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Humanising AI: The Key to Solving **Global Problems?**

By Joseph Sirosh, Corporate Vice President, Cloud AI Platform, Microsoft

Necessity is the mother of all inventions, and every technological breakthrough in history was born out of the need to enhance human life. Today, the rapid development of civilization has also brought about challenges on multiple fronts – environmental, health care, lifestyle, agriculture and transportation, among others. I believe with the recent advances in Artificial Intelligence (AI), we are at the verge of solving the world's most pressing challenges.

MICROSOFT'S APPROACH TO AI: From "A PC on every desktop" to "AI in every software".

When Bill Gates and Paul Allen founded Microsoft over 40 years ago, their aim was to bring the benefits of computing, then largely locked up in mainframes, to everyone. They set out to build a "personal" computer that would help people be more productive at home, school and work. Today, Microsoft is aiming to do very much the same with AI. We are building AI systems that are designed to amplify natural human ingenuity to help solve problems faced not only by businesses but also society at large. And our goal is to make them available to everyone.

MAKING HUMAN-CENTRIC AI AVAILABLE TO ALL
People around the world can benefit from AI technologies only if they are available to them. For Microsoft, this begins with basic R&D. Recently, we announced the creation of Microsoft Artificial Intelligence and Research group that brings together approximately 7,500 computer scientists, researchers and engineers, to pursue a deeper understanding of the computational foundations of intelligence, and is focused on integrating research from all fields of AI in order to solve some of AI's most difficult challenges.

Our focus is not only to build AI capabilities into our most popular products and cloud services, but also to make them available to developers to help them build their own AI-powered products. The Microsoft AI platform offers services, tools and infrastructure making AI development easier for developers and organisations of any size.

Additionally, we also have technologies available to simplify the creation of "bots" that can engage with people more naturally and conversationally. We offer a growing collection of coding and management tools to make the AI development process easier. And our Azure cloud infrastructure offerings help customers develop and deploy algorithms, and store their data and derive insights from it.

THE POTENTIAL OF MODERN AI
Think of the most complex and pressing issues that humanity faces, such as health care, transportation safety and environmental challenges. Imagine what it would mean if we could harness AI to solve these challenges, save lives, alleviate sufferings, unleash human potential, etc.

Providing effective health care at a reasonable cost to the approximately 7.5 billion people on the planet is one of society's most pressing challenges. Whether it's analyzing massive amounts of patient data to uncover hidden patterns, identifying compounds that show promise as new drugs or vaccines, or unlocking the potential of personal medicine based on in-depth genetic analysis, AI offers vast opportunities to transform how we understand diseases and improve overall health. Machine reading can help quickly find critical insights amid thousands of documents that doctors otherwise would not have time to read. By doing so, it can help them spend more of their time on higher value and potentially lifesaving work.

Some of these cases are already in action today.

PEOPLE WITH LOW VISION TO HEAR INFORMATION
AI systems are already helping people tackle big problems. An example of how AI can make a difference is a recent Microsoft offering called "**Seeing AI,**" available in the iOS app store, that can assist people with blindness and low vision as they navigate daily life. This powerful application demonstrates the potential for AI to empower people with disabilities by capturing images from the user's surroundings and instantly describing what is happening.

Microsoft Soundscape is another research project by Microsoft that explores the use of innovative audio-based technology to enable people, particularly those with blindness or low vision, to build a richer awareness of their surroundings, thus becoming more confident and empowered to get around. Unlike step-by-step navigation apps, Soundscape uses 3D audio cues to enrich ambient awareness and provide a new way to relate to the environment. It allows you to build a mental map and make

Amplifying
Human Ingenuity

*Empowering the Blind community
one step at a time*

Seeing AI – Talking
Camera App

personal route choices while being more comfortable within unfamiliar spaces.

AI ENSURING TRANSPORT SAFETY

Providing safe and efficient transportation is another area where AI can play an important role. AI controlled driverless vehicles could save lives by reducing traffic accidents while improving traffic flow and reducing carbon emissions. In India, we are working on Project HAMS (Harnessing AutoMobiles for Safety), which weaves together a virtual safety harness for vehicles using low-cost sensing devices that communicate with a cloud-based controller. Based on the raw data obtained from these sensors, we have built detectors for various events of interest including driver distraction, fatigue, etc. and also for vehicle ranging, to determine whether a safe separation distance is being maintained.
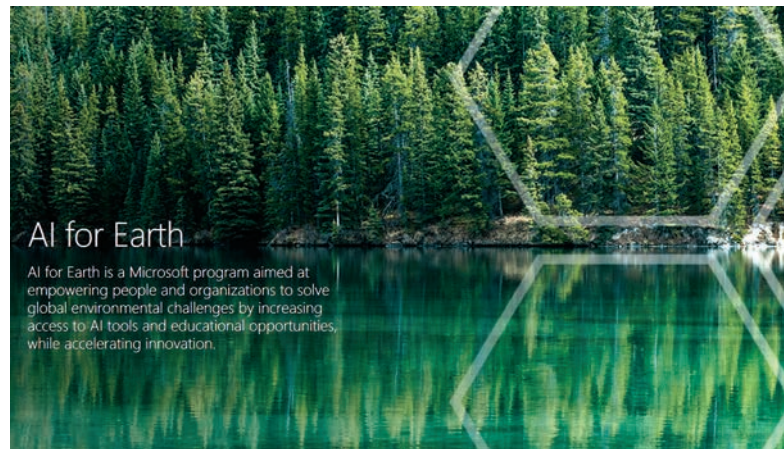
AI FOR GLOBAL ENVIRONMENTAL CHALLENGES

AI offers significant opportunities to increase food production by improving agricultural yield and reducing waste. For example, our "AI for Earth FarmBeats" project uses advanced technology, existing connectivity infrastructure, the power of the cloud and machine learning to enable data-driven farming at low cost. This initiative provides farmers with easily interpretable insights to help them improve agricultural yield, lower overall costs and reduce the environmental impact of farming.

MOVING FORWARD

It's fairly evident that AI could be the answer to some of our most daunting tasks or pressing concerns. However, as was the case with previous significant technological advances, the greatest danger of AI is that people conclude too early before they understand it completely. We will need to be thoughtful about how we address the societal issues that these changes bring about. Most importantly, we all need to work together to ensure that AI is developed in a responsible manner so that people will trust and deploy it as appropriate. This will require a shared understanding of the ethical and societal implications of these new technologies. In turn, it will help pave the way towards a common framework of principles to guide researchers and developers as they deliver a new generation of AI-enabled systems and capabilities.∎

AI for Earth

AI for Earth is a Microsoft program aimed at empowering people and organizations to solve global environmental challenges by increasing access to AI tools and educational opportunities, while accelerating innovation.

Microsoft's Seeing AI App Gives Superpowers to People with Visual Impairments

In order to create an inclusive future, it is important that everyone has access to the benefits of technology and the opportunities it creates, including differently-abled persons. One such initiative is Microsoft's Seeing AI app, which helps visually impaired and people with low visibility by narrating the world around them.

Designed to help people with vision impairments complete everyday tasks and offer new levels of independence, the free app uses the phone's camera and artificial intelligence to recognise objects, people and text and describes them to the user.

Saqib Shaikh, Senior Data Scientist at Microsoft, who is himself visually impaired, led the development of Seeing AI from Microsoft's offices in the UK. As someone who is visually impaired, he says Seeing AI has become a key tool in his daily life, and hopes it will help many others to feel more included and connected to the world around them.

THE APP LETS USERS RECOGNISE:
- **Text:** Speaks out the text as soon as it appears in front of the camera.
- **Documents:** Provides audio guidance to capture a printed page, and recognises the text, along with its original formatting. Personalisation is key, and when you're not using VoiceOver, this feature lets you choose between the voice that is used and how fast it talks. It also lets you read the document aloud without voiceover, with synchronised word highlighting. Moreover, it includes the ability to change the text size on the document channel.
- **Handwriting recognition:** Apart from being able to read printed text, such as on menus or signs, the ability to read handwriting means you can read personal notes in a greeting card, as well as printed, stylised text not usually readable by optical character recognition.
- **Products:** Scans barcodes, using audio beeps to guide you; hear the name, and package information when available.
- **People:** Allows users to save friends' faces in their contact list so they can be recognised later.

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- **Scenes:** You can hear an overall description of the scene captured.
- **Colours:** Getting dressed in the morning gets easier with this feature, which describes the colour of objects, like garments in your closet.
- **Currency:** Seeing AI can also recognise the currency of US dollars, Canadian dollars, British pounds and euros. Checking how much change is in your pocket or leaving a cash tip at a restaurant is much easier.
- **Images in other apps:** Just tap "Share" and "Recognise with Seeing AI" to describe images from emails, photos, Twitter and more. Seeing AI is available for iOS devices in India, the UK, Ireland, Australia, United States, Canada, Hong Kong, New Zealand, and Singapore. **F**
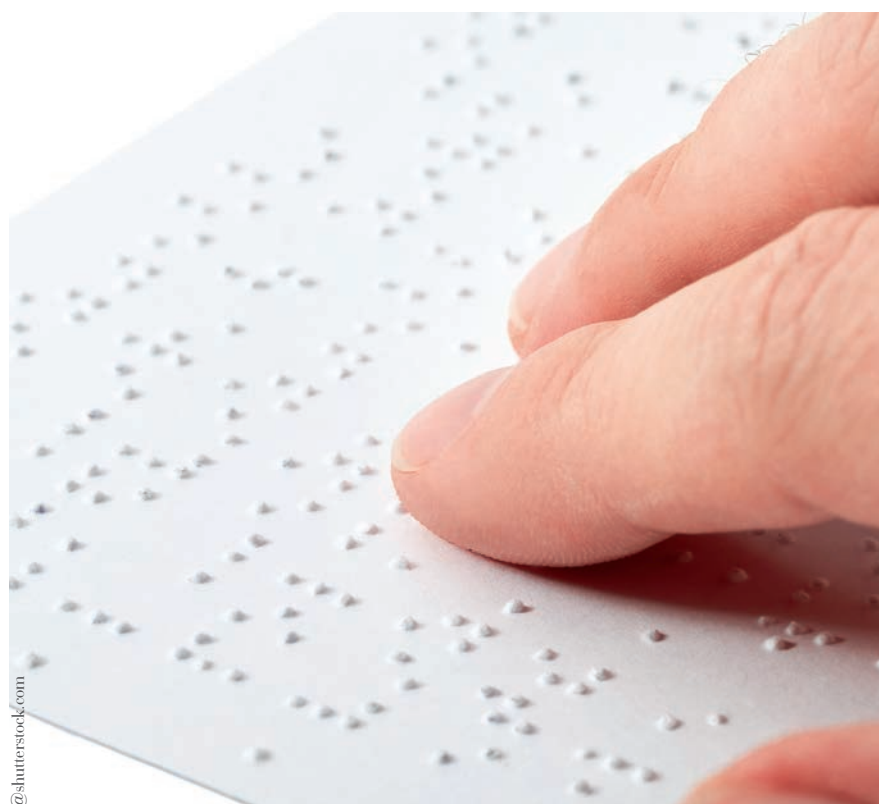
Transforming Health Care for Global Populations with AI Network

Health care is an industry that touches all of us, given the most basic of human goals which is that we all want to lead healthy lives. Last year we embarked on Health care NExT, a Microsoft initiative which aims to accelerate health care innovation through artificial intelligence and cloud computing. By working side-by-side with the health care industry's most pioneering players, Microsoft is bringing its capabilities in groundbreaking research and product development to help health care providers, biotech companies and organizations around the world use artificial intelligence (AI) and the cloud to innovate.

The AI Network for healthcare is part of Microsoft Health care NExT aimed to accelerate health care innovation through artificial intelligence and cloud computing.
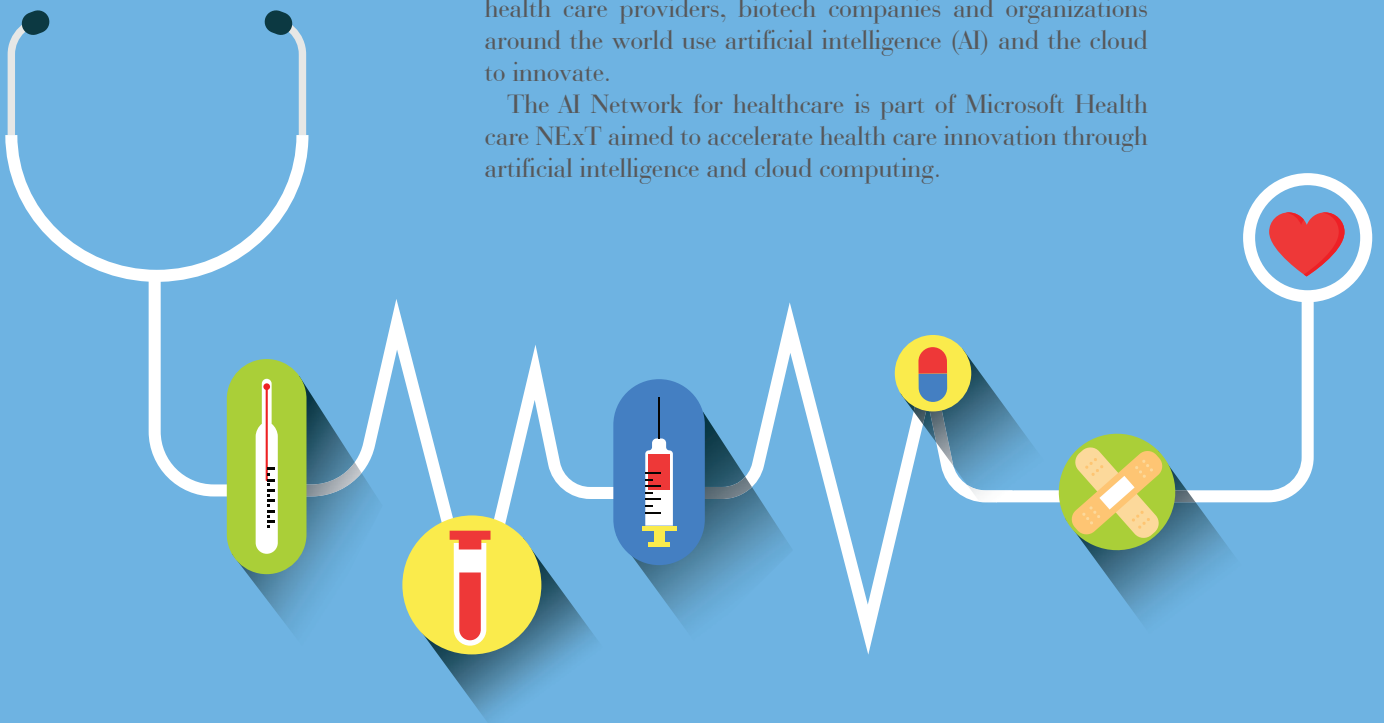
![Microsoft]

PREDICTING CARDIAC DISEASES WITH AI

Microsoft announced the expansion AI Network for Health care, to create an AI-focused network in cardiology, in partnership with one of the largest health systems in India, Apollo Hospitals.

"Nearly three million heart attacks happen in India every year and there are 30 million people who are suffering from coronary diseases. It is almost an epidemic in this country," says Dr. J. Shiv Kumar, Chief of Cardiology, Apollo Hospitals, speaking on the scale of the problem.

Despite the sheer number of cases, doctors in India are unable to identify the probability of cardiac ailments when patients come for their regular health check-up. While there are some scores or algorithms available worldwide that predict the probability of a patient having a heart attack in the next 10 to 20 years, doctors can't extrapolate the same risk-factors and apply them to patients in India since most of them are derived from western studies and don't have a high degree of accuracy for the Indian population.

The partnership between Microsoft and Apollo will work to develop and deploy new machine learning models to predict patient risk for heart disease and assist doctors on treatment plans. The team is already working on an AI-powered Cardio API (application program interface) platform.

The new heart risk score for India is more than twice as accurate when compared to existing scores. Apollo Hospitals is looking at redefining how preventive health check-ups are done across its hospitals. The models help gauge a patient's risk for heart disease and provide rich insights to doctors on treatment plans, assist early diagnosis and empower doctors with predictive solutions.

AI TO ELIMINATE AVOIDABLE BLINDNESS

Nearly 285 million people around the world suffer from some form of visual impairment. Recent medical data indicates that nearly 70% of these cases could have been prevented with early detection and screening. Today, eyecare is set to leverage AI and machine learning to help millions of people to predict and reduce the loss of vision.

A global consortium of eyecare providers, research and academic institutions, led by LV Prasad Eye Institute, have joined hands with Microsoft to apply AI to help in the elimination of avoidable blindness and scale the delivery of eyecare services worldwide. This consortium is working on diverse data sets of patients across geographies to come up with machine learning predictive models for vision impairment and eye diseases.

Refractive errors, such as near-sightedness (myopia) and farsightedness (hyperopia), are some of the most common visual impairments in the world. Microsoft, in partnership with LVPEI, has developed a machine learning approach for prediction and progression of refractive error in children and young adults. The objective is to combine anonymous medical records and therapy data from health care providers, and train cutting-edge machine learning models to predict the progression of refractive errors over a two-year period. With AI and cloud computing, monitoring and predictive analysis can be delivered on a much larger scale.

The Microsoft model is currently integrated and being validated in EMR systems at 174 centres of LVPEI in India. The model was trained on a data set of 3,35,799 instances from 1,76,037 patients aged between 0 and 25 years to predict the progression of refractive errors for a period of two years. The speciality of this model is that it predicts the refractive error for a two-year period considering a person's medical history, eye condition and gender.

Accuracy measures showed that the model proved statistically accurate and provided optimal results when used to predict cases of myopia that could become more severe and cause physical changes to the eye's sphere and cylinder. High myopia can cause blindness for which there exists no effective restorative treatment currently. In this context, the machine learning model that predicts the refractive error will be critical in identifying patients at risk of developing high myopia, when integrated into clinical practice. **F**
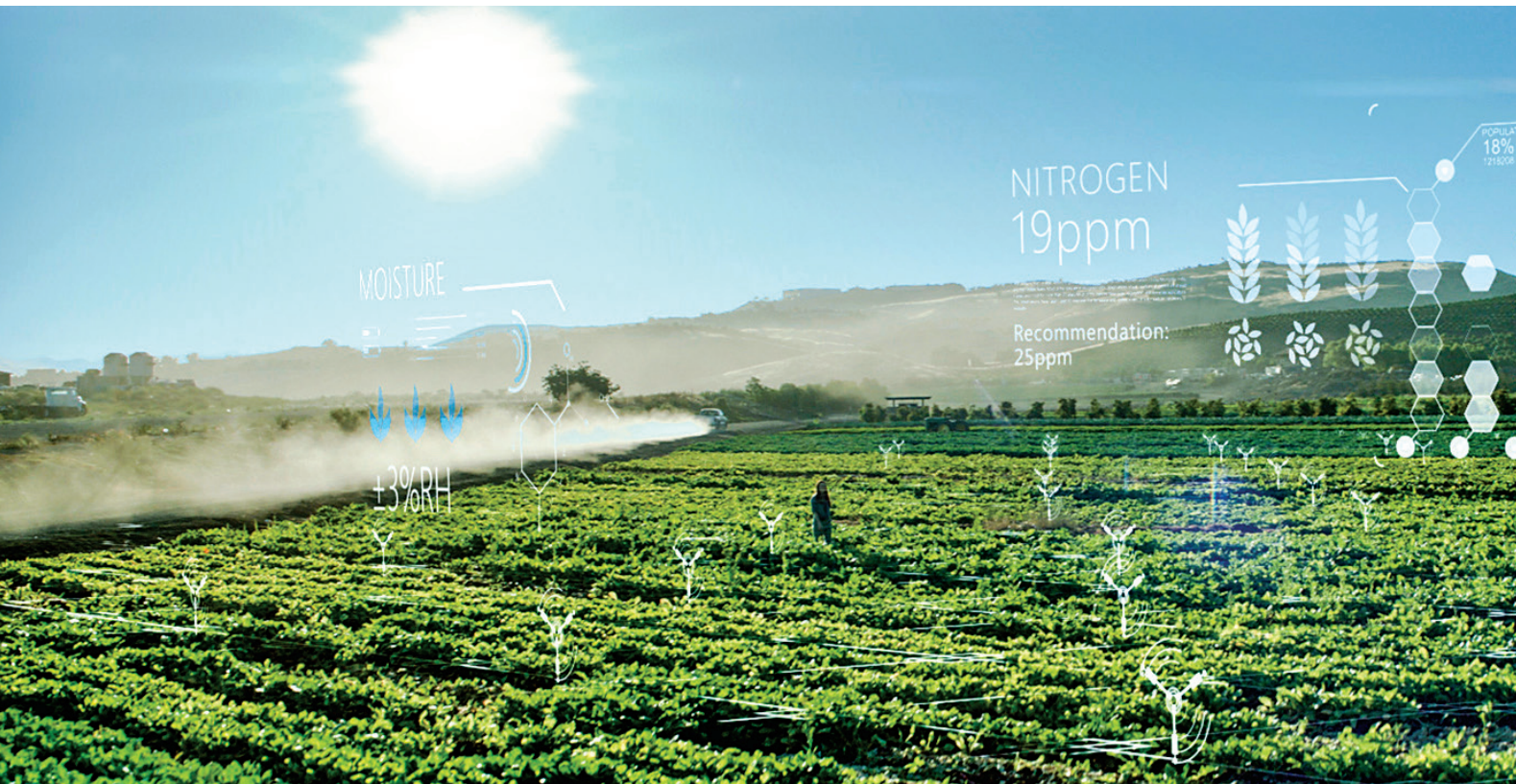
Farmers in India Reap Benefits of Artificial Intelligence in the Fields

T he fields had been freshly ploughed. The furrows ran straight and deep. Yet, thousands of farmers across Andhra Pradesh (AP) and Karnataka waited to get a text message before they sowed the seeds. The SMS, which was delivered in Telugu and Kannada, their native languages, told them when to sow their groundnut crops.

In a few dozen villages in Telangana, Maharashtra, and Madhya Pradesh, farmers are receiving automated voice calls that tell them whether their cotton crops are at risk of a pest attack, based on weather conditions and crop stage. Meanwhile in Karnataka, the government can get price forecasts for essential commodities such as tur (split red gram) three months in advance to plan for the Minimum Support Price (MSP).

Welcome to digital agriculture, where technologies such as Artificial Intelligence (AI), cloud computing, machine learning, satellite imagery, and advanced data analytics are empowering small-holder farmers to increase their income through higher crop yield and greater price control.

AI-based sowing advisories result in up to 30% higher yields.

Microsoft has collaborated with International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) a non-profit, non-political organisation that conducts agricultural research for development, to develop an AI Sowing app powered by Microsoft Cortana Intelligence Suite. The app sends sowing advisories to participating farmers on the optimal date to sow. All that the farmers need is a phone that can receive text messages.

"The sowing date is very critical to ensure that farmers harvest a good crop. And if it fails, it results in loss as a lot of costs are incurred for the seeds, as well as the fertilizer applications," says Dr. Suhas P. Wani, Director, Asia Region, ICRISAT.

Consider G. Chinnavenkateswarlu, a farmer from Bairavanikunta village. Chinnavenkateswarlu was part of a pilot programme that ICRISAT and Microsoft were running for 175 farmers in the state. In June 2016, when farmers were busy sowing their crops in Devanakonda

Mandal in the Kurnool district of AP, he decided to wait, based on an advisory he received in a text message, which included information on sowing date, land preparation, soil test-based fertilizer application, and so on. While changing weather patterns in the past decade have led to unpredictable monsoons, causing poor crop yields, with better data, Chinnavenkateswarlu and the 174 others in his test group achieved an average of 30% higher yield per hectare last year.

In 2017, the programme was expanded to touch more than 3,000 farmers across the states of Andhra Pradesh and Karnataka during the kharif crop cycle (rainy season) for a host of crops including groundnut, ragi, maize, rice and cotton, among others. The increase in yield ranged from 10% to 30% across crops.

PREDICTION ENABLES FARMERS TO PLAN

Microsoft is now taking AI in agriculture a step further. A collaboration with United Phosphorus Limited (UPL), India's largest producer of agrochemicals, led to the creation of the Pest Risk Prediction API that leverages AI and machine learning to indicate in advance the risk of pest attack. Common pest attacks can pose serious damage to crops and impact crop yield. To help farmers take preventive action, the Pest Risk Prediction App, providing guidance on the probability of pest attacks was developed.

In its first phase, about 3,000 marginal farmers, with less than five acres of land holding in 50 villages, started receiving automated voice calls for their cotton crops. These calls indicate the risk of pest attacks based on weather conditions and crop stage in addition to the sowing advisories.

"Our collaboration with Microsoft to create a Pest Risk Prediction API enables farmers to get predictive insights on the possibility of pest infestation. This empowers them to plan in advance, reducing crop loss due to pests and thereby helping them to double the farm income," says Vikram Shroff, Executive Director, UPL.

PRICE FORECASTING MODEL

State governments currently forecast prices for agricultural commodities using historical data and short-term arrivals to protect farmers from price crash or shield population from high inflation. The Government of Karnataka is now using AI for price forecast of tur, Karnataka is the second largest producer of this pulse in the country. Rather than having short-term arrival data, the price forecast for major markets would be done as much as three months in advance, which helps the government plan better.

The new model is scalable and time efficient, and can be generalised to many other regions and crops. "We are certain that digital agriculture supported by advanced technology platforms will truly benefit farmers. We believe that Microsoft's technology will support these innovative experiments which will help us transform the lives of the farmers in our state," says Dr. T.N. Prakash Kammardi, Chairman, Karnataka Agricultural Price Commission, Government of Karnataka.

AI IN AGRICULTURE IS GETTING STARTED

Shifting weather patterns such as increase in temperature, changes in precipitation levels, and groundwater density, can affect farmers dependent on timely rains for their crops. Leveraging the cloud and AI to predict advisories for sowing, pest control and commodity pricing is a major initiative towards creating increased income and providing stability for the agricultural community.

"Indian agriculture has been traditionally rain dependent and climate change has made farmers extremely vulnerable to crop loss. Insights from AI through the agriculture life cycle will help reduce uncertainty and risk in agriculture operations. Use of AI in agriculture can potentially transform the lives of millions of farmers in India and the world over," says Anil Bhansali, CVP C+E and Managing Director, Microsoft India (R&D) Pvt. Ltd. F

Transforming Translation for
Indian Languages **with AI**

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For India to become truly digital, technology needs to be accessible to all. For communication barriers to be broken, translation will need to improve significantly. Fortunately, Artificial Intelligence (AI) could hold the key to connecting people across different languages. Companies like Microsoft, for example, have been using Deep Neural Networks to vastly improve the accuracy of translations by leveraging machine learning. Today, their products support text input in all 22 constitutionally recognised Indian languages, and the Windows interface itself supports 12 languages.

Artificial Intelligence and Deep Neural Networks are being used to improve real-time language translation for Hindi, Bengali, and Tamil. Language translation is now available to all Microsoft users, whether they're using the Microsoft Edge Browser, Bing Search, Bing Translator, or even Microsoft Office 365.

CHALLENGES IN INDIAN LANGUAGE TRANSLATIONS

Training Deep Neural Networks involves sifting through massive amounts of high-quality data to execute translations. To ensure accuracy, millions of parallel sentences in each language pair, in all permutations and combinations. Indian languages are particularly complicated because, according to Microsoft's Krishna Doss Mohan, "There's not enough material on the internet that we could use to train the system." Mohan, a Senior Programmer who was part of the Microsoft team that worked on Indian languages, pointed out that India's 22 different official languages make it quite challenging to acquire high quality data to run analysis and train the system in each of these languages. Nevertheless, translation systems based on Neural Networks have shown significant improvement in both automatic and human evaluation metrics. More specifically, the team has also witnessed at least 20% improvement in translation quality for all Indic languages currently supported by Microsoft.

EMPOWERING PEOPLE ACROSS THE SPECTRUM

Successfully implementing Deep Neural Network-powered translation for Indian languages can have a genuine impact on businesses and society. In India, only about 12% of the people can speak, read, and write English, since it's not their first language. Communication can be a deeply personal experience but imagine the impact AI can have on the lives of the remaining 88% for whom such communication is a distant dream. Neural Network-based systems are uniquely positioned to ensure that the ideas we communicate are accessible, medium independent and language agnostic. When there's free communication and a free flow of ideas across different cultures and languages, everyone benefits.**F**

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650 Partners
to Drive AI for All in India

At its AI for All conference in Bengaluru on March 28, 2018 Microsoft India showcased some of its most recent artificial intelligence (AI) solutions aimed at helping improve lives and transform businesses. The company is helping 650 India-based partners to use the Microsoft cognitive services, IoT, AI and Machine Learning platforms to build solutions for India. Over the last year, Microsoft and its partners have deployed AI solutions in areas such as health care, education, agriculture, retail, e-commerce, manufacturing and financial services.

Microsoft also announced a partnership with Forus Health, a Bengaluru-based technology company focusing on retinal imaging devices, to leverage AI capabilities for early detection of diabetic retinopathy, glaucoma & macular degeneration, and help reduce avoidable blindness.

"We are working closely with our partners to bring AI to all sectors in India," said Mr. Anant Maheshwari, President, Microsoft India. "The intersection of AI with people and society presents an incredible opportunity to create a lasting, positive impact on the world and in India. Our partners are creating inclusive solutions designed to solve local societal and business problems."

Addressing the participants at the conference, Ms. Peggy Johnson, Executive Vice President, Business Development, Microsoft said, "We are working to democratise AI and make it available to all. As a company, we have been working with AI for over 25 years. As humankind discovers new challenges and refocuses on old ones, AI can help us find better and more sustainable solutions."

PARTNERSHIP WITH FORUS HEALTH
Diabetic retinopathy is one of the most common complications of diabetes population due to lifestyle changes and accounts for up to 10 per cent of cases that experience loss of vision. As part of Microsoft's AI Network for Health care, Microsoft and Forus have worked together to integrate AI-based retinal imaging APIs into Forus Health's 3Nethra devices using Microsoft Azure IoT Suite. This will help Forus technicians identify eye fundus images as well as disease conditions better. 3Nethra devices, which can be operated by minimally trained technicians, are deployed across 20 plus countries and have so far touched more than two million patients.

"Forus Health is excited to partner with Microsoft in providing integrated services in ophthalmology screening to the end customer using artificial intelligence. This would help in potential early identification and treatment for problems like diabetic retinopathy," said K. Chandrasekhar, Founder & CEO, Forus Health. This partnership will help assist doctors with diabetic patients in rural clinics in India as well as other emerging economies such as Mexico.

ENABLING PARTNERS
Microsoft helps upskill partners using trainings and hackathons on AI, machine learning, Microsoft Bot framework, cognitive APIs and Machine Learning Studio. Practice resources for partners help them develop new in-house capabilities and reach more customers. Resources are available in the field of business analytics and AI, data platform modernisation and data warehousing and big data, among others.

Microsoft partners and customers in India are using and/or offering AI-based solutions across scenarios including customer segmentation and lifetime value assessment, demands forecast, multifactor customer identification system (face, biometric and speech), omnichannel analytics, fraud detection and credit risk assessment, and remote monitoring amongst others. ⨍