, detergent, urea, caustic soda, and paint, posing a major threat to the health of consumers to diseases such as cancer. Through Qualix, milk can be assessed in just 30 seconds with data on composition indices, including fat, SNF, lactose, and protein, as well as contamination indices, such as urea, detergent, starch, vegetable oil, and water paint. This is done using spectroscopy or chemical analysis to check for adulteration.

Challenges notwithstanding, data-driven solutions well received

For a sector that has largely stuck to conventional methods and practices, accepting technology interventions didn't take place without some resistance. But Bhamra and his team have persevered, and their technology instilled confidence in growers, farmers, and distributors to ensure they deliver quality produce. Today, AgNext works with Olam, NAFED, Compass Group, Keventers, Arya, Suguna Foods, and Ananda Dairy, currently booking between US$ 5-6 million of ARR in SaaS business and likely to reach US$ 20-25 million of ARR by the end of the year. With 70 patents to be filed across various AI applications and collecting over 1 million data samples for its core ancillary AI tech, AgNext's plans now involve integrations with client ERP systems across locations and build a post-harvest SaaS platform for agriculture.

AGRICULTURE
CHALLENGER

Cropalytics: Monitoring crop health and yield

Using remote sensing, historical yield, and weather data with AI to accurately estimate crop yields to help even the smallest of the farmers.

The Frederick Forsyth classic called The Devil's Alternative starts with a dramatic sequence of the Oval Office pouring over images beamed down by US satellites of large-scale crop failures in the (erstwhile) USSR. If the images from the eyes in space were correct, USSR was headed for major turmoil and geopolitical crisis. This was the stuff of legend during the Cold War. Today, start-ups in India are using similar technology to solve more real-life (though less dramatic) problems for the humblest of farmers across the country.

One such start-up is RMSI Cropalytics that is deploying a combination of cutting-edge technology, such as satellite imaging, weather forecasting, geo-location, AI, and analytics. This is assisting with government land records, historical crop yield data and agribusiness metrics to provide vital information to every stakeholder in the value creation chain.

Let's start with a simple question – who will be interested in predicting crop yields and why? The answer is not as simple, and neither is the sheer economic value at stake. The key stakeholders in the agri economy other than the farmers themselves are commodity traders (including the government), farm credit companies, agri input (seed and pesticides) providers, agro insurance companies, and agri-data and analytics service provides. These stakeholders control represent a combined economic value of ~US$ 600 billion – which is almost equal to the combined GDP of all SAARC nations excluding India.

It is in this context that their trademarked Profile & Information of Crop Exposure & Risk (PInCER) platform provides the government, crop lenders, insurers, and traders with information and analytics to set up and manage consistent and efficient operations in the agriculture sector.

> Basically what we do is collect data from different sources, including remote sensing, historical yield and weather data, apply actuarial modelling and agronomy knowledge on it, and pull all of it into an AI/ML model, which estimates crop yields accurately at very high resolutions. This impacts the smallest farmer in every aspect from the amount of insurance premium to crop process.
>
> **Roli Jindal,**
> **Co-founder of RMSI Cropalytics**

Imagine a situation where an insurance company is determining crop insurance premium on the basis of the average yield of a district. By definition, there will be a large number of farmers who will be paying a high premium despite being above the average yield value. With farm-level yield predictions, every farmer will be paying the right premium, which is applicable for their individual land only - Roli Jindal, Co-founder of RMSI Cropalytics

Eye in the sky

Today's satellite imaging can provide resolutions of 10mx10m. That provides inputs for fairly high accuracy of predictions. But how do you correlate the image of a patch of land from space to its owner? One solution is matching the lat-long of the location with land records. With this crops up two impediments. First, on-ground verification of location indicated by the satellite image. Second, digital mapping of land records, a large number of which are in the physical paper form. The first problem is solved through a formatted SMS by the farm owner from the farm location, which is analysed by Cropalytics to determine geo-location. For the second problem, advanced image recognition and image-to-text conversion solutions are required, which can cater to multiple vernacular languages.

Optical imaging satellites go blind for 3-4 months during monsoons. No clear sky imaging is available during this period, which is a major sowing season. As tracking farm productivity during this period is crucial to yield predictions, Cropalytics has started using Synthetic Aperture Radar (SAR) satellites that are impervious to weather conditions. This will help build scalable, reliable, and consistent models even in difficult conditions.

Even a formidable combination of technologies cannot ensure that satellite images effectively differentiate between small, adjacent farm plots in assessing yields. Cropalytics has been deploying an established (and distinctly low tech) technique called crop cutting to tackle this. Here, farms are segregated into 10mx10m plots (equivalent to satellite image resolutions) and the progress and yield of this pinpointed piece of land is measured over a crop cycle. About 1,000+ such crop cutting experiments have been conducted over the last four years to improve the accuracy of farm-level yield predictions.

To augment satellite imaging to gauge crop health, mobile phone, IoT, and drone image based solutions are also being developed. This will deliver very granular recognition of crops, crop health, and farm conditions. These inputs are collated and extrapolated to a much wider area to deliver village, district, and state-level crop yield estimates, and verified historical data.

Information in your hands

No matter how powerful your technology and how accurate your prediction models, its utility is determined by its usability. Cropalytics' has provided an extremely detailed, flexible, and intuitive interface that allows users to zoom in to individual farm levels and zoom out to district levels for historical, progressive, and predictive information. This is available on computer and smartphone screens that help identify distress hotspots that are critical of insurers, governments, and service providers to be aware of.

The mobile app also collects sizeable amounts of data that are used to further train the ML model. Images captured on mobile devices are especially useful in identifying crop varieties, pests, and crop diseases. These information and analytics sets are invaluable in suggesting solutions to factors impeding farm yields, which can avoid farm distress.

Timeliness and comprehensiveness of data are imperative for agri-service providers. Given the fragmented nature of multiple data sources, this becomes a herculean task. As a result, many service providers depend on outdated data, which lead to suboptimal results. The Cropalytics solution clearly overcomes these problems and provides a single view to users that is suitable for their particular requirement.

The future is green

Crop indices measurement and prediction is still in a nascent stage from an analytics and adoption stage. New technological opportunities are being experimented with for increasingly varied applications across geographies and service segments. While it is difficult to quantify benefits at an aggregate level, the efficacy of these solutions is beyond doubt.

Governments and corporates are leading the charge in leveraging technology for higher farm productivity. This can only be good news and indicative of a truly lush green future for every farmer in India.

FEATURED STORIES

TOPICAL USE CASES

AI FOR ENABLING CONTACTLESS WORLD
GAMECHANGER

Jotter AI: Redefining the fashion technology landscape, one digital catalogue at a time

Using remote sensing, historical yield, and weather data with AI to accurately estimate crop yields to help even the smallest of the farmers.

Delhi-based Purnima Sahay is a true fashionista. She has always been on-trend and makes sure her attire speaks her style, every single time. With her passion for fashion, she is a "regular" on various e-commerce channels and spends hours zeroing in on her purchase. Why, you may ask. Because the quality of digital catalogues is not up to the mark. The inaccuracy in visual representation and other gaps make it a challenge for her and many others to arrive at the "right choice."

That's exactly where a tech-based company, such as Jotter.ai, comes into the picture. Founded by Madhavi Arelli, Harini Boinipally, and Hasini Boinipally, the company prides itself on delivering differentiated experiences that engage shoppers within the comfort of their homes. By building AI-based automated solutions around image recognition using computer vision, image processing, and deep learning, Jotter is also able to help manufacturers, aggregators, retailers, and product sellers to turbocharge their business.

In a world that is steered by personalisation, it is important to provide customised options to users that cater to that palate. With Jotter's AI engine, this and much more is possible. Apart from offering a distinctive experience and recommendations curated for every user, it also gives businesses the benefit of analytical insights that can be leveraged to increase revenue.

Whether it is natural-looking projections or advanced features (such as compare and try-on), Jotter.ai ticks the right boxes. It has partnered with Amazon as its global imagery partner for 30 countries. It is also Pan-India partners with Flipkart. It works with over 50 diverse clients across the apparel, retail, electronics, home and furniture, and grocery segments.

But before we get down to other details, it is important to understand why the digital catalogue industry is evolving at a rapid pace.

Digital catalogue imagery: The need of the hour

With social media and e-commerce growing at a fast pace, there is nothing more critical than visual imagery (and of course, price) to appease a shopper. This has also brought to the forefront the need for an automated solution for digital catalogues. In a nutshell, this means that the digital catalogue demand is directly proportional to the e-commerce market's growth. This proposition also creates an opportunity and the need to find a solution to the complex demand situation. It is essential to understand that the adoption of online shopping has fast-forwarded, especially due to the incidence of the pandemic.

The prevalence and growth of new-age technologies, such as AI, has revolutionised this industry. With a digital-first approach and inclination towards automation, the very aspect of manual labour goes down. This, in turn, does not just help in saving time, but also reduces cost and increases productivity. In any other scenario, keying in SKUs one at a time demands more workforce and time, which diverts attention from important issues.

With Jotter. ai, the very challenge of daily model intervention is wiped out. It also minimises or eliminates the need for make-up artists, styling, studios, product transportation, as well as reliance on editors.

> Not many know that 98% of work done on digital catalogues is a manual process. For over a decade now, catalogue generation has functioned like this. The average spend is anywhere between INR 700-2000, it is a huge amount to get one SKU. It is definitely a complex problem, and I believe automation will help people save cost and time. To get 1,000 pieces up, it takes 10-20 days, and the latency is more. With this, the existing challenge is solved.
>
> **Madhavi Arelli**
> Co-Founder, Jotter AI

Role of AI in resolving this challenge

With Jotter.ai, it is simple to generate high-quality digital catalogues across product categories. Not just that, it accelerates time to market, improves personalisation, and helps with product discovery. These catalogues are the perfect solution to boost revenues, and at the same time, cut costs. But what is the methodology?

To start off with, we deep dive into how their process works. When Jotter's AI engine receives input images, it utilises its deep learning networks for object detection, auto cropping, image orientation check, etc. The next step is to build AI-based draping algorithms that include human feature extraction, 3D mesh creation, custom image processing, and more. The last step is to create services for image editing. This encompasses auto shadow generation on garment edge, AI-auto cropping based on specifications, and last but not the least, adding appropriate lighting, colouring, sharpness, and exposure removal.

This is the underlying principle behind Jo Lookbook, which can generate natural-looking 3D catalogues with garments and accessories within seconds. The benefits are many − starting from adapting to changing styles, trends and customer demand, no requirement of photoshoots or editing, and big savings.

There is also a Jo App that offers users freedom to try on clothes and see how they look on them. It is as simple as taking a full-size selfie, uploading it and then AI takes over. Experiment with as many dresses and accessories or try on the latest celebrity looks. It is a dream come true for those who love being in vogue.

And for customers who are watch collectors, Jo Watch is all they need to decide on a suitable watch. Yes, with the kind of options available online, trying out what looks great and serving its purpose is crucial. Users just have to click and view the selected watch on a wrist image. They can also experiment with different brands and models, and different kinds of features and sizes.

Impact and scale

Before we discuss the impact of Jotter.ai, it is critical to look into certain limitations. Currently, their clients have to follow certain product shoot guidelines to provide them with input images. Moreover, generating catalogues for complex poses is not a feature. Last but not the least, the scope for the virtual trial market is still nascent.

Over the past few years, Jotter.ai has grown by leaps and bounds, and currently has a turnover of INR 300 crore. It also has some impressive results to its credit:

50X faster than traditional methods

>10% increase in order value

40% higher customer engagement

90% savings on photoshoots

E-commerce, as an industry, is on an upward trajectory and so are food deliveries and offline B2B stores. With the power of AI, digital catalogue services can be used to make a huge difference. After all, an image speaks a thousand words, and in this case, also sets cash registers ringing.

eClerx: Enabling a contactless world

Using AI models to address the Work From Home challenges through efficient change management.

Have you ever noticed how travelling and meditation provide a sense of tranquillity to our minds? How substantial is the influence of our surroundings on our brains? The reality is that our surroundings shape our thoughts, motivation, and ability to focus on a certain subject. It does not matter if it is for recreational activities or essential duties. Similarly, our workplace has a significant impact on our productivity.

Over the past two years, the world has gone through an unprecedented shift brought on by a virus. When such circumstances are beyond one's control, the only alternative is to employ competent change management. The COVID-19 pandemic is one of the most serious crises to hit businesses and employees in recent memory. Compared with previous years, 2020 represented an extraordinary transformation in the way IT and other industries used to function. In fact, the ability to adopt tech tools to facilitate business became a key survival factor.

The urgent need to swiftly migrate to a Work From Home (WFH) situation to maintain business continuity, posed several challenges. After all, it was the hardest thing to overnight change decades of established corporate practices and habits. The top three critical issues to solve for that emerged globally were:

IT infrastructure upkeep

Creating and maintaining a decentralised IT infrastructure to ensure that employees can WFH instead of depending on on-premise office facilities.

Productivity maintenance

Enabling the tracking of workers' productive use of time without the traditional command and control measures required radical rethinking.

Data security

Online connectivity is the bedrock of WFH productivity, which inherently poses data security issues, especially in light of increasing incidences of cybercrime that need to be mitigated. Data security is particularly critical, as data loss is a sensitive subject that can result in a loss of reputation in addition to revenues.

eClerx optimised and repurposed its current models to address these challenges through efficient change management.

A specialist Knowledge and Business Process Outsourcing (KPO/BPO) company founded in 2000, eClerx provides operational support, data management, and innovative technology and analytics solutions to 60+ global Fortune 1,000 clients, including many of the world's leading high-tech and industrial manufacturing, financial services, online retail and distributors, interactive media and entertainment companies.

So far, they have catered to the technology, media, and telecommunications verticals, by enabling efficient WFH models using technology and AI, which is at the heart of their end-to-end "technology-driven efficient WFH solution." The three most vital AI components of their solution stack are mentioned below:

1. **Veriato cerebral:** It is an AI-powered security platform that combines User and Entity Behaviour Analytics (UEBA) with User Activity Monitoring (UAM) to provide fast Data Breach Response (DBR). Unlike network monitoring or document tracking, Cerebral quickly alerts us to who is exhibiting signs of risk and provides screenshots to help us understand the real nature of the incident.

2. **Theia:** Theia, eClerx's AI-powered computer vision platform for picture and video analysis, collects data from the Veriato evaluation tool to track personnel with a high-risk score. It majorly considers three aspects for monitoring:
   - Facial recognition for detecting/identifying people
   - Mobile and camera detection to prevent a data breach
   - Pen/paper detection in front of the camera to prevent data from being copied from the computer screen

3. **EZ app:** This is an eClerx application that assists in remote troubleshooting of any IT-related issues that employees are experiencing. It employs augmented reality to automatically detect devices and possible issues, allowing the support engineer to troubleshoot remotely.

Apart from the critical components listed above, their system depends on auto recognition of devices and ports, and remote video conferences between the user and the IT support staff, to allow for faster issue resolution. Desk booking is a handy way to reserve an office desk for a specific day and time while adhering to the COVID 19 procedure to facilitate return to office strategies. They also keep an eye on user workstations that register attendance remotely.

This set of solutions comes with a formidable list of challenges to be effective, viz compliance paperwork, clearing the model acceptance criteria checklist, remediation, change management, audit and review, and risk tolerance. Image analysis required a lot of data, which was the most difficult part. It was a difficult task to collect data according to the specified use cases, combine multiple data sets to enhance volume, and label/annotate the data appropriately. Identifying items such as a camera, a phone, a piece of paper, or a pen, in particular, needed a large amount of data for training and accuracy. They used data from a variety of free sources to train the model.

Although AI and technology played a big role in the solution, there were multiple reasons why an analytics-based solution would not have been enough to tackle companies' problems:

- The cases needed to be dealt with human behaviour and were not static in nature. A pattern learnt from history, may or may not occur in future and hence the solution could not be standardised.
- The problem they were trying to solve was highly non-linear, and the features they needed to extract to solve it using traditional methods were extremely complex. For example, extracting pixel values, shapes, textures, position, and orientation from an image on a case-by-case basis is nearly impossible.
- They had to deal with a massive amount of data. The use of standard analytics-based approaches is immediately eliminated when operating at such a scale.

The solution offered by eClerx provided a unique solution set to cover end-to-end aspects of the WFH challenge, providing a 360-degree answer to the new normal situation. This includes integration with third-party tools to deliver a unified platform to upgrade the new normal to a better normal. After all, managing the environment in which the employee functions is just as important as managing employees themselves.

AI ADOPTERS
GAMECHANGER

Aditya Birla Group: AI powered suraksha with VEDA

Artificial intelligence-enabled video analytics system that helps create a safe environment in Aditya Birla Group factories and offices.

We are living a fast-paced life where we often do not pause to see how far we have come as species. We are capable of dealing with all sorts of difficulties, adapt, and overcome them. We are witnessing the COVID-19 impact and would not deny the immense efforts we are putting in to deal with the situation at hand in terms of living, working, planning, and executing things.

We have used our intelligence quotient (IQ) as well as emotional quotient (EQ) to come up with solutions that let the show go on and sail through these times. In just one-and-a-half years, we have transitioned drastically that otherwise could have taken years together to come true. Organisations are using technologies to keep businesses afloat and the cycle moving.

However, in these sensitive times, safety is the key. Without a doubt, we know technologies such as artificial intelligence (AI) have been the key to this transition and real-time safety. Manual monitoring of safety practices can lead to people becoming complacent. No one can be held responsible for detrition of safety standards in an area in a manufacturing unit.

As a solution, a wonderful example of a technology-aided tool to take care of people's safety and make the operation go on is Video Enabled Decision and Alerts (VEDA). VEDA is an AI-enabled video analytics system that helps create a safe environment in Aditya Birla Group factories and offices. This product uses computer vision techniques to analyse videos, and provide alerts and insights to make real-time decisions.

VEDA, an AI platform and a first-of-its-kind proprietary product, uses computer vision techniques to provide alerts and insights to take real-time decisions - Deep Thomas, Group Chief Data and Analytics Officer, Aditya Birla Group

The group data and analytics cell (GDNA) is a central function in Aditya Birla Group (revenue of US$ 48.3 billion) created to provide cutting-edge AI solutions to businesses and take these AI products to a larger audience. The team comprises more than 60 data scientists, product specialists, and business engagement managers from varied backgrounds, including manufacturing, finance, and retail areas of focus include safety, quality, logistics, procurement, and energy.

Safety accidents, in most cases, are avoidable if adequate safety training is provided, safety procedures are followed, and proper safety equipment is worn. With VEDA, the Aditya Birla group is trying to change fundamental behaviour by combining human behaviour with computer vision technology.

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> VEDA was an idea that emerged from a hackathon in 2019. Six months later it was successfully deployed at a plant in Taloja. During the lockdown, we added new features to the platform that enhanced worker safety in the post-COVID world.
>
> **Naveen Xavier**
> **Vice President, Group Data & Analytics, Aditya Birla Group**

VEDA has been successfully deployed at three plants of UltraTech, seven plants of Hindalco, and four plants of Grasim. According to company sources, "manufacturing plants lose a big number of man-hours due to accidents and other safety-related issues. In the 2019-20 period for Hindalco, approximately 26 man-days were lost, and over 600 minor injuries and accidents were reported."

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These are not just accidents that are the sole concern for the organisation; it is the amount of work that goes into identifying the root cause and updating systems so that accidents do not occur again is a time-consuming affair. Even after the process completion, the real impact numbers cannot be accurately estimated.

The underlying idea is to ensure the safety of workers and employees in a manufacturing plant by processing multiple video feeds in real-time. The system takes input in the form of multiple raw video feeds captured through CCTV, which is then analysed 24x7 via an on-premise server using AI. The output provides safety trends on a dashboard that can send alerts through real-time voice, text, or email.

The platform is scalable and built for quick deployment. The system's advanced capabilities can cater to the needs of manufacturing units and offices post COVID-19.

VEDA is embedded with a social distancing monitoring module that detects workers in a frame and then calculates the distance between two workers. When any video feed records recurring violations lower than the threshold distance value for a minimum specified duration, an alert is triggered. The platform works on a transfer learning approach and fine-tuned the MobileNetV2 model for person detection using the TensorFlow framework. The accuracy of the distance is based on the transformation matrix, which in turn depends on the accurate calibration of ground points. Besides temperature monitoring and face mask detection, a robust social distancing measurement algorithm has also been built into VEDA.

The platform has a competitive advantage due to factors such as cost effectiveness, scalability, and flexibility. In addition, it can work both on-premises or on the cloud, and owing to its modular nature, new models can be trained independently.

The implementation of video analytics will aid transformation in a business environment by increasing process efficiencies, understanding customer behaviour, and enhancing safety in diverse environments while considerably reducing manual intervention. In addition, VEDA delivers an intangible amount of cost benefits by monitoring fire, oil spillage, crowd formation, and people movement in unsafe zones, and use of safety gear by workers on shop floors.

> VEDA is a powerful platform. We used it successfully for changing people's behaviour, attitude and habits in the manufacturing plant.
>
> **Vaishali Surawar**
> **Unit Head, Hindalco Industries Ltd, Taloja**

The solution faced several challenges, such as lack of data for modelling, annotating data, streamlining a feedback mechanism for model governance, and change management.

Post deployment, the system needs human intervention or surveillance as only a human can detect and differentiate between an erroneous and a genuine one.

VEDA has two primary segments − Suraksha and COVID-19. Suraksha aims to ensure productivity improvement, audit process compliance, reduction in equipment downtime, and fewer accidents. The COVID-19 segment is ensuring adherence to guidelines and protocols by detecting fever and monitoring social distancing.

AI ADOPTERS
CHALLENGER

Max Life: AI-enhanced customer experience

Building an automated analysis of customer interactions over voice calls using language-based speech analysis models, along with Natural Language Processing, to derive insights from customer interactions.

The year 2020 threw the world a curveball like no other. Yet, the digital transition that the world witnessed was nothing less than impressive. The manner in which businesses transitioned from a physical to digital setup is one for books. Particularly, the service industry had to develop mechanisms to maintain touchpoints with customers and maintain the trust between the existing clientele. With customer relationships functioning as a key aspect to businesses in the service sector, companies cannot afford to leave any stone unturned in reaching out to them, serving them, resolving their issues, listening to them, and taking their feedback.

AI is making its mark in the service industry for improving customer relations through chatbots, speech recognition, and more. Major players in the industry are looking to tap AI tools to discover customer needs at various life stages and offer appropriate products at each step.

Max Life Insurance Company Limited is a subsidiary of the publicly listed Max Financial Services Limited and is a joint venture between Max India Ltd and Axis Bank. The company was established in 2000 and is currently the fourth-largest private life insurer and the largest non-bank life insurer in India. It has a revenue (2021) of INR 16,184 crore and a market valuation of INR 20,000 crore. The company has a wide portfolio of life insurance products - protection insurance, health, pension, annuity, child, retirement, savings, and growth plans. The company employs 10,000+ people and is ranked 18th on the Great Places to Work list in India. It is the only life insurance company in the top 50.

> Human conversation is not only one of the most widely used communication medium but also most insightful as it contains unfiltered thoughts. Having said, that it is also the most underutilized source of information by an organization. Vox helps solve that aspect and provides insights hitherto unseen. It helps us understand our customer's needs, pain points, expectations, first hand and also enables us to provide hyper customized customer experience, drive business and enable our agents to have a high quality and engaging conversation with the customers. Our plan is to scale up the solution across value chain - sales & onboarding, customer verification calls, tele medicals, customer service and renewals.
>
> **V (Vishy) Viswanand**
> Deputy Managing Director, Max Life Insurance Co. Ltd.

The company witnesses a tremendous volume of customer interactions with over 3.5 lakh customers voice calls happening daily across different touchpoints – sales calls, policy renewal reminders, customer verification calls, tele-medicals, customer service calls, and more. The company has an online portal, where customers buy policies through the Max life website or partner websites, contributing 30% to incoming volumes.

According to company sources, currently, from every 100 customers, only 8 customers end up purchasing the policy online (8%), while others drop off. Thus, the key challenge is to understand the exact pain points for not buying our policy (pricing, product, competition, agent behaviour, etc.).

The other area where AI-aided technology is critical is detecting fraudulent transactions and maintaining online security.

Improving customer experience with AI

To improve customer engagement and efficient redressal of customer queries, Max Life Insurance Company Limited is now using VOX Speech AI Programme. This initiative is harnessing the potential of AI to unlock insights from a huge heap of voice data to generate insights across customer needs, pain points, expectations for the ability to provide a customised experience, and drive business from these customers.

At Max Life, we have a tremendous volume of customer interactions with more than 3.5 lakh customer voice calls happening daily across different touchpoints – sales calls, policy renewal reminders, customer verification calls, tele medicals, and customer service calls. These personalised interactions with customers have valuable insights beyond what can be captured in customer surveys and feedback but this data is not used currently due to inability to manually analyse such huge volumes of calls by listening to each of these. - Company sources

The focus is to have an automated analysis of customer interactions over voice calls leveraging Speech AI (end-to-end speech analysis engine) using language-based speech analysis models, along with Natural Language Processing, to derive insights from customer interactions across types of the customer voice.

The VOX programme aims at building an end-to-end, speech AI platform to analyse customer interactions happening through voice calls for every call interaction with the use of contextualised models across each type of customer interaction. In this phase, sales calls for the customer buying patterns and pain points to improve sales conversions shall be analysed. In addition, customer verification calls for the identification of cases of misselling and obligatory sales to reduce complaints and improve the quality of sales will also provide actionable results.

Reminders such as renewal reminders to understand key reasons for not paying renewal premiums on time to improve renewal income and persistency calls for customising interactions and provide upfront resolution can be done by VOX.

At the core

The entire solution is spread across three layers. First is the data layer. This layer is responsible for generating the audio call data from dialer equipment. It also processes the audio file to extract call metadata, such as callid, timestamp, and agent ID.

The next is the AI layer. This is the layer where automated analysis of the customer interactions happens using AI to process calls. It is further divided into validation programme, which validates the call type, labels, and channels associated. The Max Life Versbose detects word phrases, short forms, phonetics, pronunciations, etc. The speech to text model uses AI for noise removal, Spectrogram, RNN-BLSTM lexicon, decoding search, word sequencing, etc. The transcription phase identifies accuracy, word-level confidence, and timestamps, along with speaker labels and call transcripts. Finally, the Natural Language Processing programme processes transcription outputs, calculates time and accuracy, processes text, and performs stemming/ lemmatisation and sentiment classification.

The last layer is the Visualisation layer that provides business insights in a graphical representation of data such as call durations, monologue, conversations, overall quality rating, customer purchase levers, and customer call sentiments.

The company is experimenting in various dimensions of cognitive computing in delivering a conversational experience to the customer via bots, along with using the machine and deep learning for underwriting purposes. Additionally, they are automating some of their processes using robotics.

There are challenges associated with the solution. These challenges are primarily around the handling of voice call data and ensuring customer privacy. Encryption of customer information such as policy details and mobile number, masking customer personal information during transcript can be challenging and requires high security and scrutiny. Another challenge that lies in front is managing volume data. With an average of ~5 mins call at a rate of ~15,000 calls, the storage can reach up to ~300 GB per day. Yet another complexity stays in the voice call data set. Splitting audio calls to extract customer and agent transcript, voice rate compression, background noise removal, and labeling of data for model training can be overly complex and sophisticated.

With changing technologies and increasing awareness, consumers' expectations are rising too. To maintain a competitive edge in the market, the insurance sector has to build capabilities using customer insights. It is time to learn from the traditional principles of business and strengthen the approach with the power of the latest technologies and come up with a hybrid approach.

Vox is based on a language model approach to maximise insights from calls. It is customised per the context of Max Life to enable transcription accuracy for more targeted actionable business insights. With an ability to manage Hindi, English, and Hinglish calls, Vox can handle various types of conversations. A high-quality dashboard for valuable information representation makes VOX an end-to-end platform for voice data processing.

AI FOR COVID-19
GAMECHANGER

IBM: A dynamic virtual aid to ICMR's evolving pandemic response using Watson

COVID-19 hit everyone discriminately. A new virus was spreading rapidly, and it was crucial to have the right information to make quick, but informed decisions. Indian Council of Medical Research (ICMR) deployed IBM Watson's virtual agent to ensure automatic responses to queries from frontline workers and speed-up diagnostics reporting.

"Will I contract COVID-19 by touching toilet seats and door handles?"
"What kind of drugs need to be used to treat COVID-19?"
"How effective is hand sanitiser in combating the spread of COVID-19?"

These are just a handful of the questions that dominated our minds and determined social etiquette from early 2020.

18 months into the pandemic and even the best of us is battle-weary – from managing the effects of the pandemic to constantly upgrading ourselves about the nature of the virus and its impact. As countries transition into treating the pandemic as an endemic, what has changed from early 2020 to now is the access to information about COVID-19 and ways to manage its spread. Information has been crucial to influencing the global pandemic response.

But in the early days of the pandemic, frontline workers, healthcare officials, and lawmakers struggled with one more menace other than the pandemic - misinformation and improper medical protocols. COVID-19 was caused by a novel coronavirus so even medical workers were learning as they treated patients. Exacerbated by panic, fear and rumours, it was getting increasingly challenging to ensure accurate information on COVID-19 diagnostics and related data.

And this was one area where technology has been exponentially useful.

ICMR ropes in IBM Watson to aid frontline staff with updated information on COVID-19

To meet challenges surrounding information about COVID-19, ICMR needed the capability to effectively use data for rapid detection and treatment. The organisation sought an AI solution - a virtual agent based on IBM Watson AI - to automatically respond to queries from frontline staff and data-entry operators across the country regarding COVID-19.

In the early days of the pandemic, testing field technicians were finding it difficult to find accurate and updated data on COVID-19 diagnostics and reporting. In most scenarios, they would reach out to a handful of doctors or medical experts in ICMR for answers. This was an unsustainable model because of the lack of scale. Successful testing and prevention of spread of the virus are crucial in controlling the virus in such a pandemic. It was highly crucial to enable government bodies, such as ICMR, to utilise data and capabilities effectively for rapid

detection and treatment. The virtual agent based on the IBM Watson AI technology that automated and accelerated responses to queries and facilitated access to accurate and updated data on COVID-19 diagnostics and reporting. The Watson virtual agent was trained to understand and respond to common queries in English and Hindi based on the latest guidelines.

> This collaboration is Good-Tech in action and a testament to IBM's commitment of enabling governments, businesses, and citizens across the globe to have access to technology and expertise in tackling the challenges of COVID-19 pandemic.
>
> **Kiran Challapalli**
> IBM

> The virtual agent can answer queries regarding COVID-19 in general – final guidelines issued by the ICMR, nature and process of data to be captured by test labs, how to record inventory of test kits and reagents, the process of reporting to various government agencies and references to the latest guidance protocols.

Eventually, queries were categorised under various headings, such as governance, logistics, data entry and sharing, and staff training and testing. The solution was deployed on IBM Public Cloud and using SaaS technologies, such as Watson Assistant, Discovery, and Language Translation.

Why this solution worked?

As cases were beginning to mount, ICMR had to scale its testing measures as fast delivery of information was critical. By building and deploying the solution through the IBM Public Cloud, the solution was ready to launch in just a few weeks. Moreover, virtual assistants require manual training that can take up to 4 weeks but Watson AI's ability to mine chat and email logs, categorise data and create intents with training data, brought down the typical turnaround period to just a few days. Given the dynamic nature of COVID-19, rules and guidelines were constantly changing. However, Watson was able to manage this effortlessly by automatically fetching important and dynamic information from multiple sources without changes in the application. Version control allows improvements to be made in development without affecting production. Moreover, changes get pushed to production automatically. Watson provides analytics dashboards showing detailed view of the interactions, thus helping ICMR understand the areas of concerns.

With this solution in place, ICMR was able to focus on business priorities, such as developing and updating testing and treatment protocols and guidance for COVID-19. The organisation implemented the virtual agent on protected pages of its website, which can be accessed only by authorised personnel who are involved with sample collection and testing in hospitals and diagnostic labs.

In our collective memories, this will remain the most unprecedented life event for which we were not prepared. It has taken a gargantuan and collective effort to reach where we are, and until we are fully out of this endemic, we have to rely on new, updated information. AI's capability to trawl archives, websites, and other sources of content, with relative ease, will enable humans to stay on top of relevant and recent information pertaining to COVID-19 and guide us in taking informed measures to protect ourselves.

AI FOR COVID-19
CHALLENGER

IISc Bangalore: Accurate mass testing method to map infectious disease spread

Researchers at IISc, in collaboration with AIIMS Bhopal, have repurposed Raman Spectroscopy - a spectroscopic technique originally used to determine vibrational modes of molecules through a structural fingerprint, along with AI, to develop a highly accurate, non-invasive, and economic mass testing method for infectious diseases, such as COVID-19.

Until early 2020, the term reverse transcription polymerase chain reaction (RT PCR) was relatively unknown to the public at large. But a cursory search on Google Trends revealed that India topped searches for the term RT PCR in the past year. Discovered in 1985 by Kary Mullis, RT PCR was considered amongst the most advanced methods of RNA detection and quantification.

Today, it is the preferred test to check for the presence of COVID-19 in a person, even animals. During the second wave, as hospitals and diagnostic labs were getting overwhelmed with patients, several cases of false negatives and positive RT PCR results were being generated. Scientists have said that when administered correctly, RT PCR is mostly 100% accurate. Several reasons amount to false RT PCR results that include improper administration and administering the test too late (if the virus has passed the nasal cavity and started settling on lungs).

In such cases, it is essential to have a quick and accurate mass testing method that is clinically approved.

Raman spectroscopy meets AI

IISc, along with AIIMS Bhopal, has devised a novel, efficient, and cost-effective way to conduct mass testing. The way involves using Raman spectroscopy with AI to detect COVID-19 biomarkers in blood samples. This is a collaborative project with Prof. Siva Umapathy's laboratory in the Department of Inorganic and Physical Chemistry, IISc; Dr. Sarman Singh's laboratory in AIIMS, Bhopal; Prof. Chiranjib Bhattacharya's laboratory in the Department of Computer Science & Automation, IISc; and Prof. Dipankar Nandi's laboratory in the Department of Biochemistry, IISc.

Raman spectroscopy is an analytical technique where scattered light is used to measure a sample's vibrational energy modes. It can provide chemical and structural information, and identification of substances through their characteristic Raman 'fingerprint'. Raman Spectroscopy extracts this information through the detection of Raman Scattering from the sample, a method devised by physicist CV Raman and his research partner KS Krishnan in 1928.

> Newer models of AI are finding greater use in science, especially biomedical data analysis. So far, scientists have been able to analyse bacteria and sepsis, so analysing a virus seemed like a natural extension of this branch of investigation. As you know, several challenges exist with the efficacy of RT-PCR and Rapid Antigen Tests. This experiment is aimed at identifying COVID-19 biomarkers in the blood plasma of infected patients. We hope to bring about more accuracy in mass testing for COVID through this method.
>
> **Prof. Siva Umapathy**

Raman Spectroscopy has found numerous applications in biomedicine, especially in disease diagnosis.

Prognosis and diagnosis in medical practice is expected to be accurate, rapid and minimally invasive. IISc's research work has been centred around developing laser-based technology, ML and AI to provide accurate and rapid prognosis and diagnosis of COVID-19 using biochemical markers from human samples.

Laser Raman spectroscopy probes chemical molecule-specific structure and the spectra of a sample. Therefore, any change in the concentration or the structure conformation of biomolecules as a result of a disease, however subtle, is reflected in a Raman spectrum. The hundreds of spectra from different patients with different infections can be analysed to develop predictions of the type of infection and the seriousness of infection. This

> Such a hyperspectral data set and diversity in sample origins makes normal methods of data analytics methods inadequate in accurately predicting the disease, and requiring AI methods.
>
> **Prof. Siva Umapathy**

proposal envisages use of various AI approaches for such data sets for rapid and accurate detection of infections.

The core team at IISc has already used three common deep learning techniques: LeNET, ResNET, and Convolutional Auto Encoder (CAE) for Raman spectroscopic data.

Revolutionising the Raman method with AI for mass testing

The team behind this novel idea suggests that the Raman spectra should be recorded using indigenously developed portable instrument from blood serum samples of patients (healthy, COVID-19 positive, asymptomatic, symptomatic, severe, etc.) and eventually create a database. The obtained database can be used to train deep AI models to provide accurate identification and detection. The final model will be deployed for clinical testing. There are some governance issues that include ethical clearances and patient consent to use samples. However, after the technology is fully developed, a clinical trial would be the next step to ensure this method's validity.

The hope is we never see a mass health crisis, such as COVID-19. However, scientists have maintained as the human race will continue to see pandemics and outbreaks. What has to change is the science behind managing and controlling its spread. Effective mass testing is the first step towards achieving effective outbreak control, and leveraging emerging technologies to speed up the process with accuracy is essential.

AI FOR INCLUSION
GAMECHANGER

CogniAble: Bringing accessibility and affordability for managing autism spectrum disorder

The journey of CogniAble stems from the personal motivation of its co-founders, Manu and Swati Kohli, whose son Ekagrah has ASD.

Ananya Sahay, a corporate professional, one day noticed a delay in the speech of her son, Akshay. That's not all - he would not make enough eye contact and had slow reflexes. The signs appeared when he was 15-16 months old, and soon after, she consulted a specialist. After a series of examinations, he was diagnosed with Autism Spectrum Disorder (ASD) and his treatment began. Although his speech issue continued, Akshay was showing growth in several other ways.

ASD isn't as rare as we think it to be. Per the Rehabilitation Council of India, 1 in 500 or 0.20% of people in India suffer from this Pervasive Developmental Disorder (PAD). The condition is marked by a deficit in social interaction and communication, apart from other cognitive struggles. But it is important to note that all patients do not show strikingly similar symptoms; they could vary from person to person.

That said, it is critical to identify this condition early on, as with the case of Akshay, since ASD manifests itself at birth or within the first two-and-a-half years of life.

Although Akshay's case is a positive one, there are many people who struggle with the early identification and treatment of their children. This is where CogniAble steps in to find a solution to this challenge. It is an artificial intelligence and machine learning-driven mobile app and web solution for automated early detection and intervention of ASD.

Blending in accessibility and affordability

The journey of CogniAble stems from the personal motivation of its co-founders, Manu and Swati Kohli, whose son Ekagrah has ASD. They realised that affordability and accessibility are critical to helping in the early detection and affordable treatment of the condition. The team at CogniAble brings together some of the best researchers and scientists from the Indian Institute of Technology Delhi (IIT-D), pediatricians and psychologists from India and the US to provide solutions that are not just effective, but also help in quality management.

Both their research and personal experience led the Kohlis to tap into this ill-equipped and underserved

market. To begin with, there is an obvious gap in the diagnosis of autism. The Indian Academy of Pediatrics (IAP) and American Academy of Pediatrics (AAP) recommend screening for children at the age of 18 and 24 months. The present rate, statistics suggest, is 15%. Alarmingly, only 40% of the affected children are diagnosed by the age of 3.

That's not all - the high cost of managing autism is also a huge challenge. The annual charges for autism therapy fall between INR 3,00,000 and INR 5,00,000 in India, and US$ 60,000 in the US. In a nutshell, the average medical expenditure for ASD children and adolescents is 4.1 to 6.2 times greater than those without ASD.

With CogniAble, all children can have access to early diagnosis and treatments, and that too, within the early intervention window. Moreover, it increases pediatricians' efficiency and help them act on parental concerns early on, helping them identify behavioural conditions and expedite the diagnosis.

Last but not the least, it also helps parents to positively affect the unique developmental health and progress of their children.

Resolving the diagnosis dilemma

The screening is a long and tedious process in most cases. At CogniAble, the diagnosis has been simplified, and the service delivery is quicker and more accurate. It starts with assessment through a filled questionnaire (with 17 questions) by the patient's parents or guardian. The question is analysed by AI. The questionnaire-based screening outcome is shared within an hour.

CogniAble has 1,000+ users who are leveraging the platform for not just the assessment, but programme development, individualised education plans, child-specific teaching procedures, training videos, regular programme updates, and data recording, amongst others.

After these steps, a video-based assessment of the child is taken, in which a user records a play-based video of the patient, based on 12 identified behavioural landmarks evoked. After the video is uploaded and submitted by the user, the video is analysed through computer vision and has 89% accuracy at present. Once this is done, the user receives the screening result, along with the digital prescription of the personalised treatment programme.

The platform offers users an opportunity to learn 800 skills at 10-20% of the market price.

Showcasing success

CogniAble has been able to taste success in a short span of time. According to the numbers recorded in March 2021, the questionnaire-based screening was validated with 93% accuracy and took only 8 minutes to administer. In May 2021, the results for the video-based screening were out, which showed an 80% sensitivity score, 90% specificity score, and 89% ASD screening accuracy. This is to be improved in the next six months.

Regarding the therapy platform, the autism severity reduced by 5.5 points on the SRS2 scale over six months.

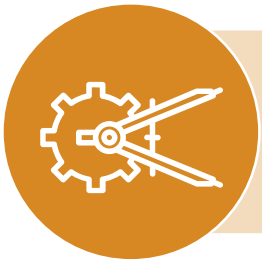
The platform offers a plethora of benefits to its users. To begin with, it is affordable for the masses at 10-20% of the market price. It is usable by both clinical experts and non-experts. The data-driven approach enhances the speed and customisation, and adds the requisite structure to the management of ASD. It also has access to internationally used clinical approaches. Last but not the least, CogniAble is remotely available on iOS, Android, and personal computer.

CogniAble is an effective solution that bridges the gap between accessibility and affordability to help in the quality management of ASD. It caters to both B2B and B2C clients, including special needs clinics and schools, private hospitals, pediatricians, special educators, and therapists. It is also beneficial for government-run primary and secondary healthcare centres.

The key to managing ASD is through early detection and appropriate treatment. Many parents miss these vital, early signs – which could put them in a favoured window for early intervention for their child. Thanks to CogniAble, this is now possible.

AI FOR INCLUSION
CHALLENGER

Continual Engine: Changing the landscape of STEM learning



Using AI to translate technical diagrams into standardised and highly descriptive text, making STEM subjects accessible for students with cognitive and visual accessibility needs.

The first image in your mind in response to the word 'classroom' will, in most likelihood, be a blackboard. That's because it is perhaps the most powerful tool in the hands of a teacher, which makes an indelible mark in the minds of students. The blackboard is where a teacher draws, writes, and annotates while explaining complex concepts. Given that the human mind remembers pictures better than plain text, this technique is invaluable to every student's learning process.

In today's digitised world, classrooms are going digital, which requires STEM content to be reimagined for desktop or handheld screens. The challenge for every STEM content developer is to bring the same amount of clarity as provided by a teacher with a blackboard by supporting diagrams and equations with lucid explanations on screen.

The problem becomes exponentially severe when developing content for students with accessibility needs - primarily visual and cognitive. For many STEM topics and subjects such as accounting, diagrams, graphs, and tables are essential to understanding concepts. In chemistry, for example, a bulk of the subject matter is represented through equations and line diagrams.

Publishers and teachers have been trying to overcome this hurdle by including an 'alt-text or alternative text. Alternative text is a comprehensive textual description of an image, diagram, chart, table, or graph. In case of a graph, the alt-text would describe the axes, the interval between points in each axis, the coordinates of essential points, shape, and trend of the graph.

> Over 700 million students have some sort of visual disability. Studies have shown that over 80% of students can't pursue STEM subjects because the course content is not accessible.
>
> **Mousumi Kapoor**
> Continual Engine founder

The only issue is creating alternative text is an expensive and time-consuming affair. That is because until now, the only reliable way of doing it was through the manual intervention of a subject matter expert (SME). Even screen readers cannot parse images effectively.

Employing SMEs to describe every image in a textbook or course is a resource-intensive task. Typically, it takes a cycle time of 2 to 3 months for a single book worth of images to be manually authored to alt-text and may cost anywhere between US$ 10,000 and US$ 100,000.

Invicta, an AI alt-text authoring platform from Continual Engine, might be the solution to this problem.

Using an AI-powered system to automate alt-text authoring can lead to a 50% reduction in cycle time and a 60% reduction in costs of creating alt-text.

Invicta is a sophisticated solution as each subject requires different parsing techniques. For example, equations and graphs in mathematics require different approaches compared with parsing line equations and aromatics and line diagrams in chemistry.

> Using AI to automate the process of describing images, equations, graphs, tables, etc., into high-quality, accurate descriptions, will reduce cycle time and cost associated with alt text.
>
> **Mousumi Kapoor**
> Continual Engine founder

To translate technical images, such as equations and graphs, from various STEM subjects into highly detailed, standardised descriptions, Invicta needs six steps.

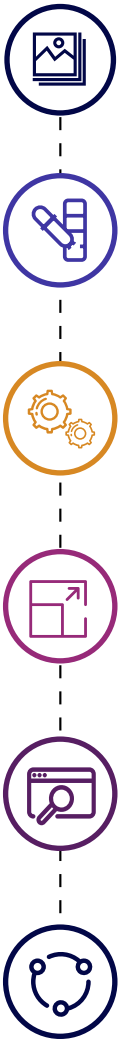


Image capture
Invicta accepts images across multiple file formats, including jpeg, png, and eps.

Pre-processing
Images are then optimised and denoised to be analysed by the AI. This optimisation and correction process includes binarisation, skewing, segmentation, and removing outliers.

Image processing
Invicta uses deep neural network-based image processing architecture to extract essential features from images. This is done using various techniques, including computer vision, object detection, CNN, RNN, and seq 2 seq modelling, to name a few.

Feature transformation
The features extracted are then transformed into standardised algorithm readable structures, such as JSON, SMILE, and LaTeX.

Parsing
An algorithm-based parser will then transform the features described into text.

Human in the loop
Finally, an SME will check the machine's output and validate the result to maintain accuracy.

The ability to fully transpose images into text represents a paradigm shift in educational content publishing.

First, it makes STEM subjects accessible for students with cognitive and visual accessibility needs. A screen reader can easily read the alt-text generated by Invicta. As the solution is automated, publishers can pursue alt-text inclusion at scale, making it feasible for many students to pursue their STEM goals.

Second, Invicta's solutions benefit teachers, especially in the digital new-normal world of post-2020. The alt-text descriptions that Invictus generates are both highly detailed and standardised. This means that teachers can use these texts as ready reference with which to teach students. Also, as the text is highly standardised, descriptions of subject-critical diagrams will not vary from teacher to teacher.

Finally, Invicta becomes an essential keystone in the push towards modular digital content publishing.

Publishers are starting to move away from the basic digital transposition of educational content such as PDF textbooks. Today, education publishers are looking to publish content in sophisticated modular content-aware packages that can be staked into bespoke bundles. The hurdle so far has been technical images and diagrams. Invicta adds that this capability can become a crucial step in the digital content publishing pipeline.

There is no doubt that an AI tool such as Invicta can change the landscape of STEM learning. The technology makes STEM subjects and their complex concepts more accessible to a much larger group of students, making the stream more inclusive than it has ever been.

Moreover, the capabilities it adds to publishers who use it cannot be understated. It is quite possible that shortly, all publishers will be using the tool, which in addition to improving inclusivity will also become a mainstay in their digital content push.

AI FOR PUBLIC SERVICES
GAMECHANGER

Wadhwani AI: Helping the cotton farmers of India

Wadhwani's solution enables accurate and verifiable pest monitoring and surveillance. The solution also provides timely and granular intervention recommendations that can be integrated with existing agricultural programmes serving cotton farmers.

The idea of AI that first came into the limelight in 1950 is now on poised to become the most dominant intelligence known to man. It is no more just a product or technology, but an enabler for almost everything we do. Be it astronomy, genomics, or healthcare, AI has taken the centrestage everywhere.

When it comes to India, the need is not just to pioneer in AI deployment, but to use it to empower millions of people across the country to overcome multitudes of challenges across various industries and sectors. "Wherever there is a decision-making process, AI certainly has a role to play, and help in taking better decisions. In the Indian context, AI is a problem solver than a wealth generator", says V Kamakoti, head of India's AI task force and faculty at IIT-Madras.

But is it of any use to a poor Indian cotton farmer who loses more than half of his yield to pests? Do all these AI tools make any difference in the lives of small-scale cotton producers who struggle lifelong to earn some bread, due to uncertainties in yields?

The government has been one of the torchbearers in exploiting the potential of AI for the cause. An example is the Maharashtra government's partnership with Wadhwani AI, an independent non-profit institute developing AI-based solutions for underserved communities in developing countries, to help cotton farmers in Maharashtra.

Cotton is particularly vulnerable to pest attacks. And in case of Maharashtra, factors such as soil composition, wind conditions, and climate change have increased the variance of the types of pests, particularly pink bollworms, and the time they attack crops.

This often results in farmers indiscriminately spraying pesticides on crops and sabotaging their harvests, resulting in loss of income to farmers, and in some cases severe debt and even farmer suicides. A fact that needs mentioning here is that cotton accounts for about half of India's pesticide usage.

Wadhwani AI presents a new solution to this problem via deep learning, smartphone cameras, inexpensive pest traps, existing digital pipelines, and agricultural extension-worker programmes.

> Wadhwani AI's solution enables not just the identification of the pest but also helps the farmer or the extension worker make timely decisions. The solution aims to be integrated with existing government systems and serve about 80% of the 6 million cotton farmers in India.
>
> **Rajesh Jain**
> Senior Director of Programs at Wadhwani AI.

Today, farmer welfare programmes run by the state government or industry bodies provide information on pest management to farmers through a network of extension field workers. As a result, farmers receive delayed and generalised pest advisory, while some in remote areas may not receive any advice at all.

To tackle this issue, Wadhwani AI is working on a solution that can be used to provide millions of farmers with timely, localised advice, reducing crop loss and over-use of pesticides by improving the timing of usage.

Their pest management solution is an AI-powered farm decision support system that equips the lay farmer with the knowledge of an agriculture expert, directly on their smartphone via a mobile application, CottonAce. It requires lead farmers or extension workers to upload a photo of pests collected in commonly-used pheromone traps. Thereafter, the deep learning AI model identifies and counts adult male moths in the photo to predict the level of infestation and generate a Green, Yellow, or Red Alert. Based on the level of infestations, it then provides real-time recommendations on pesticide spraying (organic and chemical) based on rules set by entomologists from local agriculture universities. And all this happens in a matter of minutes.

The solution enables accurate and verifiable pest monitoring and surveillance, and provides timely and (geographically) granular intervention recommendations that can be integrated with existing agricultural programmes serving cotton farmers.

The AI model is trained on a data set of 30,000+ pest images and 2,00,000+ annotated pest instances collected in over three crop-growing seasons and in five different states. This is coded in Python and has a modified Single Shot Detector (SSD) architecture to classify the image as trap or not and then it counts the numbers of pests in the image.

Using a combination of network pruning and quantisation, the model has been compressed from a 250 MB cloud network to a less than 10 MB app that can even work offline. This was done to make the model compatible to run on low-end smartphones in areas that do not have network connectivity. The app is multilingual, offers easy onboarding, and has high accuracy (less than 5% false and mixed alarm rate). A web portal enables partners to access real-time data on pest infestations in the geographies they operate in.

> In Kharif 2020, we deployed our solution via an app through on-ground partners, such as Welspun Foundation and Deshpande Foundation in four districts across three of the largest cotton-producing states in India – Gujarat, Maharashtra, and Telangana. Through existing agricultural programmes, we reached nearly 15,000 farmers who saw a benefit through an increase in profit and a reduction in pesticide cost compared with 2019. There was 20-26.5% increase in profits, reduction in pesticide cost due to more judicious spraying, and higher selling price due to better quality of the cotton crop. We are looking to scale the model to 300,000 farmers this year, 2 million farmers through garments of Telangana, Maharashtra, Gujarat in the following year, and then go global and scale it to 5 million farmers.
>
> **Rajesh Jain**
> Senior Director of Programs, Wadhwani AI.

However, the model was not perfect and had its share of challenges. First, there was a need for a human-centric design that works with farmers. To tackle this, team Wadhwani conducted multiple rounds of user iterations with prototypes and incorporated the insights into the UX of the app. Second, there were poor-quality images as they were captured on the farmer's phone. To overcome this, Wadhwani created a classification algorithm to identify poor versus good images and then train the farmers through that on taking data images. Third was offline inference for which the team compressed the app size and enabled it to work offline.

The research effort of Wadhwani AI in developing a template that can be replicated in large-scale agriculture programmes worldwide won it the Google AI Impact Challenge grant in 2019. It has partnered with Welspun Foundation, Deshpande Foundation, Better Cotton Initiative, IDH Cotton Programme, etc., to build and test this solution. At present, it is being used by more than 18,000 farmers across Maharashtra, Gujarat, and Telangana.

AI FOR SUSTAINABILITY
GAMECHANGER

Vigyanlabs: Saving the planet, one watt at a time

PowerMind customers have saved 30% energy, on an average, and seen cooling energy reductions, as lesser energy consumption of endpoints means lesser heat generated in buildings. The solution is being adopted across various sectors, such as BFSI, Manufacturing, IT/ITES, Education, and Healthcare, saving 30% energy across the board.

"I don't want to protect the environment; I want to create a world that doesn't need protection."
- Unknown

Today, sustainability is no longer an option or a choice; it is a necessity for us to survive and be able to protect a habitat for future generations. Caution, awareness, and action have begun changing previously held beliefs about climate change, leading to an evolved and cohesive approach to managing a disastrous fallout. Becoming sustainable has become a key goal for organisations.

Roughly 1.5 billion computers in the world consume around 320 terawatts (TWh) of energy per year. Per the Climate Savers report, about 50% of PC energy consumption is wasted as heat and other non-productive areas. This wastage amounts to 160 TWh, equivalent to operating 4 Fukushima Nuclear plants (each with 40 TWh per year). It is more than what many countries, such as Egypt and Sweden, consume in an entire year.

These numbers seek attention and critically require that we save energy to make our actions world sustainable.

Building a green and sustainable computing future

Standard OS power policies are rigid. A personal computer (PC) goes to monitor off state after 15 mins, then goes to sleep after 30 mins, and then hibernates after 60 mins. As a result, PCs are one of the largest power guzzlers in the world. There are

Vigyanlabs is an innovation-driven organisation focused on building products to promote green computing. The organisation has won many awards and accolades over the years, including the NASSCOM - Technology Innovation of the Year Award in 2013, which serves as a benchmark for the industry to capture the innovation journey of India across Indian and multinational organisations. Vigyanlabs won this award for its outstanding work in Intelligent Power Management of IT infrastructure and its product IPM+.

Srinivas Varadarajan, founder-CEO of Vigyanlabs, and Srivatsa Krishnaswamy, founder-director of Vigyanlabs, took this challenge of bringing about a change in the way we use our computers and run businesses. Srinivas has over two decades of experience in IT. He was also the principal architect of the biometrics-based national ID programme - 'Aadhaar'. While Srivatsa, who has over three decades of global experience in IT worked as the consulting application architect in India's Aadhaar programme as well.

no standard solutions today that can non-intrusively save energy on computers. Chipsets and hardware get optimised year after year. However, they can only respond to what the application usage patterns and contexts are. Only an AI-powered, continuously adapting power policy can address this problem, which is nonexistent today.

The founder duo has developed an AI-driven patented solution called AI PowerMind. AI PowerMind engine continuously learns the usage patterns of the PC user and adapts the power scheme continuously to achieve up to 30−50% energy savings.

This is achieved by accurately learning and understanding users' daily usages patterns with more than 80% confidence level. Stringent power-saving actions, such as sleep or hibernate are applied during this idleness to save significant energy. This can be applied to meeting patterns and adjusted per the meeting reschedule.

AI PowerMind has the ability to continuously learn the idle time and usage patterns at the edge devices and predict upcoming idle times with high accuracy. They can predict both the time and duration of upcoming idle slots. The learning accuracy improves significantly over time as more and more data are available for deep learning. The power scheme parameters are dynamically tuned every day based on deep learning inputs.

In summary, this results in continuous energy savings with the least user interruption. AI PowerMind provides accurate predictions by comparing recent contextual and usage events with those of the past. The real-time introspective nature to correct its false prediction within a short defined interval of time provides superior accuracy.

AI PowerMind has been deployed in endpoints, such as laptop, desktop, and data centre servers. It is a deep learning model based on CNN. The solution supports both 32bit and 64bit systems for laptops, desktops, and servers. It provides energy savings that directly add to the enterprise's bottom line without any additional effort and is completely non-intrusive.

Implementation challenges

The first challenge for the company was to convert the asynchronous idle event records into synchronous time series problems. The idle data was then required to be preprocessed and normalised according to power action parameters.

The next challenge was to ensure introspective nature in the model. In order to do that, the team defined a waiting time for each of the predicted power actions, and if within that waiting duration agent finds any user activity, it discards the predicted power action.

The later version of the solution introduced weightage for recent contextual and usage events progressively compared with contexts and usage patterns in the past and learned from past false predictions.

The endpoints that physical users operate had to ensure executing power actions when there is no user activity going on. Therefore, the patented sensor application runs to ensure non-intrusive power actions in the endpoints operated by users.

Another critical consideration was that as the product is deployed in highly secure BFSI environments, such as SBI, the product needs to work in a highly secure banking sector environment. Hence, highly secure TLS 1.2+ with AES 256 encryption to communicate with the centralised server over HTTPS was to be used. This ensured that no network ports or firewalls needed to be reconfigured to communicate with the centralised server.

The solution is tested and approved for VAPT by CERT IN certified auditors and Protiviti. However, as the solution runs on end-user machines used in critical environments, such as Teller Machines, we needed to ensure that the resource utilisation and footprint are completely independent, which was a big challenge. This necessitated a lot of incremental data processing to avoid large data handling scenarios.

The impact and scale

PowerMind customers have saved 30% energy, on an average, and have seen cooling energy reductions, too, as lesser energy consumption of endpoints means lesser heat generated in buildings. The solution is being adopted across various sectors such as BFSI, manufacturing, IT/ITES, education, and healthcare, saving 30% energy across the board.

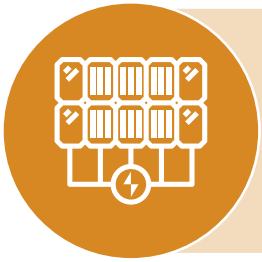
The solution helps organisations contribute to saving the environment in terms of reduced carbon emission, saving trees and water, and saving energy costs. It is worth a mention that the AI PowerMind engine has saved more than 1,800 GWH energy to date and has been deployed over more than 6 million endpoint devices across 26,000+ customer office locations.

To give some perspective, 1,800 GWH energy saved is equivalent to powering the entire city of Mumbai for almost 12-18 months. That is equivalent to CO2 reduction of 800,000+ tons of CO2, which translated into roughly 1.8 million acres of US forests.

As organisations seek to responsibly address sustainability, it is pertinent to remember that incremental change requires the aid of technology and optimised use of resources to ensure a greener, safer future.

AI FOR SUSTAINABILITY
CHALLENGER

Mahindra Teqo: Making solar power 'cleaner' with Teqo



If our algorithms are applied across the installed solar energy capacity of 40 GW across India, it could result in savings of up to INR 500 crore annually" - Team Mahindra Teqo

"Sustainability has to be a way of life to be a way of business" - Anand Mahindra, Chairman, Mahindra Group. This vision of the group chairman pretty much says it all – sustainability has to become a way of life for the industry. Keeping the wheels of industry moving requires an enormous amount of power generation, for which India is betting big on the sun. As the leader of the ambitious Solar Alliance, India is fast tracking the solar power generation ecosystem from every perspective.

For it to become a way of life, Mahindra Teqo is reviewing an innocuous looking aspect that can have a big impact – increasing the productivity of Photo Voltaic (PV) cells simply by keeping them clean. Installing solar power plants is just not enough; unless asset management efficiency improves over time – returns will either stagnate or decline due to lack of maintenance. Mahindra Teqo, a subsidiary of the Mahindra Group, a new breed of tech-enabled renewable energy asset management solutions provider, assists solar and wind energy asset owners in increasing profitability. It is responsible for about 4.5 GWp of solar PV assets and 7.5 GWp of software.

Understanding why it needs to be done

The upkeep of a solar power plant is fraught with problems; one of which being dust. Dust hinders the photon-to-electricity conversion radiation. According to a study conducted by Mahindra Teqo, the module cleaning activity accounts for 30-40% of the overall operation cost of a solar power plant. The easiest controlled losses are soiling and string failure. The planning and monitoring of module cleaning consumed a total of 1,845 man hours each month per location. It figured that by optimising cleaning cycles and factoring in the string factor, could significantly reduce cleaning time and actually be a game changer. In a market gasping for profitability, this is a bright ray showing the way to high efficiency.

> If our algorithms are applied across the installed solar energy capacity of 40 GW across India, it could result in savings of up to INR 500 crore annually.
>
> **Kapil Panwar**
> Lead data scientist at Mahindra Teqo

To find out the root cause of the problem, they performed a why-why analysis.

- Regimented cleaning preformed on site without any focus on optimisation
- Required complex calculations and extra efforts of site team to plan the process
- Relative soiling depends on multiple parameters that keeps changing with time
- Automation of cleaning trigger was not available in any SCADA or system
- Required predictive and automation methodology was not available

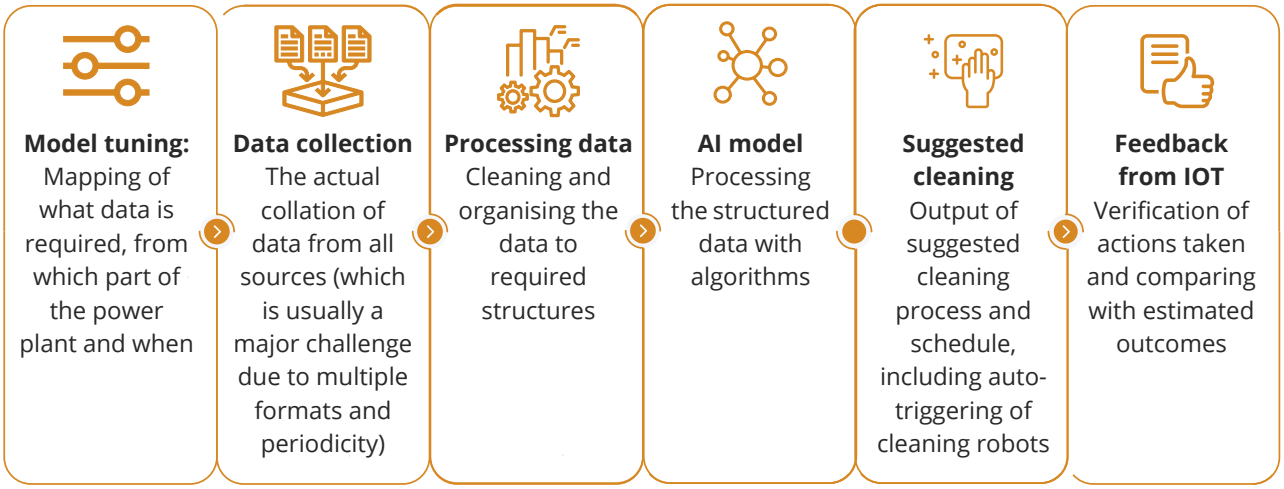
... and came up with strong actionable points.

Understanding how it needs to be done

They decided to create a generic module cleaning tool that could be used on any site, based on AI models that provide great accuracy and speed. This model could determine when cleaning should be done, which parts of the plant needed to be cleaned and which part should be cleaned first in the event of a water or time constraint to enhance generation.

To continually improve the model, a ML-based general model was added that uses a high level technology stack consisting of Python, Hadoop, PySpark, FastAPI and PostgreSQL. It learns by itself, optimises cleaning costs, and saves water at no additional cost. It understands the requirements of different PV modules, such as crystalline and thin file modules, and gives string health information, which dictates the cleaning process - wet, dry, and robotic cleaning. It can also be used to activate cleaning robots that can completely automate the process, requiring no human intervention.

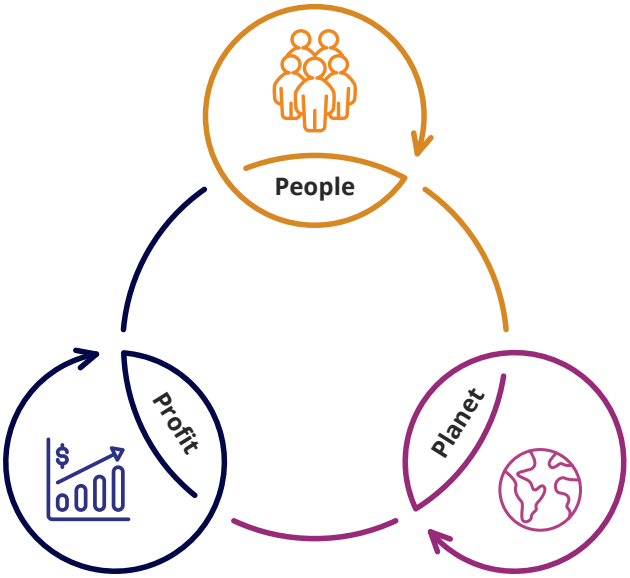
So how do the different elements come together to deliver efficiency? This is done through a governance mechanism in which tech enables the end-to-end process:



The outcome is two-fold:

1. Efficient identification of underperforming modules that require cleaning (without any manpower having to do a physical survey), along with prioritisation instead of a full cleaning of modules
2. Efficient triggering of requirement specific cleaning depending on the type, configuration, and relative soiling of the module/string

The team started with a generic model and is continuously improving on it with every process cycle over time, specific to user requirements. As the model is built on open-source tools, safety of tools and data was a challenge that was overcome through encrypted binary formatting.



People

- Improve time taken in cleaning planning, prioritisation, and scheduling from 1845 hr/mth to 30 hr/mth, which can be redeployed for more productive usage elsewhere.
- Reduced work complexity through the model will help speed up manpower productivity.
- Efficient time utilisation will ensure minimal overruns and therefore, improve work-life balance.
- EPS will also be improved.

Planet

- About 25% savings in water consumption for module cleaning purposes
- Better asset utilisation leading to lower resource consumption

Profit

- About 25% cost savings on module cleaning
- INR 75 lac/MW/year improvement in ROI for clients
- Increased asset life cycle due to better asset management

Every bit matters

As children, we are often taught how the “small” efforts make a “big” difference. This is especially true in case of Mahindra Teqo.

FEATURED STORIES

TECHNOLOGICAL USE CASES

Natural Language Processing
GAMECHANGER

IIT Madras: Bridging the language divide

Samanantar, described as translation corpora and tools for the next billion users, is a vernacular translation system that can translate legal documents in the judicial domain.

Ages ago, following the great flood, some people decided to migrate eastward to build a city and a tower at Babel. The tower was meant to be the tallest one ever so that it would reach the heavens, bringing the men who built it eternal fame and glory. Seeing this, God − in an attempt to divide the human race − created many new languages, to confound their speech, and scattered them around the world.

The famous Tower of Babel story from the ancient scriptures might be a myth. But strong barriers that exist in our civilisation as a result of the linguistic divide is a reality − even in the modern age of digital and emerging technologies. And nowhere this is more visible than in India − a land of vast linguistic diversity with over 500 languages.

Since its independence, India has been facing its own 'Tower of Babel' moments in its governance, especially in the judiciary. The country's judiciary has a hierarchal system that starts from the Munsif Courts and Sessions Courts at the local level, to high courts at the state level, and finally the Supreme Court at the national level. In most cases, lower tier courts use local or regional languages, while the Supreme Court and many high courts use English in their proceedings as specified in Article 348 of the Constitution.

As a result, many of the proceedings from the Supreme Court is often inaccessible to non-English speakers of the country, hampering the fundamental right to have equality before the law.

In the 2018-19 Annual Report, the Supreme Court has declared its commitment to translating judgments into the vernacular languages of litigants. Recently, it has started translating its proceedings to nine of the 22 scheduled languages. However, this has been done manually, which is time-consuming, expensive, and leads to more delays in the already snail-paced judiciary process.

On the bright side, major advancements have been happening in an AI sub-branch called Natural Language Processing or NLP. Natural Language Processing makes machines process, understand and generate human languages. And only an Natural Language Processing-powered automatic translation system can provide the solution to the language problems in the judicial system. However, that requires an accurate, free, open-source, automatic translation system that can process Indian languages, which is almost non-existent. And that is where Samanantar - an AI language translation model built by the IIT Madras faculty Mitesh Khapra and Pratyush Kumar, becomes a Gamechanger.

The 'Samanantara Yatra'

Samanantar's origin goes back to the days when Mitesh who has been working in the space of Natural Language Processing as part of his PhD, and Pratyush who was focusing on the systems side of AI, came together to create the AI4Bharat initiative.

> We understood that in today's world of deep learning, we need to combine domain expertise with the technology to make any impact on society, and we chose the domain of Natural Language Processing.
> We recognised that we need to combine Natural Language Processing with systems thinking to build large systems, to collect large amounts of data, and then address some of these problems in very standardised ways.
>
> **Pratyush Kumar**
> Associate Professor, IIT Madras

Samanantar, described as translation corpora and tools for the next billion users, can translate legal documents in the judicial domain. It is currently deployed in the Supreme Court of India as a pilot project.

We felt that before starting with translation, sentiment detection and question answering, it is good to start with foundational blocks, which is to simply create a large corporate of Indian language text. And eventually we were able to increase the size of corpus available by an order of magnitude of 10 in many Indian languages. - Pratyush Kumar

Samanantar's journey had two critical components – the Indic language corpus created for training models and the Vector Space Models used for machine translation. The first one was the biggest hurdles to overcome in India's vernacular Natural Language Processing space due to lack of training data for Indic languages.

In fact, one of the key foundations of Samanantar is the 46 million parallel sentences collected by the team using smart tools from the web on which the models were trained.

The second core component of Samanantar is the vector space models that were then trained on this rich Indic language corpus.

Vector space models are algebraic models that are often used to represent text as a vector of identifiers. With these models, one can identify whether various texts are similar in meaning, regardless of whether they share the same words. The team then used efficient approximate nearest neighbour search using FAISS to search over 100 million sentences to find a matching sentence resulting in translation.

Presently, Samanantar offers English to Indic and Indic to English translation and supports 11 Indian languages. Apart from the Supreme Court of India, Samanantar is now being used by Bangladesh Supreme Court, C-DAC, Pratham Books, and Ek Step Foundation for translation works. It has been known to provide an accuracy rate much better than similar solutions from tech giants, such as Google and Microsoft.

According to Pratyush, the team is also working on an Indic to Indic translation model with languages Tamil and Oriya.

Indic languages face a unique challenge in their continuity and relevance, in the age of the Internet – one that predominantly caters to English. Efforts made by companies such as Samanantar are moving in the direction of making the internet more equitable and suited to the preferences of a land characterised by multiple languages.

The AI model we used can take a Hindi sentence and a sentence in another language such as English and map it to a common vector space where it can find parallel sentences based on distance - Mitesh Khapra IIT Madras faculty

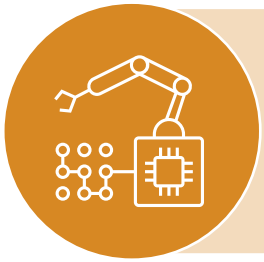
> The goal here is to bring parity in AI technology for Indian languages with English and we want to build these solutions for this long tail of Natural Language Processing tasks for as many Indian languages as possible.

Mitesh Khapra
Associate Professor, IIT Madras

Extractful.AI

Natural Language Processing
CHALLENGER

Extractful AI: The future of document processing



Extractful AI uses artificial intelligence and machine learning to seamlessly understand data and its context without being constrained by formatting or medium.

It is the end of the month, and Ankita's team is in a fix. The number of sales orders has drastically increased over the last week. Ankita and her team have to process every one of the hundreds of orders. This involves entering data from a mix of handwritten, digital, and printed documents into their organisations' ERP. What's more, sales orders from different sources have differing templates, nomenclature, and different formatting.

This is a grueling task. Each document should be scrutinised carefully. Additionally, Ankita's team is further slowed down as the documents are not in a standardised format. Each document usually takes a member of his team up to 30 mins to process.

Ankita is used to situations like this. Every month, the scenario repeats itself. Sales orders do not arrive uniformly over a month, skewing heavily towards the month's end. This puts extra pressure on his team, in many cases requiring them to work overtime during month end. What's more, having to process the sheer volume of documents in many formats and media severely compromises accuracy. Ankita expects a fair amount of errors to crop up and enter the ERP.

Ankita has tried using RPA automation tools before. However, these tools work on precise templates. If any sales order is not in a template the tool understands, it cannot extract data from the document. What's worse, over time, the number of templates keep increasing making the process even more unmanageable. Given that controlling sales order templates is not feasible, neither is this solution for Ankita.

Ankita needs a tool that understands sales documents so that he does and processes many of them at superhuman speeds.

This is where Extractful AI comes in.

Extractful AI uses artificial intelligence and machine learning to understand data and its context seamlessly. It is not constrained by formatting or medium.

Extractful plugs into Ankita's ERP. It processes hundreds of sales orders seamlessly. From handwritten documents to digital-only orders, Extractful AI translates the data into a format the ERP understands at unparalleled speeds - almost 20 times faster. What's more, the entries into the ERP are more accurate than ever before - at 99.9%, a number unmatched by even the most meticulous individual.

Extract critical business intelligence from critical B2B data from various documents, from sales orders to engineering documents, at unprecedented speeds with near-perfect accuracy. All without human intervention.

This is what Extractful AI promises

Extractful AI is poised to change information processing from documents fundamentally. Translating documentation to a machine-usable data task that is generally labour intensive and error-prone. It is also a task that has been thought of as difficult to automate. When using traditional automation techniques, documents need to conform

> Since RPA automation solutions are template-based, the number of templates they have to create keeps on increasing, making it unmanageable.
>
> **Karthikeyan Balaji**
> Founder

to a uniform standardisation for a tool to recognise and interpret the data. With almost 150,000 different varieties of documents, this is usually not feasible. Introducing a new kind of document type or even slightly altering accepted document types would require reprogramming of the automation tool.

"In the case of Extractful AI, we are template free", says Karthikeyan Balaji.

In other words, only an AI-powered by machine learning, trained on thousands of document types, does not have the same limitations.

The data is then pushed automatically to the ERP where it populates.

The business impact from a tool such as Extractful AI is immense. Document processing for regular teams is inherently non-scalable. With Extractful AI, document processing is 20x faster compared with manual processing. Additionally, it can extract data at 99.6% accuracy, where a regular individual would have a 10% error rate. This invariable leads to faster order turnaround (almost 40%) and operational efficiency, resulting in nearly 70% less manpower needed.

> Today Extractful AI has partnered with organisations across countries. Some of the international brands they work with include Verizon, Himalaya, NMC Trading, and the Marriot group.

One of Extractful AI's partners is the 116-year-old Pacific Gas and Electricity Company. Naturally, PG&E's engineering drawings go back over a hundred years. Extractful AI has successfully processed and extracted a century's worth of data from these engineering drawings – going all the way back to the early 1900s. Many of these engineering drawings from the early to late 20th century were handwritten. This is a gargantuan task that is just not feasible to tackle without an AI-driven hyper-automation system.

Extract AI is a solution that will confer an enormous competitive advantage to organisations that deal with large volumes of documentation. Manufacturing, utilities, telcom, hospitality, and legal services are just some industries that will benefit, allowing them to generate business intelligence from documents at a big scale.

Indeed, organisations that do not use platforms such as Extractful AI will find themselves losing out to the competition.

For Ankita, this means she and her team have suddenly gained back many hours that they can use for more complex, less repetitive tasks, but also be assured that business intelligence data imputed in his ERP is more accurate than it has ever been.

Extractful AI is already capable of interpreting and extracting meta-data in these use cases -

Payment advise and Debit notes - including accounting for amount receivables and payables and allowing for automated audits.

Engineering Drawings - including title block identification, meta-data extraction and data transformation.

Vendor Invoices including invoice v.s purchase order discrepancies and automated alert systems

Sales Orders including orders to cash processing and automating reconciliations.

Extractful AI works in 3 major steps

Data Extraction - Extractful AI automatically opens documents attached to emails and scans them, Using image processing and computer vision, the AI isolates and extracts the relevant data from the document.

Data Interpretation - Extractful AI then interprets the data extracted. It understands what the data is and the context of the data using Layout Analysis and Table Detection. Using Fuzzy Data Interpretation, even interpret and match non-standard, fuzzy data like product descriptions and addresses

Data Transformation - Finally, Extractful AI transforms the data from the documents t a form that the ERP will be able to easily import, matching each data point to specific fields in the ERP.

toch

COMPUTER VISION
GAMECHANGER

Toch AI: Making engaging and interactive videos

Toch AI's cloud-agnostic platform enables processing content on the fly, automatically meta-tagging it, understanding the content, and identifying key moments. Thus, it focuses on optimising video content to make it more engaging, interactive, and monetisable.

There was a time when watching television was a novelty, a luxury for children. Today, even toddlers display a surprising amount of proficiency in handling technology, and gravitate towards videos. The sights, sounds, colourful graphics, and movements keep them deeply engaged. Video is now a preferred medium for children to engage with, going well beyond just general entertainment. A large amount of modern learning is being facilitated through video, which is soaring in popularity amongst youngsters. Video generation and development gives sound RoI and is a flexible marketing and communication tool.

In a time dominated with video content, it can get challenging to ensure viewer recall and retention. The onus is on video production companies to ensure their viewers are captivated and engaged.

Toch AI, an AI-driven platform, revolutionises videos to make them more engaging and interactive. Toch helps broadcasters, OTT platforms, media platforms, and creators to offer the right content at the right time, meeting and exceeding their customers' expectations.

Enriching content in a dynamic video-centric world

Established in 2016, Toch AI is a SaaS company that provides software to its customers implemented as intractable assets. It is a cloud-agnostic platform that enables processing content on the fly, automatically meta-tagging it, understanding content, and identifying key moments. The company focuses on optimising video content to be more engaging, more interactive, and more monetisable. Toch AI has state-of-the-art deep-learning AI technologies that redefine video content across platforms. As a foremost player in this industry Toch AI is placed uniquely as a first mover to capture many aspects of this industry through its ever-evolving and learning AI platform.

The target groups for Toch are OTT platforms, broadcasters, short-form video creators, entertainment companies, and social media platforms.

> Toch leverages innovative solutions with patented AI technology-driven across sports, entertainment, and news to deliver better, faster content in real-time benefitting our users. Tomorrow, we can empower safer living across the world by translating our patented algorithms into vital sectors such as traffic management, security, road safety, healthcare, and education. For instance, to be able to analyse faces and predict high-risk situations before they actually happen, the potential impact of our ever-evolving work is thrilling and limitless.
>
> **Vinayak S**
> Co-founder and CEO of Toch AI

> Toch is the next in the realm of shopping and interactive video streaming! It boasts of being the world's first interactive video platform that comes with SDK's and mobile applications, empowering users to add clickable hotspots, or 'tags', to any moving person or object in a video. Proven to increase engagement up by nine times in comparison with a static link at the bottom of the video frame, these tags encourage viewers to explore extra content that is hidden inside the video, opportunities to buy or help create immersive experiences.
>
> **Sanket Dantotia**
> Co-founder

Toch is addressing some key pain points about video content for customers, such as the time-consuming manual meta-data processing, and manual editing of key moments and highlights. In this scenario, the monetisation opportunities get limited while data protection becomes a big challenge, along with adhering to the manual video compliance process. In these times of various devices and operating systems, cross-platform and cross-device shareability is a must, and Toch.ai is bringing related compatible solutions.

Over the period, Toch has added many technologies to its arsenal. The start-up is currently augmenting its capabilities and hope to add unsupervised learning, user preference video mapping, and a training platform for data labelling to its systems.

Multifaceted platform

Toch has created a platform that allows live video analysis to create short snippets of the feed in real-time. This task takes an incredible amount of manual effort and time. The platform enables the instant creation of key moments from videos for monetisation and engagement. The AI engine is constantly working at the backend to analyse different types of moments and create audio-visual files for consumption by end-users i.e., viewers or audience.
The solution is offering attractive features, such as

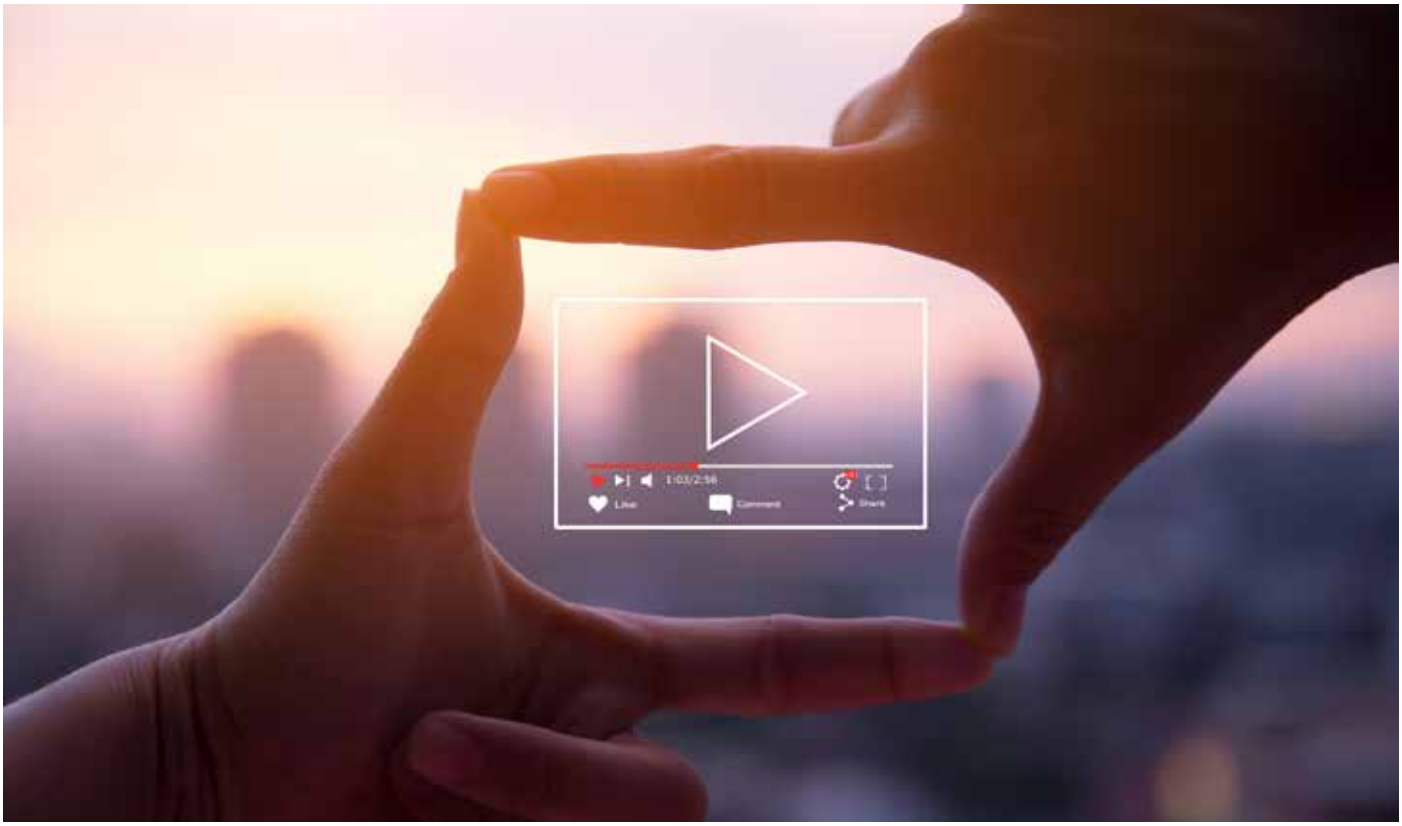
bite-sized videos, Toch Amplify, and Toch Engage. Toch Amplify lets users design their stories that leads to improved engagement with audience. One can add graphical overlays, insert slates, and design content beautifully for brand building in real-time and on the fly with the solution.

With automated highlights and key moments, viewers will never miss an important aspect. Toch Engage helps you increase your reach to new audiences or increase the traffic of your content. You can resize and customise live broadcasts and existing content automatically across new-age platforms.

In terms of technical description, all the modules are built in-house using AWS and IBM for cloud infrastructure. The solution has been rigorously tested and used by customers across various real environments, including SonyLIV, Disney Hotstar, Twitch, ESPN, English Premier League, F1, amongst others. It has been also working with an international OTT platform to successfully produce events such as the Australian Open, and Champions League Football. It has helped an international OTT platform to bring IPL to the masses through their apps.

Like every AI company, Toch had been facing numerous challenges, especially around data gathering, processing, and narrowing down to the right algorithm in building this tool. There were a few infrastructural challenges too. However, the company plans to stay sorted in terms of regulatory compliance and governance. The AI engine is governed by the processes set by the partner in association with Toch.ai. It is a multistep process of rule-based, self-governance where a user can easily set the rule to use data for testing and validation. The data is then regularly monitored and evaluated to correct and avoid bias.

The future is data, and the future is customer-centric with more online engagement. Sports training, online learning, and marketing will come to rely heavily on AI and emotional analysis of customers. Sustained engagement from youngsters and enthusiasts, coupled with sturdy governance, is required to make AI application in every imaginable scenario a reality.



FEATURED STORIES

Exemplars

Tamil Nadu eGovernance Agency: Making cataract detection and screening more accessible with E-Paarvai

To overcome the shortage of ophthalmologists, the Tamil Nadu eGovernance Agency (TNeGA) has developed an intelligent AI-powered mobile application called E-Paarvai to identify the presence of cataracts in a person's eye.

There are over 10 million people in India who are bilaterally blind. In almost 70% of the cases, cataract is the leading cause. Cataract causes clouding of the clear lenses of the human eye. Most cataracts develop slowly over time, often depriving the person a chance of salvaging their vision.

However, cataract can be removed surgically and vision can be retained, provided it is detected earlier. And this is where the biggest hurdle arises. India has a glaring shortage of ophthalmologists – there are only 12,000 ophthalmologists in India. This makes regular cataract screening a challenge, mainly in rural areas where access to medical specialists remains a challenge. Roughly, there is one ophthalmologist for every 250,000 people in rural areas.

As a result, several cataract cases go undetected, leading to unavoidable blindness. The National Programme for Control of Blindness & Visual Impairment (NPCBVI) shows that of the over 10 million patients registered on the national platform, almost 99% of them have been reported for cataract disease. Now, if we are to screen these 10 million patients with the available ophthalmologists, it will take years, considering the current ophthalmologist-to-population ratio in rural India − 1:250,000.

To overcome this obstacle and for efficient detection and screening of cataracts, Tamil Nadu eGovernance Agency (TNeGA) has developed an intelligent AI-powered mobile application, called E-Paarvai to identify the presence of cataracts in the eye of the person being screened. TNeGA, which is a state nodal agency responsible for driving technology initiatives for the government of Tamil Nadu, develops low-cost, technology-enabled scalable solutions in critical sectors (such as education, healthcare, and agriculture).

> E- Paarvai was created, when blindness Control Society of Tamil Nadu had reached out to us and informed us about the staff shortage. As a result, we created an AI solution that is quite effective for routine diagnosis especially in environments that are stretched for resources.
>
> **Santosh K Misra**
> Former CEO of TNeGA who oversaw the development of E-Paarvai

The solution is built using computer vision technology and the AI model is rolled out using an Android App where field workers capture the patient's eye using their smartphone. The model then predicts whether the eye has a mature cataract, immature cataract, IOL or no cataract. With doctors already overwhelmed with work following an analytics only based approach would have put more pressure on doctors and delayed the entire screening process. Therefore, AI was chosen as a crucial element in the solution.

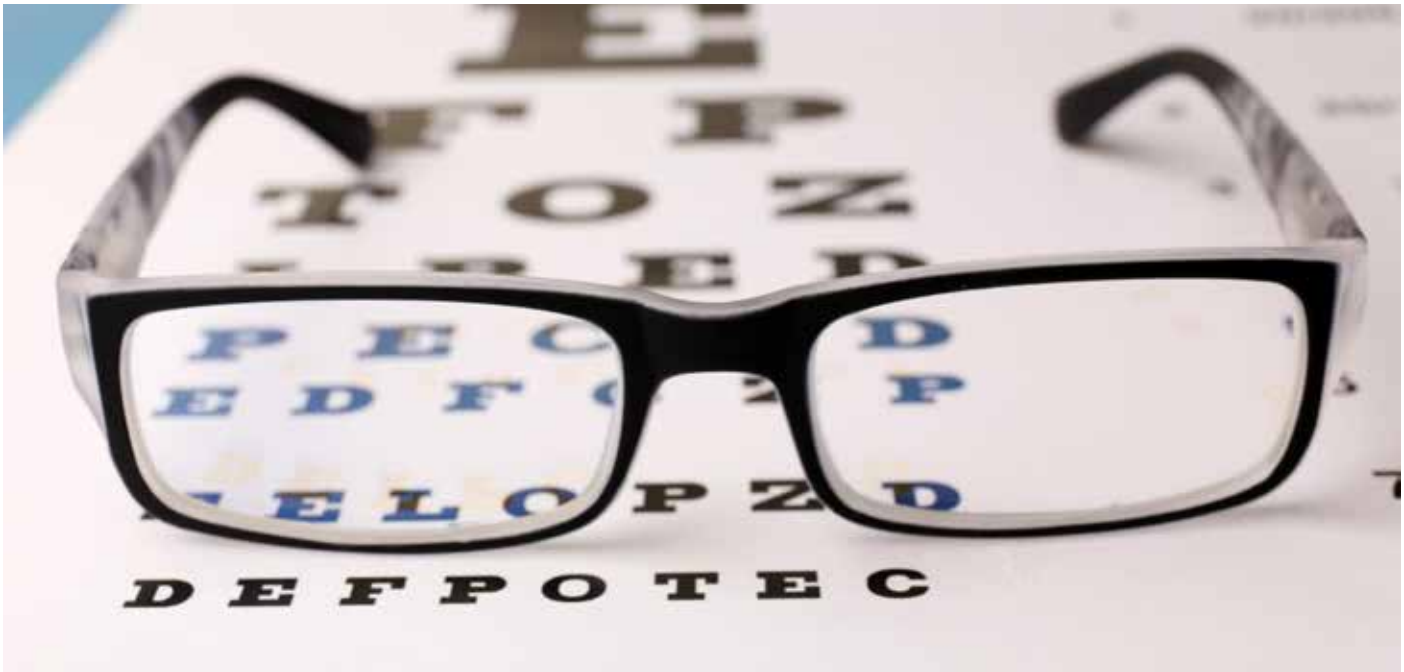
The system is designed in a way that any primary healthcare worker can download and set it up in five minutes - Chokkalingam of TNeGA.

The fieldworker downloads the application on their smartphone and captures the patient's eye, which is then analysed by the AI and sent to a centralised district-wise dashboard where the District Medical Officer receives the screened patient details for further action (in most cases a surgery). Furthermore, the Tamil Nadu State Control Blindness Society is tasked with ensuring 30 days for clearing any of the cataract detection submitted to the dashboard.

When it comes to the technical side, the solution that was developed with a vendor is state of the art.

The development of e-Paarvai was not without any challenges. As the e-Paarvai app was developed on free-hand eye images taken from the smartphone, finding such a data set was the biggest challenge. As a result, the entire training data set had to be created from scratch. Furthermore, the system adheres to the TAM-DEF (Transparency & Audit, Misuse protection, Digital divide & Data deficit, Ethics, Fairness & Equity) framework (Tamil Nadu AI Policy 2020) of governance.

> We leveraged computer vision and it's state-of-the-art object detection model to solve the problem. For classifying the multi-class classification model, we chose YoloV5 a Pytorch framework. We created a sufficiently large and well-labelled data set for getting good results. Initially, we used the default settings of Yolov5 to establish the performance baseline and later we modified based on the data. Currently, the AI model has an accuracy of 91%.
>
> **Priyanjit Ghosh**
> TNeGA



India houses over 10 million blind people and 2 of 3 cases may well have been prevented if diagnoses were timely. In low-income groups, general apathy and lack of knowledge are major hindrances to the early diagnosis of cataracts. This technology is showing promising results and the impact will result in much better public services delivery that helps in early diagnosis, prioritising cases that eventually leads to the prevention of blindness - Santosh K Misra Former CEO of TNeGA who oversaw the development of E-Paarvai

The e-Paarvai app is being used by the Tamil Nadu State Control Blindness Society (TNSBCS). As the launch of this application in February 2021, the system has been rolled out to more than 14 districts. It has screened more than 1,280+ patients in various rural areas of Tamil Nadu.

The e-Paarvai app is poised to help 20 million residents of Tamil Nadu aged 50+, who are most susceptible to developing cataracts. However, this solution can just as well be implemented across states, essentially limiting the burden on the healthcare system and reliance on limited numbers of ophthalmologists.

MyGov: Fighting the wave of misinformation

To fight the widespread transmission of misinformation, and provide accurate facts and advice on COVID -19, the team at MyGov created the Corona chatbot in just six days with the help of Haptik and WhatsApp.

When the going gets tough, the tough get innovative. COVID-19 has been one of the most complex and difficult challenges that the world collectively faced. So, when the dreaded virus reached India, there was panic. Not only was there fear of a public health crisis but apprehension over a deluge of information, a lot of which was inadequate and incorrect. Misinformation about the pandemic was spreading rapidly. Sensing that it could escalate well out of their control, the government decided to harness the MyGov platform to set the record straight about COVID-19.

The MyGov portal has been the primary citizen engagement and participatory governance platform of the government for the past seven years. The website has an extended presence across social media platforms to supplement reach and has 70 million users (across platforms) who have visited the site over a billion times already. To further increase interactivity, MyGov has become active on messaging platforms, such as WhatsApp (37.5 million users) and Telegram (2.8 million users). To contain the panic and bring a sense of order, the team decided to deploy these assets to reach out to as many citizens as possible with correct and updated information. This would serve as a single point of information from the government about COVID-19.

The team mobilised action on multiple fronts simultaneously – new COVID-19 section on the website, myth-buster and fact check campaigns; information on government notifications; lockdowns; medical information and citizen contributions on COVID-appropriate practices. But that was not enough.

> People wanted to directly ask questions and get the information rather than searching on a portal or scouting for it elsewhere. We were inspired by the WHO chatbot and wanted to build a similar one, but on WhatsApp, which can answer people's queries. We spoke to WhatsApp and our partners Haptik. We launched the Corona Chatbot in just 5-6 days.
>
> **Abhishek Singh**
> CEO of MyGov

The team pulled out all the stops to get every piece of the puzzle together – information from multiple ministries (Health and Family Welfare, Ayush, Home Affairs, External Affairs, etc.), mobile numbers on which it would run, workflows aligned to questions, customisation, and the technology to be able to handle massive volumes. The result was astounding. Within two weeks of launch, they had topped 10 million users. Today the count stands at 39 million users. One of the key reasons for this massive response was language localisation. It started with English, followed by Hindi, and subsequently other regional languages were also added.

Experience is key

The interface was kept extremely simple. The conversation starts with users greeting the chatbot with a "Namaste". In response, the information menu is provided, along with a numeric code against each. Users message the number corresponding to the information they need, and the conversation gets going. You can get a wide range of information such as COVID-19 vaccination, government updates, professional advice on improving immunity through Ayush and yoga, Corona symptoms and where to get help. But even this was not enough, and the tough got even more innovative.

The chatbot was trained to intelligently accommodate queries other than the standard menu and even respond appropriately. So to the message "is Hindi available", the chatbot recognises 'Hindi' and automatically changes the language and provides the menu in Hindi to continue the conversation. As another example, to the message 'how many doses to take?', the chatbot understands the keyword set to give an appropriate answer. If no keyword is recognised, additional questions will be asked for clarity to progress the interaction.

We had to cater to different kinds of users who would not necessarily follow the menu-driven workflow. So what would happen if someone posted a question like 'Is Hindi available?' or just types in 'vaccination centre - Abhishek Singh, CEO of MyGov

The AI engine is being continuously trained to improve responses to questions. Every question that it does not understand – irrespective of construct and language – is looked into, mapped to the database of answers from the health ministry, so that the chatbot can give more relevant and appropriate responses. Being API driven, changes and updates to it happen dynamically. Hosted on AWS servers, it connects to the backend through Haptik's web SDKs to pull data from multiple sources with adequate authorisation.

If it works well, make it work better

By now the confidence of the team was high. The success of the WhatsApp chatbot was replicated as the Saathi Chatbot on the MyGov.in website, which could converse in English and Hindi.

> The Saathi Chatbot for the website was meant to cater to people who were not using WhatsApp and were coming directly to our portal. Now the same experience could be provided to users, where the conversation could be menu-driven or question-driven. The same API driven content was made available seamlessly across both the platforms.
>
> **Abhishek Singh**
> CEO of MyGov

In fact, it worked so well that it was integrated through API interfaces with other government channels, such as 13 state COVID-19 bots, the Ministry of Health and Family Welfare website, and the Arogya Set app, as well as other social media channels (such as Facebook Messenger and Google Maps). If you are on Google Maps and search for MyGov, a button will pop up with which you can initiate a conversation with the chatbot. Each of these solutions is using different AI engines in a seamlessly integrated way.

What is next?

Expand, grow, and proliferate. Expand availability to beyond the 13 state chatbots and languages to include the whole country. Increase the user base by improving responsiveness, data accuracy, and information segments. Proliferate interfaces to as many digital platforms as possible beyond the current including WhatsApp, Facebook, Google and Koo, to name a few.

COVID-19 is constantly changing the game, and information has never been more vital in the fight against the pandemic. Constantly being updated with scientific facts and certified data is an ongoing activity. MyGov's versatility and efficacy to address the spread of misinformation forms a crucial element in India's ensuing fight against COVID-19.

Telangana State Government: Averting stampedes through efficient crowd monitoring

The Telangana police has successfully used the Crowd Estimation and Management tool to effectively manage crowds at the India vs West Indies T20 match in Hyderabad in 2019 and the Medaram Jatara Festival in 2020.

India is a land of diverse cultures and festivals are an inherent part of the cultural fabric of this nation. While they bring with them much fanfare and joy, festive gatherings usually teem with crowds that are often difficult to control. The inability to manage tens of thousands of people leads to accidents, and in extreme cases, stampedes and mass casualties.

Maintaining law and order is a critical aspect of governance, and technology is necessary to manage huge crowds with ease. The Emerging Technologies Wing' under the Information Technology, Electronics and Communications Department (ITE & C) aims to resolve this challenge through the first-of-its-kind dedicated initiative. Under its umbrella falls the vision to develop a conducive ecosystem for emerging technologies in Telangana. The idea is to leverage emerging technologies to enable better governance and improve citizen service delivery.

Consequently, the Telangana AI Mission (T-AIM) was established to undertake the implementation.

Over the past two years, the ITE & CE department has worked extensively across technologies, including AI, blockchain, drones, cloud, cybersecurity, and e-waste. In fact, 2020 was declared as the 'Year of AI' in Telangana, to accelerate the state's AI innovation ecosystem. The state-specific AI framework was released in June 2020, to identify the required initiatives for ecosystem development.

Delving deeper into the problem

Picture this - close to 11 crore people visit the city of Haridwar during the Kumbh Mela. This statistic is almost twice the population of the United Kingdom, and more than four times the population of Australia.

Similarly, in Mumbai, more than 20 lakh people participate in the Ganpati Visarjan every year. That is not all - more than a crore people from six states attend the Medaram Jathara in Telangana.
The situation is unmanageable, to say the least - it is not possible to predict the number of people based on the images, leave alone maintaining constant vigil. Moreover, it is hard to predict erratic crowd behaviour, and at the same time, difficult to uniformly deploy manpower, as crowd densities fluctuate over time. Plus, there is evidence to prove that unmanaged crowds often get agitated and pose safety threats, especially in the form of stampedes.

From a list of 400+ start-ups, Awiros was selected by the Telangana government for implementing AI applications in the state. The start-up has developed an array of AI-based applications for better governance and safety of citizens, the first of which was an AI-based crowd estimation and management

application. They have developed the world's first operating system for the deployment and management of video AI apps. In due course of time, they have worked with the Telangana government on several large-scale projects.

Today, their solution caters largely to the police departments.

> The Telangana police have used it effectively to manage crowds at the India vs West Indies T20 match in Hyderabad in 2019 as well as the Medaram Jatara Festival in 2020.

Cracking the crowd conundrum

Here is how the problem is solved, using a step-by-step procedure. To begin with, there is estimation of large crowds, moving on to the prediction of crowd density, and identification of bottlenecks, all using deep learning. The videos are first analysed using surveillance cameras, after which the analysis of crowd variation is assessed. Last but not the least, the areas of high crowding probability are identified. Thereafter, action is taken through strategies such as manpower deployment and public announcement. There is also rerouting crowds to less crowded areas.

The solution is the first application of its kind that can estimate crowd densities in real-time using surveillance cameras. Not only does this help the authorities detect the problem, but also tracks the variation in crowd density in an area to facilitate corrective measures so that untoward incidents are averted.

Let us get a better understanding of the solution. It uses camera feed from a network of surveillance cameras. The video stream is fetched from the Video Management System (VMS) server and then analysed using Awiros Video Intelligence Engyn that runs on the Awiros operating system.

Using a state-of-the-art deep learning-based object classifier, human figures are identified in the camera frame to count the number. This helps determine crowd density. In case this parameter exceeds the threshold defined by the user, alerts are sent out. This solution is versatile and can be deployed On-Premises, Cloud, and Edge+ Central configurations. It can be integrated with every component of a surveillance infrastructure, including Video Management Systems (VMSs) and Integrated Command and Control Centre (ICCC).

A few minor challenges

As with everything, there are slight technical challenges in its functioning. A case in point is the India vs West Indies T20 match, during which the app was deployed on a PTZ camera positioned on the east-side stand in the stadium. The camera was then rotated to focus on each of the spectators' stands in the stadium, one after the other. Every single time, the app was used to estimate the number of people present in the stands. These estimations were then added to figure out a final count of the total number of people in the stadium during the duration of the match. Despite this, a crowd of 25,000+ was estimated in the stadium, with an accuracy of 93%.

Similarly, at Medaram Jatara, Awiros AI-based Crowd Estimation and Management System, was installed on three different cameras on the premises, to estimate crowd densities and track variation in crowd densities in real-time, throughout the duration of the festival.

The impact and scale of this solution is huge, and can be compared through these numbers. Although only three cameras were used through AI, the standard monitoring used 12,000 police personnel, 350 CCTV cameras, 20 special cameras, and more.

All in all, this one-of-a-kind solution holds a competitive advantage like no other. It can estimate crowd densities in real-time, generate information and alerts both on desktop and mobile, and boast high compatibility. Last but not the least, given the adequate infrastructure, the same solution can be scaled for any number of video feeds.

Managing crowds effectively has been a pain point for law enforcement officials for long. Fortunately, this solution makes it a breeze!

FEATURED STORIES

SPECIAL MENTIONS

INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY
HYDERABAD

Matchday AI: Striking the perfect shot with automated data capture

Matchday.ai provides high-tech computer vision and AI-based solutions catered to broadcasters, pro athletes, semi-professional and amateur athletes, and sports teams/ franchisees.

A few things can beat the pure, unadulterated joy of watching a sports tournament live. The stadium reverberates with the sounds of loud cheering by fans, which fuels the motivation of players. However, performing well under such circumstances is not an easy task. Even otherwise, no match comes with a one-size-fits-all guide that helps players navigate challenges. In such cases, having deep data insights can help assess the situation better, and work on shortcomings in the future.

This is a principle on which Matchday AI works on. They are a sports visual tracking technology company that uses AI to automatically mine deep data from sports videos in real-time. Their technology has already created revolutionary inroads in badminton, and there is a lot that is in store with regard to cricket and football.

The start-up's technology is partly licensed from and validated by the International Institute of Information Technology, Hyderabad (IIIT-H), one of the most reputed universities, which features amongst the top three in Asia for AI research. What's more, they work with some top-of-the-line clientele, including Star Sports and the Pullela Gopichand Academy in Bengaluru.

Matchday AI revolves around automating data collection and video tagging in sports using both AI and computer vision technology. It is robust, done in real-time, and automated, and requires no wearables. With these attributes, it specifically caters to sports producers and athletes of all levels.

How did it all begin?

It was in 2019 that IIIT-H's Centre for Visual Information Technology generated interest from someone associated with a well-known sports broadcasting company. The next step was to assess the badminton analytics model. Although badminton comes next only to cricket, it has largely been viewed as a recreational sport. Fortunately, it has been viewed through a different lens, thanks to the likes of global favourites, such as Saina Nehwal and PV Sindhu.

Surprisingly, there is hardly any data that delves deep into their performance. Of course, there is a high reliance on coach-recommended techniques, but what about the details that can only be found through new-age technologies, such as AI? That is exactly how Matchday AI decided to use its capabilities and explore possibilities through its machine learning techniques.

Identifying problem areas

The idea was also to work on certain problem areas that were identified. The first question was, "What is the cost of winning/losing in top tier sports?". The cost of relegation is US$ 100 million, and it is safe to say that cost cannot be encapsulated by a number.

Second, what are the athletes doing to gain a competitive edge? They are turning towards data to gain a competitive edge. The market is growing at 26% CAGR from US$ 1 billion to US$ 4.5 billion, and performance analytics is one of the fastest-growing segments. However, the pain point here is that data collection in sports is primitive and has its problems.

With the help of AI, Matchday AI has charted out a step-by-step process to tackle the challenge. It includes object identification, location estimation, and action identification in a video. The current process is inaccurate, limited in approach, and taxing.

Research to start-up: The journey

A method was devised to analyse badminton broadcast videos. This was done by tracking players, assessing shots, and generating data to know other details that could provide a competitive edge. The pilot was first tested during the semi-final match of the Premier Badminton League (PBL). The results were impressive, to say the least - they did not just focus on improving user experience, but also on the performance of sportspersons.

This project was carried out under the jurisdiction of Product Labs. The idea was to bring alive products by way of carrying out intensive research. Harshvardhan Kommana, the co-founder of Matchday AI, was the first employee of Product Labs. At that point, he was a fresh MBA graduate from Babson's College, US. Only a few months later, Ganesh Yaparia, a student at IIIT-H reached out to Product Labs with a similar proposition, but the game was football. The sensibilities matched and that is how the two got together to form Matchday AI.

At Product Labs, technology focused lab research work, market and feasibility study, early prototyping, and pilot with potential customers such a Star Sports is carried out. The next step is to gather market feedback using existing prototypes, tweaking tech per market feedback, building product casing to make tech usable, and lastly, converting pilot into paid customers.

There are several advantages that start-ups can receive through this. It provides strong credibility, especially for deep tech companies. It also leads to early validation and revenue, and provides a technology base to build upon for research. Moreover, it offers continued market access.

Impact and scale

Moreover, its role from a broadcasting solution to a coaching one has also helped Matchday AI evolve the structure in certain ways. For instance, there was the inclusion of five-shot categories earlier, including smash, drop, forehand, backhand, and the serve. At the request of the Gopichand academy, an analysis of over 30 categories was carried out. Today, the solution offers several components - a fixed camera, a model that connects the camera as well as a processing unit to receive the video. In addition, the statistics are displayed on the smartphones of coaches and even players.

This solution is scalable to any sporting arena through Smart Courts. These courts are regular playing fields fitted with specialised hardware, with the feed being processed by certain algorithms to automatically capture match data and generate valuable outputs.

At present, they do generate revenue, but they do not have a steady stream. They are associated with Gopichand's Academy as well as Prakash Padukone's. However, due to the pandemic, things have been quite hit.

Minus Zero: Building AI that drives like an Indian on Indian roads

In the short span of a year, the company has already developed several patentable proprietary technologies, getting closer to the dream of putting an autonomous car on Indian roads. It aims to achieve Level 5 autonomy by 2023, in partnership with an automotive OEM.

In April 2021, a self-driving prototype of a rickshaw was tested on a public road in Jalandhar. The video uploaded on YouTube, showed the e-rickshaw, along with a safety driver, making impressive manoeuvres as it navigated through the chaos that Indian roads are known for. This was the first manifestation of the dream of a young AI techie from Punjab – Gagandeep Reehal.

The 21-year-old Gagandeep is a young man of many interests. Already a published author, AI researcher and entrepreneur, this second-year engineering student is leading a transformation for the Indian mobility sector. "I envision a future where everyone is using autonomous electric vehicles in India like they currently use cabs," he says.

> In most other countries, such as the US and the UK, there is rule-based driving. Indian roads present a unique challenge as there are no lane markings, no one follows rules and everything from vehicles to animals can be encountered anytime, anywhere.
>
> **Gagandeep Reehal**
> Co-Founder & CEO, Minus Zero

At 1.35 million each year, the number of accidents that Indian roads witness is the highest in the world. "The major reason for these accidents is human error. Therefore, self-driving is much safer as it removes the human negligence from the equation completely." Gagan argues that self-driving is a strong need of the hour and can no longer be considered a futuristic technology.

Together with an old school mate Gursimran Kalra, Gagan co-founded Minus Zero in 2020. This start-up is now working towards building level 5 autonomy for unstructured Indian roads.

There is no doubt that Indian roads are the ultimate litmus test for self-driving technology.

A research paper that inspired the idea

Minus Zero's self-driving tech was born out of a research paper that Gagan was writing about AI algorithms that are less dependent on data. "How much data can you keep collecting? How many million miles worth of data is it possible to collect for self-driving? Waymo has collected 20 million miles, Cruise has collected two million miles, and Tesla has collected over two billion miles."

> The main problem with LiDAR sensors is high cost – each sensor costs INR 8-9 lakh, making it unaffordable for an average customer. We use camera images in our tech. The only other company in the world using this approach is Tesla.
>
> **Gagandeep Reehal**
> Co-Founder & CEO, Minus Zero

The start-up's AI model is not data hungry. It takes its driving decision much like a human driver. "You do not need to show thousands of images of a bird to a baby to teach them what a bird looks like. Similarly, our algorithms do not need so much data to learn." Their nature-inspired AI simulates human-like driving aesthetics.

Apart from solving the data and the unstructured traffic problems for India, there is another problem that Minus Zero seeks to solve. That is related to the expensive LiDAR sensors that are most commonly used in autonomous vehicles.

An autonomous driving future for India

Minus Zero envisions a culture of shared mobility for Indians to tackle the rising cost of owning a private car. In the short span of a year, the company has already developed several patentable proprietary technologies, getting closer to the dream of putting an autonomous car on Indian roads. It aims to achieve level 5 autonomy by 2023, in partnership with an automotive OEM.

Our business model is based on the premise that if humans are at all involved in the mobility chain, the scope for making errors, with the option to effectively over-ride any analytics-based solution, will continue to exist. Hence, we believe that a machine well-trained to handle these tasks in only the right manner is the way forward to make cities a better place to live. This will help us emerge out of the present mobility arrangement. This has essentially remained unchanged for more than a century, thereby begging of us to not improve upon it with analytics but to take it through an evolution - Gagan
The environmental concerns build a compelling case for shared electric vehicles (EVs). While the pollution from ICE vehicles will decrease, the crumbling public transport system will also be aided. Therefore, smart mobility paves the way for smarter and greener cities in India.

With a talented team of 25+ members, we aim to build fully autonomous electric vehicles that are extremely affordable, suited for unstructured Indian roads, require less computational power, and are not dependent on an expensive LiDAR technology - Co-founder

Speedbreakers in the journey

Gagan believes that academic knowledge is incomplete unless applied to a real-world setting to solve a practical problem. Even as a young boy, he had been encouraged by his mother to expand the scope of his learning beyond textbooks. "Most of what I know has been acquired through self-learning – reading books and watching videos. I was able to code by class 5. Then I got into engineering and realised that my particular interest lies in AI."

However, the going was not always so smooth for this resolute boy. Facing his fair share of hardships, he has had to forego an offer of admission to Oxford University because he was unable to secure a scholarship. None of this has dented his drive, however, and he continues to move the needle of innovation.

If the success of AI is to be measured by its ability to solve socio-economic challenges, India is the best testing ground. The innumerable challenges that are unique to this diverse nation provide ample opportunity to innovators, entrepreneurs, and technologists working in the AI space. All one needs is a keen eye to identify a solvable problem. Look carefully around you – can you spot any?

INNOVATOR USE CASES

MANUFACTURING & INDUSTRIAL AUTOMOTIVE

Tiger Analytics

ML-powered digital twin streamlines predictive equipment maintenance

Use case overview

The maintenance process relied on pre-planned maintenance activities at periodic intervals. This involves operators shutting down machines according to the maintenance schedule to carry out routine maintenance and repair. This resulted in an inability to effectively address unexpected breakdowns and high costs (because of expensive part replacements). Tiger Analytics' AI and ML-driven solution helps improve machines' reliability on the shop floor, which in turn saves maintenance cost.

Beneficiaries: Blast Furnace Reliability team and Tata Steel Jamshedpur

Problem identification

Detailed view of the opportunity

» Operator-driven manual inspections were usually carried out with the help of a few models for anomaly detection.
» Individual model maintenance was required.
» No standardised framework made it an analyst-dependent solution.

Solution innovation

Description of proposed solution

» Develop an AI and ML-driven solution to help improve machines' reliability on the shop floor.
» Send proactive GUI alerts to maintenance operations.

Role of AI and technical specifications

» ML-based models help identify and flag anomalies.
» AI enables model monitoring; semi-automated retraining is a must

Challenges and known risks

» Data inadequacies
» Missing sensors
» Broken pipelines

Impact and scale

Impact metrics and solution scalability

» Tiger Analytics' solution has so far resulted in a saving of **US$ 2.75 million (~INR 20 cr)** in terms of cost of maintenance saved and production loss averted.
» It follows a transparent approach, with no dependency on external IPs and solutions.
» The solution uses a model monitoring and semi-automated retraining framework.
» On-demand future upgrade is possible due to open design concepts.

BFSI

Wright Research

Machine learning driven investment solutions

Use case overview

Wright Research enables investors to find best investments across market factors, time horizons, and asset classes through cutting-edge AI and data science-based research in investing. The company's solution also strives to grow client capital in a stable and risk-controlled way.

Beneficiaries: Retail investor portfolio

Problem identification

Detailed view of the opportunity

- With increasing awareness of quantitative finance and markets in India, investors know many opportunities that can help them achieve their goals. Making the best out of these opportunities requires a dynamic, data-driven approach, focusing on risk management and market regime identification.
- Providing an optimal portfolio with a balance between risk, returns, and cost is quite important.

Solution innovation

Description of proposed solution

- The proposed investment solution is risk-controlled and can consistently achieve stable returns by tapping opportunities hidden in various parts of the market.
- Traditional and AI-powered sentiment and alternative data is used as inputs. Complex models are used to gauge market risks and regimes.
- The solution's optimal portfolios use multiple weak indicators of returns and combines it to a strong portfolio to create a more robust indicator using ML. The modelling framework for portfolios is quite nuanced, where a balance between risk, rewards, and cost is tried to be attained.

Role of AI and technical specifications

- The solution has a three-layered design − structured and unstructured data processing, risk and return modelling using ML, and optimal portfolio construction.
- The proposed model is set up on the cloud with a Python-Django-based fully integrated website and research notebooks. In addition, it uses multiple frameworks, such as vectorised and event based, to validate investment thesis on 20 years of data.
- The AI pipeline uses deep neural networks, hidden Markov models, and boosting/bagging techniques on thousands of data points to create live portfolios

Challenges and known risks

- Getting robust datasets and processing unstructured data; optimising ML pipelines using multiple iterations for speed; out of sample validation and live performance attribution

Impact and scale

Impact metrics and solution scalability

- The company has two types of ML-powered products live in the production set up. The first one, long-only portfolio, has grown from INR 1 crore to INR 21 crore in one year, with 1,500 active retail investors and 95% return in 22 months. The second one, long-short portfolios, has validated ML-based thesis out of a sample and is exhibiting strong performance.
- Moreover, the company's subscribers have increased 10x in a year and AUM has grown 30x.

EDUCATION

Devnagri

Transition at scale

Use case overview

A major part of Indian population does not understand English due to lack of accessibility and awareness of resources. To make the matters worse, only 0.1% content is available in local languages.

Devnagri's Neural Machine Translation (NMT) helps people understand the context by translating it to Indian languages using the best out of both machine translation and professional translation.

Beneficiaries: Embibe

Problem identification

Detailed view of the opportunity

- About 90% Indian population does not understand English due to limited accessibility and awareness of resources.
- In a few years, India will have more than 1 billion internet users who do not understand English.
- However, only 0.1% content is available in local languages on internet.

Solution innovation

Description of proposed solution

- Build Neural machine Translation (NMT) in Indian languages i.e., converting content on internet into Indian languages.
- Use a technique that helps avoid the problem of having a lot of data for the lift off for NMT.
- Train the machine on context added by humans that helps in speeding up translations.

Role of AI and technical specifications

- Devnagri Machine Translation (DMT) uses an AI-powered workflow to increase the efficiency and accuracy of the translation process.
- It also uses hybrid model Natural Language Processing and a combination of other ML techniques to power translations.
- It tries to maximise the number of words processed, aiming to control operation cost and reduce the number of words at every step of the production chain.

Challenges and known risks

- Data availability
- Translator availability
- Belief of businesses that localisation is a necessity

Impact and scale

Impact metrics and solution scalability

- NLT converted about 30 million words in its first year of launch and 300 million of parallel corpora by end of the latest year.
- About 5,000 translators check the accuracy of corpora being collected by Devnagri, using only 10% of the total capacity.
- Devnagri is ready with its own machine translation engines in 14 Indian languages.
- AI and human model lead to a higher accuracy.

HEALTHCARE & LIFE SCIENCES

Wipro Limited

AI-assisted drug repurposing

Use case overview

The success rate for drug approval is quite low despite huge investments in cost and time. Many drugs, even those from major public health organisations, sometimes fail in the clinical trial stages. Wipro has built an Artificial Intelligence (AI) model that advances the drug repurposing process by increasing the success rate of drug approval using Machine Learning (ML) based therapeutic pairing.

Beneficiaries: Pharmaceutical companies and research labs

Problem identification

Detailed view of the opportunity

- The success rate of the drug repurposing process is just 9%. On an average, it takes 10 years for a drug to enter the market, starting from the discovery stage. This results in increased R&D costs, leading pharma companies to develop drugs only for specific diseases to generate business. Consequently, there is an increase in drug and healthcare costs, making a vast societal impact.
- A solution that identifies biological compounds and clinical factors using AI algorithms, and uses ML-based approach for protein/gene level analysis, can reduce timelines for the drug approval.

Solution innovation

Description of proposed solution

- Developed an AI-based algorithm to identify compounds from drug repository, using data mining and Natural Language Processing (NLP) techniques.
- Used a ranking mechanism to identify and validate candidates for drug repurposing; sent top drugs for approval.

Role of AI and technical specifications

- Data incudes many complex parameters. Hence, an analytics-based solution does not suffice. ML and deep learning based systems are essential to identify right correlations between drugs and diseases.
- Deep learning approaches are used to create a hierarchy of identified drugs, and for holistic evaluation of drug efficacy. This requires an understanding of drug protein and target protein interactions. The drug ranking is then refined by evaluating the molecular structural compatibility of drugs and the target.

Challenges and known risks

- Availability and accessibility of data for a variety of diseases has been a challenge. Unstructured data from journals, various databases, and online resources had to be pre-processed and cleaned for modelling.
- Genome sequence is quite complex, consisting of more than 30,000 nucleotides per sequence. Using deep learning methods to analyse the sequence is a challenging task.

Impact and scale

Impact metrics and solution scalability

- Success rates (from 9% to 40%) are higher as the algorithm focuses on protein-level interactions and 20 other factors related to the drug's effect on a disease.
- The time taken to launch a drug reduced from 10 years to 1-2 years.
- New drug-disease associations are discovered and molecules and proteins are identified to prevent the entry and replications of viral RNA.
- Identifying the most applicable drugs useful for a specific viral outbreak. This helps pharma companies develop antiviral therapeutics against epidemics such as SARS-CoV-2 and other strains.
- Cost reduced drastically by creating a platform for specific target category of diseases/pathogens.

HEALTHCARE & LIFE SCIENCES

In-Med Prognostics Pvt Ltd

Volumetric analysis of the brain

Use case overview

A volumetric analysis of brain MRI images is a crucial step in the assessment of neurological disorders. However, at present, the assessment is done via eyeballing and manual segmentation, which is time consuming. In-Med Prognostics has developed an AI-based algorithm, which uses 3D medical image processing techniques and deep learning to automate the segmentation of brain structures and calculate their volumes using pixel information.

Beneficiaries: Patients suffering from various neurological and psychiatric disorders, their caregivers, and Indian physicians

Problem identification

Detailed view of the opportunity

- India has a few registered neurologists to cater to more than 30 million patients with neuro disorders. The number of patients with dementia, Parkinson's disease, strokes, and other age-linked diseases is expected to increase exponentially. Therefore, moving brain health into the preventative space is key.
- At present, manual segmentation of brain MRI images is done for the assessment of neurological diseases. This method can be subjective and have poor reproducibility. A tool that provides fast, accurate, and objective analysis of brain MRI images can act as a clinical decision support tool for neuro physicians.

Solution innovation

Description of proposed solution

- NeuroShield is provided as a web-based application to customers. The tool is an automated quantifying analytics tool/cloud platform, where brain MRI scans are uploaded, and the data is harmonised and pre-processed. The algorithm then gives the segmentation of the brain structure, which is used to calculate volumes of structures and generate a report.

Role of AI and technical specifications

- The tool uses 3D brain MRI images and calculates volumes and atrophy percentages, and identifies patterns in comparison with its proprietary Indian reference ranges.
- The algorithm is developed using deep nets and trained to identify specific features and extract them from 3D MRIs of the brain using NVIDAs GPU. The complete solution is deployed on cloud and integrated seamlessly with a hospital's radiology department.
- Python-based deep learning framework is used to develop, test, and validate algorithms.

Challenges and known risks

- Due to multiple vendors and different MRI field strengths, the inherent characteristics of datasets from different machines are to be considered and neutralised without affecting image quality.
- The images, being 3D in nature and having different resolutions/matrices, require special pre-processing before training.

Impact and scale

Impact metrics and solution scalability

- NeuroShield has two deployment platform options − a web-based portal hosted on AWS and a cross-platform application installed on Windows, MacOS, or Linux.
- The algorithm can reduce the time taken for segmentation and provides a decision support system (backed by robust and accurate predictions and calculations) for neurologists.
- Additionally, the cost structure makes it affordable and accessible to everyone.

TRANSPORT & LOGISTICS

Locus.sh

Shipment sorting with augmented geocoding

Use case overview

Geocoding is critical in logistics but expensive and challenging. Companies such as Amazon.in delivers about 4.5 lakh shipments every day. These shipments cost INR 1.64 lakh per day in geocoding only. Locus.sh came up with an augmented geocoding engine that can geocode addresses, with faster shipment and at a lower cost, in India.

Beneficiaries: Bluedart and Myntra

Problem identification

Detailed view of the opportunity

- Geocoding is critical in logistics but expensive.
- United States Postal Service attributes UD$ 1.6B cost to undelivered mails every year.
- Geocoding is especially challenging in developing countries.

Solution innovation

Description of proposed solution

- Augmented a geocoding engine that can geocode addresses in India.
- Reduced cost of geocoding
- Enabled faster shipment sorting (auto sort).

Role of AI and technical specifications

- Uses Natural Language Processing and recurrent neural networks to map human inputs to GPS data.
- The model is trained in AWS GPU clusters.
- Uses a linear chain conditional random field (CRF) for PREMISES, LOCALITY, CITY, PIN CODE, and STATE.

Challenges and known risks

- Pre-trained language models cannot be used as addresses do not adhere to any human language and consist of a sparse vocabulary.
- Synchronisation and validation of the multiple sources of time series data to build the input ground truth.
- Execution data does not match with the ground reality. For example, incorrect GPS input (considered as device error) or delivery executives inaccurately marking completion (considered as human error).
- Feedback to AI models is essential but decoupling from product servers is critical.

Impact and scale

Impact metrics and solution scalability

- About 537 million parcels sorted and 1,158 million kilometers reduced.
- US$ 1.17B saved in logistics costs.
- Nearly 426 million Kg CO2 GHG reduced.
- About 55% of Locus powered deliveries in Bangalore rely on our augmented geocoding.

RETAIL & CPG

Streamoid

Domain optimised AI styling recommendations

Use case overview

A styling knowledge-based AI recommendation system needs to be built that is optimised for brands, styles, trends, and business goals to solve the cold start problem faced in retail and personalisation at scale.

Beneficiaries: Aditya Birla Fashion Retail Ltd.

Problem identification

Detailed view of the opportunity

» Good merchandising strategies are not efficient.
» Relevancy of recommendations needs to be improved.
» 1:1 personalised styling options are limited.

Solution innovation

Description of proposed solution

» Provides multiple outfits recommendation for each product.
» Auto-generates style notes for products and smart pairing of complementary products.
» Faceted search using product attributes.
» Offers the "For You" page for logged in shoppers (personalised styling).

Role of AI and technical specifications

» Acts as a hybrid AI engine that uses both rules and models. Using automated style extraction, the engine is optimised for each retailer based on catalogue images.
» Auto tagging reduces data quality check time by 70-80%.
» Built a vast taxonomy for fashion to understand the catalogue better. Use computer vision (basic tenet of AI) to extract image attribution with a high accuracy.

Challenges and known risks

» Using minimal data (which is publicly available) to train ML models causes complexity as large-scale datasets are in the order of million and not affordable.
» Domain adaption is a big problem as fashion changes with time and no two retailers adopt the same kind of styles. This creates a unique problem for creating generalized models that work across multiple retailers.

Impact and scale

Impact metrics and solution scalability

» A human stylist can create 250-300 outfits in a day, while Streamoid's AI stylists can curate 54,000 outfits in an hour with an easy-to-scale solution.
» PDP (product detail page) views increased by 30% and clickthrough rate (CTRs) by 10%.
» Sales conversions went up 3X.

AGRICULTURE

SatSure Analytics India Private Limited

SatSure Cygnus

Use case overview

During the monsoon season, the cloud cover significantly reduces the area available for the analysis of any agricultural monitoring. SatSure Cygnus has developed a unique Generative Adversarial Network (GAN) model for the reconstruction of the Sentinel-1 synthetic aperture radar (SAR) image data to optical and multispectral Sentinel-2 data. This helps create a synthetic satellite imagery to do data gap filling for crop monitoring.

Beneficiaries: Agriculture and insurance sectors

Problem identification

Detailed view of the opportunity

» Although there are more than 300 active, earth-imaging satellites, the optical satellite imagery has challenges around the affordability and revisit time. Cloud cover during the monsoon season poses a challenge of visibility through satellites for crop monitoring. Even though SAR data serves as an alternative to manage the visibility issue, frequency is low. Moreover, its interpretability is complex and sparse.

» An all-weather optical satellite imagery source with higher frequency, can overcome the challenge of visibility through synthetic optical image generation from a SAR image.

Solution innovation

Description of proposed solution

» A unique Generative Adversarial Network (GAN) model has been developed.

» Sentinel-1, Sentinel-2, and Landsat-8 satellite imagery (which is publicly available) were downloaded from their respective data providers and stored in cloud storage for ingestion during training and subsequent use.

» The deep learning model (written in Python) was custom built by SatSure and trained on a virtual machine using NVIDIA GPUs on Oracle cloud infrastructure. The service is available on the SatSure Sparta platform.

Role of AI and technical specifications

» This deep learning approach processes data from two polarisation datasets of Sentinel-1 SAR data and converts them into the R, G, B, NIR, and SWIR bands. These bands are essential to undertake complex crop modeling work, such as AI-driven yield estimation, crop growth modeling, and crop identification.

» The synthetic data output is at the single spatial resolution of 10 meters, same as an original Sentinel-2 image. Hence, without launching any additional satellites, the frequency of agricultural monitoring can be increased from weekly to three times a week anywhere in the world.

Challenges and known risks

» About 2 years' worth of data (~1.5 TB) were downloaded and processed.

» Although a few research papers exist on the subject, they were not designed to provide accurate image reconstruction at a commercial scale.

Impact and scale

Impact metrics and solution scalability

» SatSure Cygnus eliminates the need to deploy more satellite infrastructure to get optical and cloud-free multi-spectral satellite imagery, by providing revisit three times a week anywhere on the globe. For the revisit, they use public satellite image datasets and deep learning.

» The final product revolutionises all-season crop monitoring, especially in the rainy season and developing countries, by reducing the cost of access of services by an order of magnitude of 10^6.

AI FOR ENABLING CONTACTLESS WORLD

AuthBridge Research Services

AuthDKYC

Use case overview

As COVID-19 restricted on-ground verifications, non-digital KYC processes caused application process delays, heavy spends on resources, and exposed employees to risks. Information collection inaccuracy and no recording of an executive visit in the absence of physical workspaces also became a cause of concern. AuthBridge's non-assisted Digital KYC emerged as an alternative, providing a cost-efficient, compliant, and faster customer onboarding and KYC.

Beneficiaries: Wherever there is a need to verify customers, vendors, partners, or employees

Problem identification

Detailed view of the opportunity

- AuthDKYC is a mobile-first solution to verify employees, customers, and vendor partners digitally to reduce keystroke time, cost, and human effort without having to rely on physical customer meetings.
- This solution is especially relevant during a pandemic to continue business as usual without putting our people and clients, and their stakeholders at risk.
- It is a paperless, anytime, and anywhere KYC product for remote authentication and onboarding of employees, customers, and vendor partners within the constantly changing bounds of regulatory compliance.

Solution innovation

Description of proposed solution

- AuthDKYC overcomes limitations (such as non-legible PDF/images, manual, long, and error-prone comparison of photo images to a real person) of analytics-based solutions using smart document classification for accurate extraction of NID details via OCR.
- The solution then verifies these details in real time and extracts the face from any photo ID to match with the selfie/photo of the user to detect impersonation frauds.
- It also does liveness detection of a person and eliminates the probability of identity frauds.
- Moreover, the solution performs digital address verification via geo-coordinate triangulation and Aadhaar or digital eSign.

Role of AI and technical specifications

- The solution is a combination of integrated API verifications, combined with AI elements for liveness detection, document classification, data extraction, face detection, face matching, and distance variance analysis for accurate and remote customer identification.
- AuthDKYC's infrastructure uses dockers and GIT version control. The platform is built on Python using ML, neural networks, Natural Language Processing, and computer vision.

Challenges and known risks

- Data gathering from a range of sources, especially from DLs, was a major challenge as the format varies for various states, apart from electronic chip DLs.
- Image pre-processing and extractions are difficult due to the small size of user's photo in the national ID.
- Data augmentation and text processing also posed some roadblocks.

Impact and scale

Impact metrics and solution scalability

- Seamless customer experience with an integrable proof of identity (PoI) and a proof of address (PoA) check made possible; cost reduced by 70-80%.
- Application processing turnaround time reduced by 90%, with instant servicing of KYC requests.
- Process transparency and accuracy increased, with up to 10x faster onboarding.

AI ADOPTERS

ICICI Bank

AI document cognitive solution

Use case overview

The bank's retail liabilities operations group receives thousands of service requests every day from customers for their respective address change in records. For this, the bank has developed an AI-based platform, which is highly secure and containerised with the ability to support myriad requesting systems in the bank.

Beneficiaries: Retail liabilities operations group

Problem identification

Detailed view of the opportunity

- Retail operations group needs to process daily service requests for address changes; this poses a big challenge as it involves highly sensitive and confidential KYC documents.
- This process is prone to manual errors, which in turn can affect customer deliverables to the right address.
- Excel-based offline processing is time consuming, which may lead to customer dissatisfaction.

Solution innovation

Description of proposed solution

- The solution is embedded with a deep learning-based document classification to understand the KYC document's structure.
- It is a low-code platform to democratise an AI building model for tagging and training data by analysts (example: ROI tagging).
- In the proposed model, Azure Read OCR API extracts data only from the ROI marked by the AI engine. The address is bifurcated using the ML algorithm that understands nouns and segregates address from the names. Natural Language Processing algorithm is used to apply name matching and address matching.

Role of AI and technical specifications

- The solution is powered with AI classifier for document classification (YOLO v4 Architecture) and AI fuzzy matching logic for address matching.
- In addition, it is driven by computer vision for object detection (YOLO v4 model) and Natural Language Processing algorithms for named entity recognition. It also includes region of interest-based OCR extraction.

Challenges and known risks

- In the service requests, customers attach KYC documents with inconsistent scan quality.
- Unstructured characteristics prevail in the same type of KYC document across different customers. Example: driving licence (DL) has different formats for different states.
- Integrating various source channels is difficult.
- Incorrect orientation and non-uniformity of the content across a document.
- Similar looking KYC documents (example: RC copy versus DL) could be an issue.

Impact and scale

Impact metrics and solution scalability

- The application can process a volume as high as 1 lakh service requests per month and has a potential of yielding 325 percent in return on investment.
- It also helps save 36 hours of human effort per day in the processing of 3,000+ KYC documents and enhances customer experience as the application is enabled with batch processing and automatic mail shooting.
- The solution is containerised with Kubernetes orchestration to support scalability. It includes Representational State Transfer (REST) APIs for easy integration with other applications.

AI FOR COVID-19

DocketRun Tech Private Limited

DocketRun TRAQ-19

Use case overview

COVID-19 spreads with a high transmission probability, making it challenging for organisations in the contact-intensive business to manually maintain protocols. Through an AI-powered video analytics platform, DocketRun uses CCTV screening of these organisations to enforce appropriate behaviour. It also helps businesses lower the risk of non-compliance and improve monitoring adherence to SOPs to increase efficiencies, profitability, customer experience, and employee NPS.

Beneficiaries: Retail and manufacturing industries

Problem identification

Detailed view of the opportunity

- A person infected with COVID-19 can emit aerosols (infectious COVID-19 particles). These particles can float or drift around the air. Another person can breathe in these aerosols and become infected with virus. Safety measures, such as wearing a mask and maintaining social distancing can prevent the spread.
- It is critically important to abide by these safety measures to ensure employees' safety and maintain business resilience. However, a human eye cannot track a CCTV footage manually for mass screening.
- This scenario presents a need to assess violation of protocols and respond to it on a real-time basis.

Solution innovation

Description of proposed solution

- The solution uses an organisation's CCTV screening to undertake face attendance and temperature analysis of employees. In case of non-adherence, it raises real-time alerts with respective zone names. It also generates automated e-mails for violation summary and reports.
- Sanitisation heatmaps are produced. Crowd monitoring and cleanliness checks are carried out.
- Ward numbers, hospital records, patient profiles, bed availability, and quarantine centres are also traced.

Role of AI and technical specifications

- The proposed solution connects Real-Time Streaming Protocol (RTSP) feed to AI edge.
- It collects CCTV footage, creates first-time, hand-labelled dataset (4TB+), and undertakes auto-labelling to fine-tune the model.
- It generates remote auto updates (such as object detection, classification, and tracker) of the AI model.

Challenges and known risks

- Funds are unavailable to hold extra inventory to cutdown delivery timeline.
- Delayed device procurement is an issue.
- In-house integration and commissioning are complex.

Impact and scale

Impact metrics and solution scalability

- 735+ CCTV cameras made smarter using DocketRun AI; COVID-19 violations decreased by 30–35%.
- Eight partners/collaborations took place for co-creating/production.
- This model supports local governments that may lead to other huge and impactful opportunities.
- The solution is scalable with a faster response time, customisable SOPs, and a plug and play feature.

AI FOR COVID-19

Indegene Pvt Ltd

Intelligent safety suite

Use case overview

After the approval of the COVID vaccine, a pharma company has to report any adverse reactions of that to the health authorities worldwide. A significant increase in Adverse Event (AE) reporting, higher media scrutiny, and stringent regulatory requirements are currently posing challenges to the pharma industry. In such cases, Intelligent Safety Suite assists pharma companies by automating the processing of data on post-COVID-19 vaccine AEs.

Beneficiaries: Pharma and life sciences and PV case processing team for the COVID-19 vaccine

Problem identification

Detailed view of the opportunity

» Currently, pharma companies are busy processing adverse reactions to COVID-19 drugs and vaccines released. As more people are getting vaccinated, reaction instances are rising. To manage this sudden surge in cases, an increased human effort is needed to process these cases.

Solution innovation

Description of proposed solution

» Automates most of the case preparation work by analysing unstructured textual data to identify various parameters (such as adverse events, drug used, and concomitant drugs).

» Receives unstructured narrative material and responds with NER entities, along with the assertion of entities in the given context.

Role of AI and technical specifications

» Using deep learning models and addressing negations in the context, the solution uses AI to understand the medical context for entity extraction from content and automatically infer the relationship amongst entities. AI assists medical representatives in case processing by automatically capturing medical conditions, drugs, illness, etc., with great accuracy.

» These models have been trained using historical annotated data. As part of the data pipeline, the use case examined sentence construction trends, and developed a model based on LSTM-CRF to detect and extract named entities. This model is a deep neural network architecture implemented using the Tensorflow-Keras library programming language used in Python.

Challenges and known risks

» The amount of data available to train the AI system posed a big challenge. Aggregation of a medical procured data was a difficult task. Additionally, the unstructured language is a free text to the user who can use short hands, misspell words, or even employ negations.

» Another issue that arose throughout the model's development was data skewness. The majority of the class was under outside tag when referred to the Inside, Outside, and Beginning (IOB) format of data.

» Training data preparation was tedious as it required converting normal text data into the IOB format.

Impact and scale

Impact metrics and solution scalability

» Reduced time to process a single case from 60 minutes to 15 minutes.

» The model can be scaled up using latest MLOps techniques. It can also deploy models in multiple pods in Kubernetes clusters in the auto-scale mode to efficiently meet various concurrent requests.

AI FOR INCLUSION

Achala Health Services

Robot Assisted Elderly Care ("CHARLIE")

Use case overview

The elderly population is set to multiply in the next two decades. Hence, AI technologies can be used in the daily healthcare management of the geriatric age group. This use case involves designing, building, and operating robots powered by an AI- and IoT-based platform. The platform offers a range of personalised health care experiences, enabling elderly people to live in safer, healthier, and more engaging environments.

Beneficiaries: Geriatric population

Problem identification

Detailed view of the opportunity

» The elderly population may multiply three times in the 60+ age group and five times in the 80+ age group in the next two decades. A majority suffers from cognitive and mental health disorders, physical injuries, and chronic health conditions; about 15-20% of the people in this age group stay alone.
» This demographic shift opens opportunities for AI technologies in elders' daily healthcare management, as there is lack of geriatric centres in India and a large potential shortfall of healthcare workers.

Solution innovation

Description of proposed solution

» Robot Assisted Elderly Care makes homes smart for the elderly, by providing a range of personalised health care experiences, including IoT-enabled "Elderly Finder" with fall detection and emergency dials.
» The robots provide several services, such as health checks for body vitals, 24x7 doctor connect, prescription-based pill intake reminders and alerts, pill storage, refill notification, and one-touch order placement.
» Charlie, a multi-lingual voice assistant, assists with social connects and alerts, video conferences, social engagements and appropriate recommendations for diet, health, entertainment, etc.

Role of AI and technical specifications

» AI-based activity recommendation engine that adapts dynamically to the user's cognitive ability.
» Natural Language Processing-based companion interface with highly trained Natural Language Processing algorithms to mimic human-level interactions to engage the elder user and personality classifier (which learns user preferences and adapts its personality recommendations based on their mood, choice, and need).
» Dynamic navigational module that is highly customised for the Indian indoor settings and uses AI-based depth cameras for obstacle avoidance and object recognition; AI-powered bio sensors with a single-touch, multi-vital recorder technology.

Challenges and known risks

» Integration of multiple vital sensors and their clinical validation
» Eligibility of appropriate suppliers with the right regulatory certifications.
» Designing user experience for a technologically challenged elderly population.
» Limited resources of training data and using existing datasets and assessment scales.
» Gathering validation from various geriatricians and psychiatrists to bring out an extensive elderly care model.
» Gathering various geriatricians and psychiatrist's validations to bring out an extensive elderly care model.

Impact and scale

Impact metrics and solution scalability

» Can improve and maintain physical, mental, and cognitive health of chronic patients and elderly.
» Provides an INR 150 crore scalable business opportunity in five years just focusing in India; can break-even in the second year of operations; presents additional revenue opportunities with Ayush wellness centres, and potential revenue of at least 2-3 times more if the global market is addressed.

AI FOR PUBLIC SERVICES

Tata Consultancy Services

AI-based sanitation inspection system

Use case overview

Government schools provide affordable education but also witness a huge drop-out rate, especially amongst girls, mainly due to poor sanitation. As a part of the Swatch Bharat mission, the government is enforcing cleanliness measures across public and private places that come with its own challenges such as systematic monitoring and physical inspection. To cater to this, TCS' AI-based sanitation inspection system uses computer vision to automate inspection using AI-enabled mobile application.

Beneficiaries: Public services such as schools under Andhra Pradesh State Education Department

Problem identification

Detailed view of the opportunity

- Lack of regular and reliable inspection leads to unhygienic school premises and toilets. This is leading to an increase in drop-out rate for girl students (especially those in puberty).
- Per a 2014 report by NGO Dasra, 23% girls drop out of the schools due to poor sanitation. About 25% women population without primary/secondary education means a huge impact on societal harmony, economy, and next generation's well-being.
- In addition, third-party-led manual inspection requires exponential effort, cost, and logistics considering there are about 5,00,000 toilets in one state alone.

Solution innovation

Description of proposed solution

- AI-enabled mobile app enables users to click and upload images to be processed.
- The processing involves image validation (ascertain if the given image is of a toilet seat or a washroom or a washbasin or else an invalid image), object detection (e.g., whether the given image is of an Indian or European commode) and sanitation classification (clean or unclean).
- In addition, the solution uses intelligent grading to identify cement marks, paint stains, spilled water as against mud and dirt.

Role of AI and technical specifications

- Application of computer vision to automate the inspection.
- Object detection and localisation techniques to identify what needs to be inspected (a toilet, floor area, washbasin, etc.).
- Image classification techniques to grade the cleanliness of the given object/entity.
- ML techniques to nudge users for better capture of images.
- Intuitive visualisation dashboards.

Challenges and known risks

- High volume: ~4,50,000 images per day to be processed.
- Data sources: Images are captured by different mobile and each mobile camera has different specifications.
- Data type variations: Variations in the images (such as toilets, urinals, washbasins, and common floor) captured due to different shapes, sizes, colours, etc.
- Annotation image data: Images requiring annotations to mark the boundary of the region of interest and subsequent review by business users, and categorising images into correct grades, i.e., image quality, size, and orientation..

Impact and scale

Impact metrics and solution scalability

- Operational efficacy: Enabled near real-time visibility with intuitive and user-friendly dashboards for monitoring and tracking the cleanliness of toilets across levels in the education ecosystem.
- Revenue optimisation by enabling both cost optimisation (due to operational improvement) and growth and transformation (by availing basic right of education).
- Facelift for schools and the education department through a state-of-the-art solution to promote education.
- Significant reduction in the school drop-outs specially girls due to availability of clean and usable toilets.
- The solution is expected to process ~4,50,000 images of restroom/urinals/washbasins per day.

AI FOR SUSTAINABILITY

Aquaconnect

Aquaculture pond risk mitigation using computer vision

Use case overview

Aquaconnect has enabled the digitalisation of farm data by creating a pond diary and providing pond or farm boundary information. This helps in disease and pond water quality prediction, and monitors ponds on a near real-time basis.

Beneficiaries: Aquafarmers, buyers, banks, and insurance firm

Problem identification

Detailed view of the opportunity

- The farming sector faces several challenges related to sustainability, traceability, and transparency, including natural disaster risks and lack of formal credit options.
- By enabling farm data digitalisation, such as pond diary and pond boundary, Aquaconnect helps farmers mitigate risks as well as increases their access to formal credit.

Solution innovation

Description of proposed solution

- Aquaconnect uses deep learning model to identify location of the farm and monitor it. Ponds are monitored on a near real-time basis, and pond or farm boundaries are updated twice in a year within 15 days, using image processing and segmentation.
- A pond diary is created, which helps predict diseases, monitor pond water quality, and extract handwritten pond management data.

Role of AI and technical specifications

- Used deep learning (CNN) and image georeferencing to segment pond boundary and monitor ponds on a real-time basis.
- Leveraged computer vision techniques for object and edge detection.

Challenges and known risks

- Availability and accessibility, along with quality, are some data-related challenges.
- Monitoring model performance to improve business outcomes, reduce risk of model failure, and report compliance with external and internal regulations.
- Technology adoption in coastal communities is difficult.

Impact and scale

Impact metrics and solution scalability

- About 80% of the farmer financing and 100% of insurance are archived.
- Able to connect 100+ farmers to processers, thus eliminating middlemen and increasing profit margin.
- Provided alerts in the disease outbreak and helped both farmers and the insurance sector during natural disasters.
- Approached Farmer Producers' Organisation (FPO) and relevant state government agencies.
- Future scalability and portability possible by enhancing social knowledge about Aquaconnect's web and mobile application.
- Aiming to connect 1,000+ farmers to exporters by the end of the financial year and 10% of the total farmer base in the next two years.

NATURAL LANGUAGE PROCESSING

TheMathCompany

Intelligent scientific document inference tool

Use case overview

The R&D team of a global confectionery and food product manufacturer was tasked with manual scanning of scientific literature and news commentaries to ensure timely awareness of food safety and nutrition issues. However, the complex nature of scientific literature made the scanning, categorisation, and tagging of documents a technical and tedious process involving subject matter experts (SMEs). Acknowledging this challenge, TheMathCompany streamlined and automated the research process by increasing the volume of documents scanned while reducing the time spent.

Beneficiaries: CPG industry and a leading global confectionery and food product manufacturer

Problem identification

Detailed view of the opportunity

» The long-drawn manual process, which is initially followed, adds a subjective bias in the identification of relevant articles. The exponentially growing datasets can further increase the possibility of human error.

» Scanning and tagging volumes of data also eventually reflect in the low number of articles being reviewed, thus leaving plausible gaps between the latest scientific updates and an SME information repository.

Solution innovation

Description of proposed solution

» To automate the process and save the time spent on sifting through large datasets, a solution was built with the amalgamation of data engineering and data science using Natural Language Processing and deep learning.

» The solution converted text into vectors using embeddings. Relevance of documents was determined via relationships amongst authors, journals, and citations, along with using tagged client data. An accuracy threshold of 95% was assigned to ensure that no information was lost due to an inaccurate tagging of documents as irrelevant to the business.

» An automated end-to-end pipeline on the Azure platform was built to extract data using Azure functions, Databricks, and ADF. The solution used Natural Language Processing models to classify articles as relevant/ irrelevant.

Role of AI and technical specifications

» The automated Natural Language Processing engine consisted of a data pipeline to extract data every day, a data lake to store raw and processed data, an interactive web-based UI (React JS) where SMEs can share feedback, and a dashboard for key metrics.

Challenges and known risks

» Data security: Used VPN to access data and ran activities on the client's Azure environment.

» Infrastructure: To minimise the cost of testing (an added cost) on the Azure Databricks cluster, necessary permissions were taken to run them on Google Colab using GPUs.

» Non-availability of API for a data source: Using Robotic Process Automation, data was extracted every day from the specified data source by mimicking the human data selection process from the portal.

Impact and scale

Impact metrics and solution scalability

» With 97% accuracy, the model was constantly able to improve, learn, and generalise input documents.

» Reduced manual effort for SMEs and external contractors, resulting in estimated cost savings of US$ 1.3 million per year and additional cost savings of US$ 100,000 on API by building the RPA solution.

» Saved legal costs (due to non-compliance) ranging between US$ 1 million and US$ 20 million. The solution is scalable to more data sources and multiple scientific topics using a dynamic pipeline and user interface.

NATURAL LANGUAGE PROCESSING

Policybazaar.com

AI for contact centre

Use case overview

To enhance customer experience and improve overall sales conversions and revenue, Policybazaar.com has built a solution that generates insights from sales and service-related calls made by agents to current or potential customers. AI for the contact centre converts audio files into text (speech-to-text) on Indian Languages to enable downstream Natural Language Processing tasks.

Beneficiaries: Internal operations team (with ~10,000+ members) of the company

Problem identification

Detailed view of the opportunity

- At the core of the sales process, the company has more than 6,000 specialised agents trying to pitch the right set of products. Over 200,000 calls between the customer and agents happen every day.
- Hence, it becomes important to develop Natural Language Processing-based solutions on these calls to improve various facets of an agent's productivity: agent pitches, ability to understand customer requirements, tone, customer intent, cross-sell/up-sell, persuasion, etc.
- An improvement in agent productivity translates directly into business outcomes. Building Natural Language Processing solutions on these calls also helps prioritise customers and leads, thereby improving process efficiency.

Solution innovation

Description of proposed solution

- The proposed solution converts audio files into text (speech-to-text) on Indian Languages to enable downstream Natural Language Processing tasks.
- Deep learning and Natural Language Processing models are used for a variety of use cases to improve the contact centre's operational efficiency and increase sales funnel conversion.

Role of AI and technical specifications

- The solution has two major layers − Automated Speech Recognition (ASR) and the Natural Language Processing engine. The Natural Language Processing stack is triggered after ASR events. First layer (ASR) derives transcription (word sequence) of an utterance, given a speech waveform. Through this process, the solution solves complex problems around modelling Hinglish (a mixture of Hindi and English).
- Second is the text analytics or the Natural Language Processing layer that essentially comprises multiple deep learning models on the text transcripts to solve multiple use cases: recommendation system (pre- and post-call) based on identification of a customer profile and requirements; automated quality assurance for agent performance; triggers such as "scheduling a call back" and "do not call" on the CRM system; identification of customer intent and call sentiments.

Challenges and known risks

- In the ASR system: Audio frequency from a home-grown dialer solution is 8 KHZ and building accurate models on this sampling rate is challenging. The current ASR solution is built for Hinglish only. Additionally, controlling background noises or dialects and managing volume of up to 1-2 million+ calls per day presents obstacles.
- In the NPL system: It includes too many use cases. Annotations for supervised learning are a bottleneck. Output quality from ASR heavily affects the accuracy of the Natural Language Processing models downstream. Moreover, availability of resources on the "Hinglish" language is low.

Impact and scale

Impact metrics and solution scalability

- On an average, about 15% time spent on routine tasks is saved for each agent.
- The sales funnel sees 18-20% optimisation of leads, with a 10% increase in revenue/conversion.

COMPUTER VISION

Affine Analytics Pvt. Ltd.

Vision-based quality management system

Use case overview

Existing quality management solutions are manual, inaccurate, sluggish, and expensive. Affine aims to build a hyper-convergence of AI, cloud, and IoT to produce a quality management system that is automated, accurate, quicker, and affordable.

Beneficiaries: Manufacturing and automotive, retail/CPG

Problem identification

Detailed view of the opportunity

- There is a need to enhance the quality management process in various industries using advanced tools and technologies such as Computer Vision, Hybrid systems (cloud/edge), and IoT.
- To cater to this, Affine has proposed a solution framework that receives pictures from various IoT-enabled cameras, analyses them, and infers them using deep learning computer vision architecture on both the cloud and edge platforms.

Solution innovation

Description of proposed solution

- Traditional analytics methods are vulnerable to slight changes in image structure that deep learning models can readily accommodate.
- The proposed solution implementation has three stages. First, a basic image annotation for the model is performed to understand the targeted product's morphology and profile.
- Second, deep learning model accelerators are used to fine-tune existing models based on the data annotation step.
- Third, models are customised to deploy according to client needs. In addition, integration of quality KPIs into the client's existing quality management system is enabled.

Role of AI and technical specifications

- The solution uses CNN and deep learning-based computer vision solutions that have proven to be adaptive, learnable, and scalable across multiple problem areas.
- This empowered the solution to identify various surface anomalies and defect types, such as corrosion and mechanical damages on metallic and non-metallic surfaces.

Challenges and known risks

- The solution will be deployed within the client ecosystem to ensure adherence to client security protocols. The solution would need minimum client data to fine-tune models.
- If the labelled data is unavailable, Affine would need to collaborate with customers to build customised, labelled image datasets.

Impact and scale

Impact metrics and solution scalability

- Quality check time decreased to near real-time.
- Process accuracy improved.
- The coverage beyond sample components enhanced by including on-production components.
- The solution is easily scalable by adding a new defect with minor fine-tuning and extending to any number of production lines without additional cost. It is platform agnostic and can work with any IP and IoT cameras.

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