NATIONAL SCIENCE FOUNDATION

VOLUME 42 Number 01 2026

ISSN 1391-0299

VIDURAVA

THE SCIENCE MAGAZINE OF THE NATIONAL SCIENCE FOUNDATION



AI for Safety & Resilience

VIDURAVA

Volume 42 No. 01

April 2026

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Published by
National Science Foundation
47/5, Maitland Place
Colombo 07.

Source of Images: Internet / Authors

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'VIDURAVA' Science Magazine is available at http://www.nsf.gov.lk

Contents

2 **Editorial**

3 **Leapfrog or fall behind: Sri Lanka's moment to embrace Artificial Intelligence (AI)**
Prof. Hiran Amarasekera

8 **Artificial Intelligence (AI) for disaster mitigation: how smart technology helps save lives**
Mrs. A.U.P. Athukorala

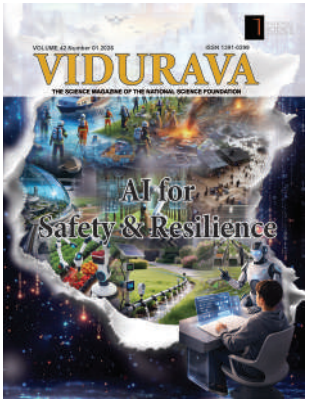
12 **Artificial Intelligence (AI) and food security: growing more food with smarter decisions**
Dr Chamila Dias

17 **Artificial Intelligence (AI) for water security**
Dr Kalpana Galappaththi

24 **Artificial Intelligence (AI) for industrial safety**
Dr Thanuja D. Ambegoda

29 **Beyond the rocks: the life and legacy of Emeritus Professor C.B. Dissanayake**
Prof. Rohana Chandrajith

31 **Let's check the knowledge gained**



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ISSN 1391-0299

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Editorial

Artificial Intelligence: a powerful ally for society resilience

The world faces growing challenges from climate change, population growth, resource scarcity, and industrial expansion. Hence, the need for innovative solutions has never been greater. Artificial Intelligence (AI) is emerging as one of the most transformative technologies of the 21st century. It offers unprecedented opportunities to strengthen food security, water security, industrial safety, and protection from natural disasters.

Food security has remained a pressing global concern, because the farmers often confront unpredictable weather patterns, pest infestations, and declining soil quality. Fortunately, the AI-powered systems can analyze vast amounts of agricultural data to predict crop yields, detect diseases early, optimize fertilizer use, and improve irrigation practices. By minimizing food waste and maximizing crop efficiency, AI ensures that growing populations have access to sufficient and nutritious food.

Due to urbanization, industrial demand, and climate variability, freshwater resources are under increasing pressure. AI can monitor water distribution networks, identify any leaks, forecast water shortages, and optimize reservoir management. Smart water systems can provide real-time insights that enable authorities to allocate resources more efficiently and respond quickly to emerging challenges. Such innovations are essential for ensuring sustainable access to clean water for communities, agriculture, and industry.

Safety is of paramount importance in the industrial sector. Accidents can result in loss of life, handicapped workers, environmental damage, and economic disruption. The AI models can continuously assess equipment performance, detect anomalies, and predict potential failures. Computer vision technologies can identify unsafe workplace conditions, while predictive maintenance reduces the likelihood of machinery breakdowns. By enhancing risk assessment and decision-making, AI contributes to safer working environments.

The growing frequency of natural disasters further highlights the importance of AI. Advanced algorithms can analyze meteorological, geological, and satellite data to improve early warning systems for floods, cyclones, droughts, landslides and earthquakes. Faster and accurate predictions allow governments and emergency responders to take preventive measures, coordinate evacuations, and allocate resources effectively. During disaster recovery, AI can assist in damage assessment and prioritize relief efforts, helping communities rebuild quickly.

Nevertheless, it is cautioned that AI is not a substitute for human judgment and responsibility. Ethical considerations, data privacy, transparency, and equitable access must remain central to AI deployment. To elaborate further, there are disadvantages in frequent use of AI in certain areas. AI would cause a depletion of human cognitive skills viz., memory, critical thinking, writing and analytical power required for mastery over any subject. Frequent adoption to AI may risk widening the socioeconomic gaps undermining human connections and causing unemployment. Generative AI can produce information that sounds plausible but factually incorrect, unless verified by human experts. For example, the health sector would be vulnerable because AI may even recommend medicine for certain health problems.

Interestingly, AI cannot generate a question for an answer you already know; however humans can do so. AI models are usually trained on Western culture values that can marginalize the diverse cultural traditions. Another disadvantage is when AI systems make biased, unethical or unsuitable decisions who would take the responsibility. Besides, training and maintaining large AI models require massive computational power with added economic costs. Developing, training, deploying and maintaining tailor-made AI systems also demand massive financial investments and specialized expertise that affects smaller organizations. Therefore, it is important that policymakers, scientists, industry leaders, and communities work to ensure that AI technologies are properly developed and actively used mainly for the public good.

The future will be definitely shaped by how effectively the society harnesses AI technology to address its most urgent challenges. Embracing AI in a wise manner can help to create a safer, more sustainable, and secured tomorrow.

Dr Seetha I. Wickremasinghe

Leapfrog or fall behind: Sri Lanka's moment to embrace Artificial Intelligence (AI)

Prof. Hiran Amarasekera



I have been fortunate to witness every major wave of the digital revolution. I watched as Windows brought personal computing to ordinary people. I saw Google changed how the world finds information. The Facebook connected billions of strangers. Smartphone puts a computer in every pocket. Through all these developments, I built and launched my website, *www.studentlanka.com* , a resource for Sri Lankan students, even before Google became a household name.

Each of these moments was significant. But when I first used ChatGPT in late 2022, I felt something different. This was not another useful tool. This was a fundamental shift in what technology could do. For the first time, a machine could understand what you meant, write like a human, explain a complex idea simply, and respond in your own language. I immediately began creating content about Artificial Intelligence (AI) on social media. The response was overwhelming while the relevant posts went viral. Thereafter, I found myself performing a new role as an AI educator.

This instinct of mine has proven right. The AI growth since 2022 has been near-vertical. And in 2026, we have moved beyond AI as a conversation partner. Today, AI acts as an agent. It can browse the Web, write codes, manage files, send emails, and complete multi-step tasks on your behalf. The revolution is no longer coming. It is already here.

What is generative AI?

The generative AI refers to a category of artificial intelligence systems that produce new content such as texts, images, audio, and many more, in direct response to what you ask them. You do not need to write codes or have a technical background. You simply type what you want to know in plain language, and the system responds.

The most widely used software tools today are ChatGPT, Claude, Google Gemini, Perplexity, and NotebookLM. Each has distinct strengths, and choosing the right tool for the right purpose makes a real difference.

ChatGPT (*www.chatgpt.com*), developed by OpenAI, was the tool that introduced the world to generative AI in 2022. It remains the most recognized name globally, and is widely used for writing, summarizing, coding, and answering questions. It is highly capable, though its responses can occasionally feel mechanical.

Claude (*www.claude.ai*), developed by Anthropic, has grown rapidly in global popularity for its more natural, thoughtful writing style, and its ability to handle long, complex documents with care. It is particularly strong for professional analysis, research support, and nuanced writing tasks.

Google Gemini (*gemini.google.com*) is backed by Google's vast data resources. For Sri Lankan users, this software matters very much. Gemini has a stronger understanding of South Asian languages, including Sinhala and Tamil, and is more likely to have relevant local knowledge compared to other models. For Sri Lankans working in their mother tongue, Gemini is often the better starting point.

Perplexity (*www.perplexity.ai*) is a powerful, but underappreciated software tool. Unlike Google, which belongs to the old retrieval era of search, it returns links to web pages. Perplexity reads those pages and gives you a direct, synthesized answer with source references. For research, fact-checking, and staying current on any topic, Perplexity is the generative AI answer to Google Search.

NotebookLM (*notebooklm.google.com*), also from Google, is perhaps the most overlooked tool available today, and it is completely free. You can upload your own documents such as research papers, reports, textbooks, or meeting notes. NotebookLM becomes an AI assistant that knows your material, answers your questions about it, generates summaries, and can even produce audio discussions of the content.

For educators, researchers, and business professionals, it is a remarkable resource that a very few people in Sri Lanka have yet discovered.

Sri Lanka's AI adoption: where we stand?

According to the Microsoft AI Economy Institute's 2025 report, Sri Lanka's AI adoption rate stands at approximately 6.6 percent, compared to a global average of 16 percent, India's 15.7 percent, and Singapore's extraordinary 52 percent. We are not just behind, but we are at risk of being left behind permanently.

Sri Lanka is a country with very high literacy rates. Yet digital literacy viz., the ability to use digital tools critically, safely, and productively remains low, even among young people. This gap shows up in troubling ways. Sri Lankan Internet users are disproportionately vulnerable to WhatsApp fraud, sharing one-time passwords (OTPs) with unknown callers, clicking on phishing links, and spreading misinformation. Simply having Internet access is not enough, without the skills to use it wisely. The reason being, the people become more exposed to harm, but not less.

The same gap appears with AI. In the training sessions I have conducted with professionals across banking, finance, education, healthcare, and government in Sri Lanka, a consistent picture emerged. Most participants use the free version of ChatGPT. The vast majority use it the same way that they use a search engine viz., typing short questions and expecting quick answers. Some use it for drafting a letter, composing an email, preparing a PowerPoint outline, or producing meeting minutes.

This in fact, is not wrong. Even the basic AI use saves time. But it represents perhaps five percent of what these tools can actually do. A small number of Sri Lankan companies have begun genuine AI transformation, slowly rebuilding their systems and workflows around AI capability. This group could be the exception. For many organizations, AI adoption is still at the surface.

The skill that changes everything: how to prompt?

Here is the single most important insight from years of AI training. The quality of what AI produces depends almost entirely on the quality of what you ask for.

Many people approach AI assuming it a search engine. They type a short phrase viz., "write a letter to my client" or "explain climate change", and accept what comes back. The results are generic, vague, and rarely what was actually needed.

Effective AI use is different. For the first time in history, people with no technology background can talk directly to a powerful AI system and get results of the highest quality. That is, only if they know how to communicate clearly. This skill is called prompting, and anyone can learn it.



Nevertheless, a simple four-step approach makes an immediate and dramatic difference:

- Role -"Act as a senior environmental scientist writing for a general audience." This immediately shapes the tone, vocabulary, and depth of the response.
- Context -"I am preparing a report for a government committee. The audience is non-technical. The topic is soil degradation in the Dry Zone." Without context, the AI makes assumptions, usually the wrong ones.
- Task -"Write a two-page summary with three key recommendations, in plain language, using short paragraphs." State exactly what you want, and in what format.
- Questions -"Ask me any clarifying questions you need before you start." This single instruction transforms the output. Instead of guessing, the AI checks what it does not know and the final result is far more specific, relevant, and useful.

This approach requires no technical training. It requires clearer thinking about what you actually want. Professionals who apply it consistently report that the quality of their AI output improves dramatically, and the time spent on correcting and revising drops significantly.

Importantly, this is not a skill reserved for computer scientists. For the first time, the subject experts such as bankers, lawyers, doctors, environmental scientists, educators, accountants etc., can use AI powerfully within their own fields, simply by communicating with clarity and precision. Unlike coding, which takes years of dedicated study, prompting can be learned in a few hours and significantly improved with practice. The expert who combines deep domain (subject) knowledge with strong prompting skills will consistently outperform those who rely on AI alone or avoid it entirely.

AI for safety and resilience: Sri Lanka's real opportunities

Beyond productivity, AI is already being deployed around the world to address exactly the kinds of challenges Sri Lanka faces every day.

Flood prediction systems give communities hours of advance warning. AI tools help doctors analyze medical scans more quickly and catch what might otherwise be missed. Farmers receive real-time, location-specific advice on pests and weather. Students learn at their own pace through tutoring systems that adapt to each individual.

Further, Sri Lanka is a country that is regularly affected by floods, with a stretched public health system, a large agricultural sector, and a young population entering into a rapidly changing job market. It has direct need for all aforementioned applications. But these tools only deliver their potential when the

people using them have the skills and confidence to do so. A flood monitoring officer unfamiliar with AI cannot benefit from AI-based flood prediction. A teacher who has never used these tools cannot guide students to use them responsibly. Therefore, the technology and the people using it must grow together.

What is holding Sri Lanka back?

There are three specific barriers that constrain AI adoption in Sri Lanka, and all three can be addressed.

The first is language. AI systems currently perform far better in English than in Sinhala or Tamil. The global training data for these tools is overwhelmingly in English. Sri Lankan users working in their mother tongue receive lower-quality, less reliable outputs as a result. While Google Gemini currently performs best in Sinhala and Tamil among mainstream tools, even it has significant gaps. Universities and government institutions are uniquely placed to generate, curate, and contribute high-quality Sinhala and Tamil datasets to improve AI performance in our languages. This should be a national priority.

The second barrier is the cost. The most capable AI tools require paid subscriptions priced in US dollars, which is significantly high relative to Sri Lankan incomes. Most users are limited to free versions with reduced capability. The institutional access arrangements through universities, professional bodies, and government departments could bring better tools to far more people.

The third barrier is the scarcity of Sri Lankan content on the Internet. The information that trains AI models comes largely from sources like Wikipedia, Reddit, and academic databases where content about Sri Lanka written in Sinhala and Tamil, is relatively sparse. This means AI tools often know less information about Sri Lanka than they know about other countries. Addressing this issue requires a deliberate effort to digitize, publish, and contribute Sri Lankan knowledge in the form of all three languages to the global digital commons.

The fears are valid; but staying out has a cost

Sri Lankans have historically been cautious adopters of new technology. This is not a weakness, but it reflects a society that thinks carefully before it leaps. Such caution has real value when it comes to AI.

The concerns being raised are legitimate. There is a genuine fear that AI will reduce the need for human thinking. The young people, in particular, will rely on AI rather than developing their own knowledge, writing ability, and critical reasoning. This concern should be taken seriously by the educators and parents alike.

AI tools also have a well-documented limitation. They can "hallucinate" by producing information that sounds confident and credible, but is factually wrong. A researcher who accepts AI output without checking, it may base decisions on invented figures or misrepresented facts. Therefore, verifying what AI produces is not optional, but is essential.

Privacy is another important concern. AI tools are cloud-based services. Sensitive personal data, confidential business information, patient records, and private communications should never be entered into public AI systems.

These are genuine risks. They must be taught, understood, and managed. But the answer is not avoidance. The countries now building competitive advantage in medicine, agriculture, education, finance, and governance are doing so with AI. Sri Lanka cannot afford to opt out of a technology already reshaping the world, for fear of risks that can be understood and managed through proper education. The goal is not uncritical adoption. It is informed, responsible, and effective use.

Enable AI: do not repeat the biotech mistake

Sri Lanka has a cautionary lesson from its own recent past. In biotechnology, the country chose restriction over engagement. The bio-safety concerns and the early prohibition of genetically

modified organisms (GMOs) meant that Sri Lanka never built the expertise or capacity to evaluate and apply these technologies on its own terms. Other countries moved forward, gained knowledge, and built lasting advantage in food production and medicine. Sri Lanka is still catching up.

The AI moment demands a different response. The answer to uncertainty is not restriction, but it is informed, responsible engagement. This means nurturing AI champions such as individuals within organizations, universities, schools, and government departments who genuinely understand these tools and build capability around them. It means embedding AI literacy across every level of education. Not as a specialist module for technology students, but as a universal competency, as fundamental as reading and numeracy.

The leapfrog moment

Sri Lanka has demonstrated before that it can move quickly when it chooses to. The country leapfrogged fixed-line telecommunications infrastructure entirely, going directly to mobile phones, and transforming how citizens communicate, bank, and access the services. The AI moment presents a comparable opportunity.

The infrastructure of generative AI is global and already accessible. The knowledge required to use it well, is learnable by anyone. Sri Lanka does not need to build AI from scratch. It needs to build the human capacity to use it effectively, before the window closes.

Sri Lanka's 6.6 percent AI adoption rate is not a verdict on what is possible. It is simply the status where we are today. The gap between us and regional leaders like Singapore and India is real, but it is not permanent. This gap can be reduced or changed easily, with a clear decision made by institutions, educators, professionals, and individuals to actively engage in this technology at least now, with both confidence and care.

The technology is ready. The question is whether we are.



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Artificial Intelligence (AI) for disaster mitigation: how smart technology helps save lives

Mrs. A.U.P. Athukorala



Introduction

A disaster is a sudden and extreme event caused by natural or manmade processes in the earth that results in severe damage to the human life, property and the environment. These events are not caused merely by humans, but they can become more severe due to human activities such as deforestation, poor urban planning, and climate change due to environmental pollution. Earthquakes, floods, cyclones, landslides, tsunamis, volcanic eruptions, and droughts are common examples for natural disasters while crowd disasters, industrial hazards, and CBRN (Chemical, Biological, Radiological and Nuclear) disasters are human-made disasters. If disasters are identified early, safety precautions can be taken in advance, and the damages to the human lives, properties and the environment can be minimized. Further, the government funds, which should be allocated for relocation and rehabilitation, can be saved. Traditional methods of identifying disasters may not be sufficient as the climate is changing rapidly and the population is growing fast. This is where Artificial Intelligence (AI) emerges as a powerful tool. By analyzing large amount of data, identifying patterns, and providing early warnings, AI can help predicting disasters, improving emergency response, and supporting recovery efforts. This article explores how AI supports the disaster management and contributes to building safer and more resilient communities.

Disaster management

Efficient and responsive disaster management systems minimize the loss of human lives and the environment. Disaster management has four main phases viz., preparedness, mitigation, response, and recovery as presented in Figure 1. Also, the disaster management is an ongoing process by which the responsible organization may plan for handling any emergency situation that happens due to a disaster.This will support to minimize or nullify the adverse effects due to the disaster.

Preparedness includes the plan for the emergency responders where any type of emergency situation can be handled. The main aim of this phase is developing short and long term strategies, developing early warning systems, and spreading awareness among communities. Disaster mitigation is an action to reduce or minimize the impact of adverse disaster before it happens. Mitigation parameters include building codes assessment, vulnerability analysis, hazard zonation mapping, land use management, risk mapping, and public awareness. The purpose of disaster response is to provide basic needs to victims. This includes providing food, clothes, shelters, medicine etc. During the disaster recovery, long term sustainable plans are developed to bring back all victims to their normal life. AI can be used in any phase of this disaster management cycle.

Instead of only reacting after the disaster, early actions help to minimize loss of life, property and environmental damage through

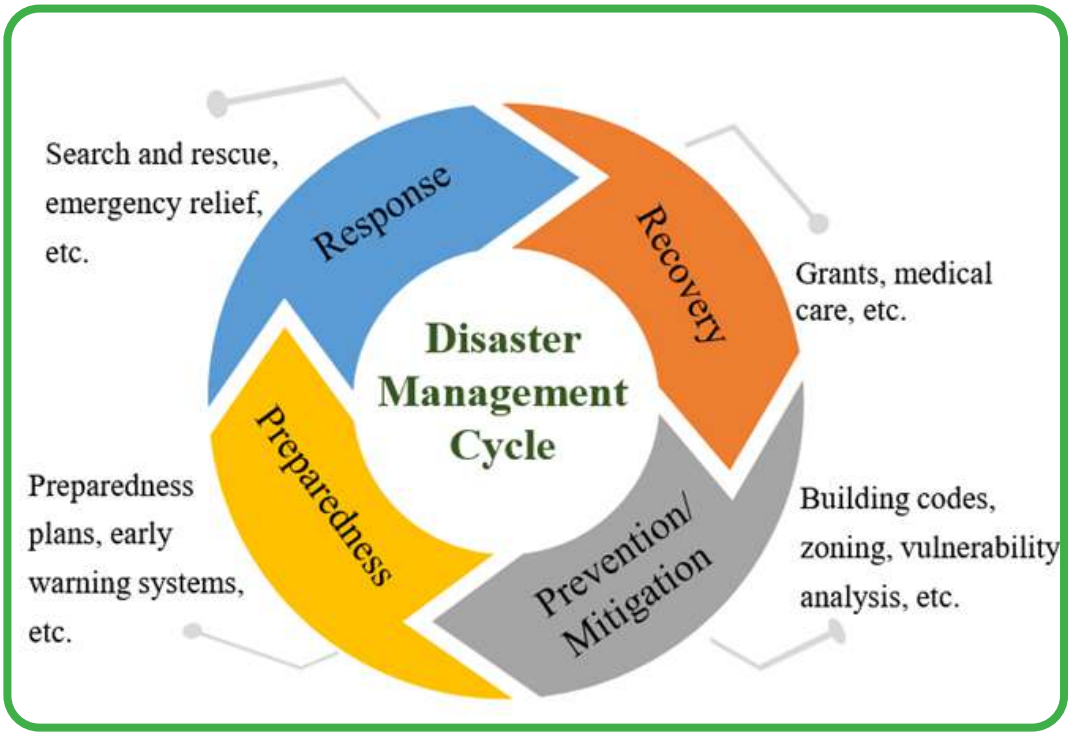


Figure 1: Disaster management cycle (Source : *Gupta and Roy, 2024*)

pre-planning, safety measures and risk reduction strategies. By investing in disaster management, communities become better prepared, more resilient and less vulnerable to future disasters making it the most effective and cost-efficient approach. Hence, AI can play a significant role in supporting disaster management in different steps such as analyzing large amount of data for predictions, generating early warnings, identifying the possible risks, and detecting the possibility of disasters etc.

How AI helps manage disasters

Early predictions on disasters can minimize the damages that can happen for both humans and the environment. The applications in AI in disaster management are composed with diverse methods of overcoming the challenges in disaster prediction, mitigation and response. These methodologies force classical Machine Learning algorithms and advanced deep learning models to extract significant insights from complex data sets.

In earthquake management, AI models such as Long-Short-Term-Memory (LSTM) systems analyze temporal seismic data for forecasting earthquakes and aftershocks, while Random Forests, Neural Networks and explainable AI techniques support rapid building damage assessment and risk mapping. For landslides, hybrid models combining Support Vector Machines (SVMs), dynamic neural networks and adaptive model-switching strategies utilize satellite, geological, and real time sensor data to deliver reliable day-ahead predictions and early warnings. Flood prediction benefits from deep learning frameworks, and video based severity classification systems that generate timely warning alarms using rainfall, soil and environmental data. Volcanic eruption prediction leverages Convolutional Neural Networks (CNNs), attention based models like VepNet, and seismic/geological data analysis for hourly forecasts and ash particle classification to support timely evacuations. AI tools for hurricanes and wildfires satellites imagery processed by CNNs, decision trees for storm intensity prediction, and deep learning for path tracking, fire detection, and propagation simulation. In addition to natural disaster management, AI techniques

can be used for managing the human- made disasters such as crowd disasters, CBRN materials disasters and industrial hazards. K-Nearest Neighbor (KNN) algorithm is used for human activity recognition, and Deep Learning Algorithms are used for analyzing images for abnormal behaviors in high density crowd. In CBRN disasters, machine learning algorithms are used for analyzing sensor data and detecting CBRN compounds quickly and accurately. Further dispersion prediction models are used to forecast how dangerous materials spread to enable faster, targeted emergency responses These AI techniques focus on real-time detection, prediction, simulation, and response optimization related to disasters. Deep learning techniques are heavily used for visual and behavioral analysis. These techniques focus on prevention and rapid response to reduce loss of life and property in high-risk industrial or crowd settings.

From the literature, it is clear that Artificial Intelligence (AI) and Machine Learning (ML) techniques can perform a significant role in early prediction, prevention, mitigation and recovery process in disaster management.

According to a study done by Gupta and Roy (2024), after referring to 72 research studies, it is found that AI techniques are most frequently used for preparedness (60%). It is identified that for recovery step AI techniques are least frequently used (Figure 2). In future, experts in system development should focus on developing more support systems using AI for disaster mitigation, recovery and response.

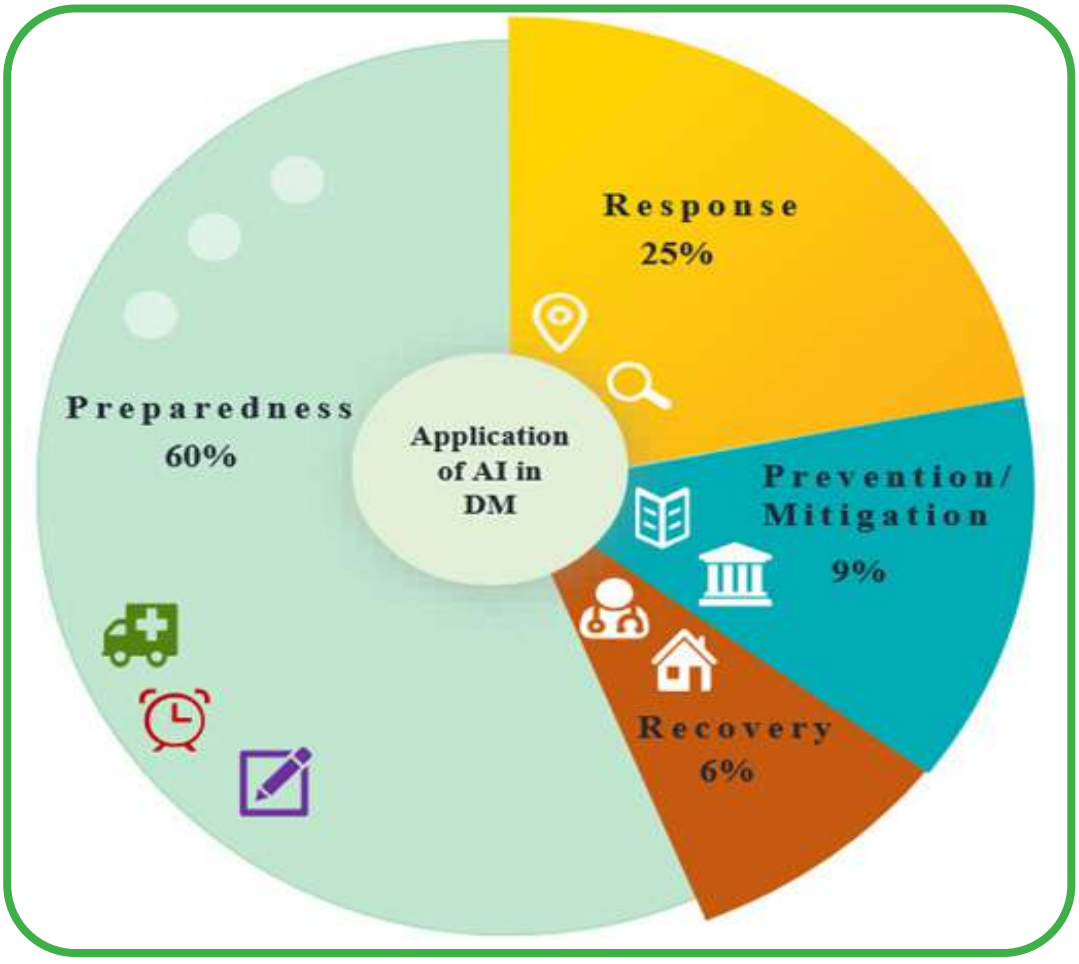


Figure 2: Percentage use of AI techniques in different phases of disaster management (Source: *Gupta and Roy, 2024*)

Challenges in using AI in disaster management

As the AI solutions significantly depend on data for predictions, sending early warnings and analyzing environmental states, the use of good quality data is an essential factor. Issues such as recording data using low quality instruments and having lots of incomplete data lower the accuracy of the output. Having lack of proper instruments and technology for collecting data in some areas, disturbs the data collection process. If the sufficient amount of data is not used for training the algorithms for forecasting, there is a higher probability

of creating wrong predictions. In addition to that, the cost of system developing, testing and maintenance can be a huge cost for the government, which create less motivation. Further, there is need to employ trained staff for data collection, operating the instruments and generating all the necessary information on time. These types of challenges can create some resistance for using AI solutions for disaster management. Hence it is the responsibility of the government and relevant authorities to allocate adequate funding for the adoption of advanced technologies in disaster management and create positive discussions with the communities on using technology for disaster management. The substantial costs associated with post-disaster recovery and rehabilitation efforts often far exceed the initial investment required for developing and implementing such technological systems.

Conclusion

If the disasters can be identified early, all the necessary precautionary actions can be initiated in advance and the loss of human lives and properties can be reduced significantly. AI based systems can be introduced aiming to simulate, detect and forecast disasters. By processing real-time data and identifying real indicators, AI techniques give emergency responders a critical head start, enabling faster and more effective issuance of early warnings to at-risk communities. AI is a powerful tool that helps us find the most vulnerable areas and people. This allows responders to focus their efforts and provide more effective support where it is needed most. AI will support not only to predict but also to determine where it would hit the hardest, which communities are at the most risk and which disaster plans are more likely to fail The ability to anticipate, adapt, and take action has the potential to fundamentally improve how societies prepare for and respond to disasters, creating a path toward greater resilience and sustainability.



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Artificial Intelligence (AI) and food security: growing more food with smarter decisions

Dr Chamila Dias



Can artificial intelligence help feed the world?

Food is one of the basic necessities of life. However, ensuring that everyone has enough, safe, and nutritious food is now becoming increasingly difficult. The world's population continues to grow, while climate change, water scarcity, land degradation, pests, and diseases threaten agricultural production. According to global estimates, nearly 10 billion people may live on Earth by 2050, meaning that food production must increase significantly to meet the future demand.

Artificial Intelligence (AI) is emerging as a powerful tool that can help address these challenges. By analyzing large amounts of data and providing useful recommendations, AI can support farmers, food producers, businesses, and governments in making better decisions. From planting seeds to delivering food to consumers, AI is transforming the way the food is produced, distributed, and consumed.

Imagine a farmer receiving a message on a mobile phone warning that a pest attack is likely to occur in a rice field within the next few days. The farmer acts immediately and prevents major crop damage. Now imagine a computer system that can predict rainfall, recommend the best time to irrigate crops, or help reduce food waste during transportation. These are no longer ideas from science fiction, but they are real applications of AI.

Understanding food security

Food security exists when all people have access to sufficient, safe, nutritious, and affordable food at all times. It is built on four important pillars.

The first pillar is food availability, which means enough food must be produced and supplied. The second is food access, meaning people must be able to obtain food physically and economically. The



Figure 1: AI in the food system: from farm to fork
(Source: *Transforming the food industry | Premium AI-generated image*)

third pillar is food utilization, which refers to food quality, nutrition, and safety. The fourth pillar is food stability, ensuring that food remains available even during difficult situations such as droughts, floods, or economic crises.

Many factors can threaten food security. Extreme weather events can destroy crops. Rising temperatures can reduce yields. Poor storage facilities can lead to food spoilage. Transportation delays can prevent food from reaching markets. Food waste also remains a major global issue. AI has the potential to strengthen all four pillars of food security by helping people make faster, smarter, and more informed decisions.

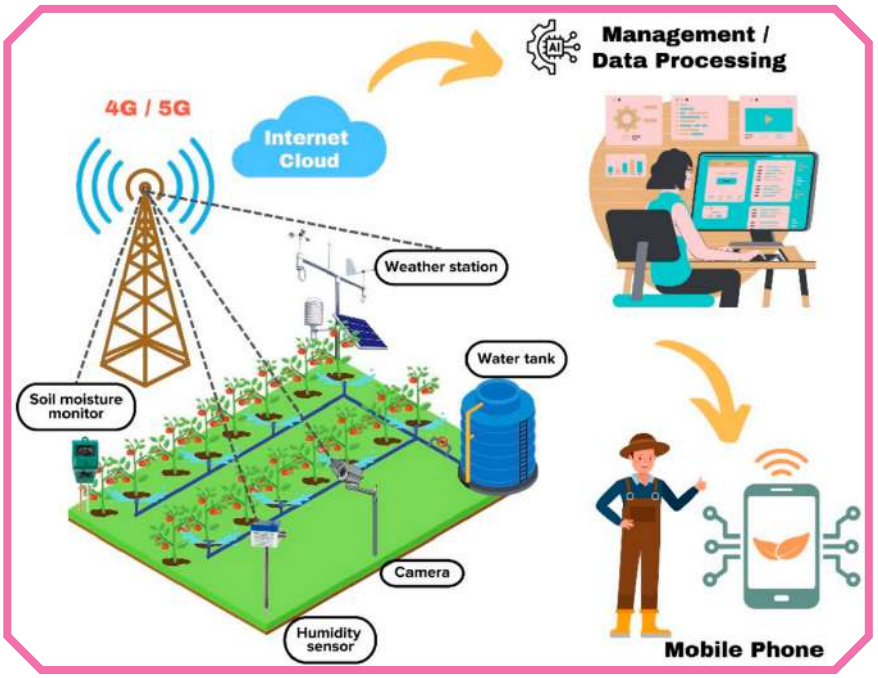


Figure 2: Advanced irrigation hub assisted with real-time weather and moisture sensors and decision support systems.

What is artificial intelligence (AI)?

AI refers to computer systems that can learn from data, recognize patterns, solve problems, and make recommendations. Many people already interact with AI every day through voice assistants, online recommendation systems, navigation applications, and translation tools.

In agriculture, AI works by collecting information from different sources such as satellites, drones, weather stations, cameras, mobile phones, and field sensors. The system then analyzes the data and provides useful insights that help farmers improve productivity and reduce risks.

Instead of replacing farmers, AI acts as a decision-support tool that helps them make better choices.

Smarter farming through precision agriculture

One of the most important applications of AI is the precision agriculture. Precision agriculture involves managing farms based on accurate information rather than guesswork.

Traditionally, farmers often apply water, fertilizer, and pesticides uniformly across entire fields. However, not all areas of a field require the same treatment. Some areas may need more water, while others may require additional nutrients. The AI systems can analyze data from satellites, drones, and field sensors to identify differences within a field. Farmers can then apply resources only where they are needed. For example, sensors placed in the soil can measure moisture levels. If a certain part of the field becomes dry, the AI system can recommend irrigation only for that area. This reduces water use while maintaining crop productivity. Similarly, AI can estimate future crop yields by analyzing weather patterns, soil conditions, and crop growth data. Farmers can use this information to plan harvesting and marketing activities more effectively. The result is the increased efficiency, lower costs, and improved agricultural productivity.

Detecting plant diseases before they spread

Plant diseases and pest attacks cause billions of dollars in agricultural losses every year. Early detection is, therefore, essential because small problems can quickly become major outbreaks.



The AI-powered image recognition systems can help farmers identify diseases at an early stage. A farmer can simply take a photograph of a suspicious leaf using a Smartphone. The AI system compares the image with thousands of examples stored in its database and suggests possible diseases or nutrient deficiencies.

For instance, if a rice leaf shows unusual spots, the system may identify the disease and recommend appropriate control measures. This allows farmers to respond quickly before the problem spreads throughout the field. Early disease detection can reduce crop losses, decrease pesticide use, and improve overall crop health. Such technologies are becoming increasingly accessible through mobile applications, making them useful even for smallholder farmers.

Using AI to predict weather and climate risks

Agriculture depends heavily on weather conditions. Farmers often face uncertainty due to droughts, floods, storms, and changing rainfall patterns.

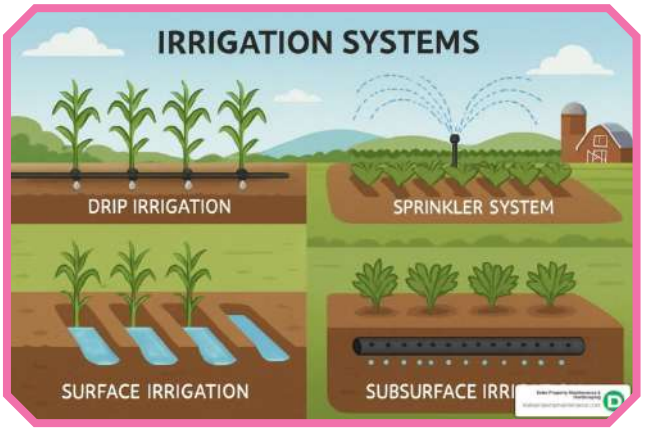
The climate change has made weather conditions more unpredictable, creating new challenges for food production.

AI can analyze historical weather records, satellite data, and climate information to generate forecasts and predictions. These predictions help farmers prepare for potential risks.

For example, if an AI system predicts a prolonged dry period, farmers can adjust irrigation schedules or choose drought-resistant crop varieties. Similarly, early flood warnings allow farmers to protect equipment, livestock, and harvested crops. The governments and the agricultural agencies can also use the AI-powered forecasting systems to develop disaster preparedness plans and strengthen national food security.

Saving water through smart irrigation

Water is one of the most valuable resources in agriculture. Unfortunately, traditional irrigation methods often result in significant water losses. Smart irrigation systems combine sensors, weather forecasts, and AI algorithms to determine when and how much water is required by crops. Instead of following fixed irrigation schedules, these systems respond to real-time field conditions. Water is applied only when necessary, reducing waste and improving the efficiency. This approach is particularly valuable



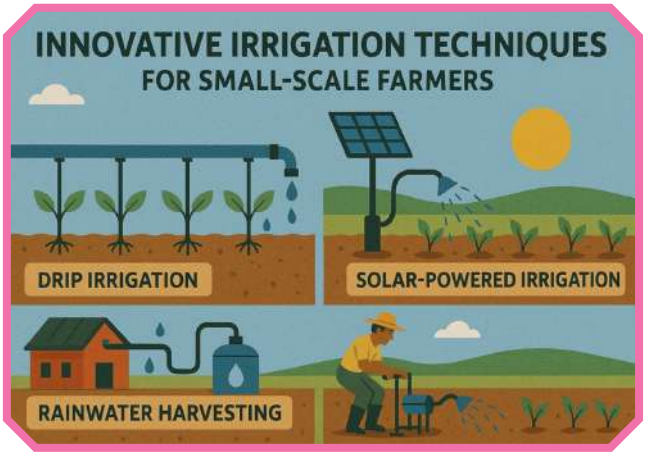


Figure 3: Evolution of traditional irrigation to smart innovative irrigation systems
(Source: *Traditional Irrigation Types*)

in regions affected by water scarcity. By conserving water while maintaining crop yields, smart irrigation contributes to both food security and environmental sustainability.

Robots, drones, and the future farms

Modern farms are increasingly adopting advanced technologies such as drones, robots, and autonomous machinery.

Drones can capture high-resolution images of fields, monitor crop growth, identify problem areas, and even apply pesticides with precision. This allows farmers to cover large areas quickly and efficiently. Autonomous tractors can perform planting and field operations with minimal human intervention. Harvesting robots are being developed to pick fruits and vegetables accurately while reducing labor requirements. Although these technologies are currently more common in the developed countries, the costs involved are gradually decreasing, making them more accessible worldwide. Future farms may combine AI, robotics, and automation to increase productivity while reducing environmental impacts.



Figure 4: Use of drones in agriculture
(*Source: DJI Agriculture Drones: The Future of Sustainable Farming - 1***)**

AI beyond the farm for improving the food supply chain

Food security is not only about growing food. It also involves transporting, storing, processing, and delivering the food efficiently. Large quantities of food are lost after harvesting due to poor storage conditions, transportation delays, and inefficient supply chains.

AI can improve logistics by predicting demand, optimizing transportation routes, and monitoring storage conditions. For example, the AI systems can analyze market trends and estimate how much food consumers are likely to purchase. Retailers can then adjust their inventory accordingly, reducing the waste caused by overstocking. Temperature sensors connected to the AI systems can monitor storage facilities and alert managers, if conditions become unsuitable for food preservation. These improvements help ensure that food reaches the consumers safely and efficiently.

Reducing food waste

Globally, a significant portion of the food produced never reaches consumers. Food waste occurs during production, transportation, storage, retailing, and household consumption. Al can help to address this problem in several ways. Retailers can use the AI systems to predict consumer demand more accurately and avoid ordering excessive quantities of food. Restaurants can analyze customer preferences and reduce unnecessary food preparation. Smart refrigerators can even remind consumers when the food products are approaching their expiration dates. Reducing the food waste not only improves food availability but also decreases the environmental impacts associated with food production.



Figure 5: Post-harvest losses of agricultural produce

Supporting smallholder farmers

Smallholder farmers produce a large share of the world's food, especially in developing

countries. However, they often face challenges such as limited access to information, technology, and financial resources. The AI-powered mobile applications can provide farmers with weather forecasts, pest alerts, market prices, and crop management advice directly through the Smartphone. For example, a farmer can receive a warning about an upcoming pest outbreak or learn where to obtain the best market price for a crop. Such information helps farmers to improve productivity and increase the income. As Smartphone ownership continues to grow, the AI-based advisory services have the potential to benefit millions of smallholder farmers around the world.

Challenges that must be overcome

Despite its many advantages, AI is not a complete solution to food security challenges. One major challenge is the cost of technology. Advanced sensors, drones, and automated equipment can be expensive; particularly for the small-scale farmers. Another challenge is the access to reliable Internet connectivity and digital infrastructure. Many rural communities still have limited access to digital services. Training is also important. Farmers need support to understand and effectively use the AI-powered tools. There are also concerns about data privacy and ownership. Farmers should have confidence that information collected from their farms will be used responsibly. Addressing these challenges will require investments in infrastructure, education, and supportive policies.

The future of AI and food security

The future of AI in agriculture is promising. Emerging technologies such as the Internet of Things (IoT), advanced robotics, digital twins, and satellite monitoring are expected to further improve farming efficiency and sustainability. Researchers are also developing AI systems that can provide personalized recommendations for individual farms. Future technologies may help farmers adapt more effectively to climate change while conserving natural resources. As these innovations become more affordable and widely available, they could play a significant role in strengthening global food security.

Food security remains one of humanity's greatest challenges. Ensuring that everyone has access to sufficient, safe, and nutritious food requires innovative solutions that increase productivity while protecting the environment. AI offers powerful tools for achieving these goals. From precision farming and disease detection to smart irrigation, climate forecasting, and food waste reduction, AI is helping transform food systems around the world. However, technology alone cannot solve food insecurity. Success will depend on collaboration among farmers, scientists, governments, businesses, and communities. By combining human knowledge with intelligent technologies, the society can build more resilient, sustainable, and efficient food systems for future generations. The future of food security may well depend on how wisely we use Artificial Intelligence today.



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Artificial Intelligence (AI) for water security

Dr Kalpana Galappaththi



Imagine standing on the bund of Parakrama Samudraya after a period of heavy rain. The vast expanse of water stretches toward the horizon, just as it did centuries ago. Yet hidden behind this familiar landscape, modern technologies such as satellites, sensors, and Artificial Intelligence (AI) are beginning to change the way water is managed.

Ancient hydraulic civilization of Sri Lanka

From a history spanning more than two thousand years, Sri Lanka has played a prominent role in shaping the Sri Lankan society through water management systems. The ancestors of Sri Lankans have created a very practical network of reservoirs, known locally as "wewa". By connecting canals that carried water across the island, each *wewa* has provided water for agriculture. Without the availability of modern technology, ancestors did this by carefully studying the environment, including rainfall, rivers, landscapes, and seasons. The reservoirs of Anuradhapura and Polonnaruwa still stand today in an active state while providing living proof of their engineering brilliance. These reservoirs enriched agricultural societies and flourishing kingdoms in the past. Ancient masterworks such as *Parakrama Samudraya* reflect the excellent creativity of the ancient Sri Lankan engineers. Reservoirs, streams, waterways, and canals were interconnected to capture, stock, and distribute water across a vast distance. There is a famous quote of King Parakramabahu, which states, *"Not even a single drop of rainwater should flow into the sea without being used for the benefit of the people".*

The quote itself reflects a deep understanding of sustainability that was far ahead of its time.

With the climate changes that make rainfall less predictable, today Sri Lanka faces a different type of challenge. While some regions experience severe floods, some regions endure long droughts. Urban growth, industrial activity, and pollution are placing increasing demand on our water resources. Even as a water-rich country, the question remains the same across generations in Sri Lanka, viz; "How do we use our water wisely and sustainably?"



Figure 1: Ancient Sri Lankan reservoirs (wewa)

With the availability of new tools, satellites, sensors, computers, and AI, the modern engineers have found new approaches for managing water resources. In many ways, AI can be seen as the next chapter in Sri Lanka's long tradition of water engineering.

Why water security matters more than ever

Water is essential for life. Although about 71% of the earth's surface is covered by water, only a very small fraction includes usable freshwater. Even from this small fraction of usable freshwater, less than 1% is readily accessible in rivers, lakes, reservoirs, and shallow groundwater. Water security is not just about achieving water availability, but about ensuring the availability of quality water with reliable supply.

Heavy rainfalls are becoming more frequent, that can influence severe floods causing negative impact on societies and infrastructure. Droughts threaten livelihoods, agriculture, and drinking water supplies. The rapid changing of climate patterns increases uncertainty of water demand forecasting, population growth, urbanization, industrial activities, and pollution increase stress on our limited water resources.

In early Sri Lanka, the water management had to mainly rely on experience and observation. At percent we are equipped with data from weather stations, river gauges, satellites, and monitoring systems, which bring us a huge advantage to establish a better water management system. Nevertheless, we have a new hurdle to overcome at present, where the challenge has transformed from the lack of information to the information processing. To overcome this challenge, AI serves as a powerful tool.

How AI learns about water

AI is not only about robots, but also a very powerful ally in decision-making *via* data analysis. Students learn from examples and exploring relationships, likewise AI. By exploring a vast amount of data, which includes rainfall records, river flows, reservoir levels, and weather patterns, AI is capable of providing predictions on future weather conditions.

The data collection is the starting process of hydrological intelligence. In this phase, AI systems gather information from numerous sources such as weather stations, satellites, sensors, drones, and historical records. This raw data is then forwarded for the data preparation. During the data preparation, cleaning, integrating, and normalizing procedures are done to organize and make the data ready for analysis. Within the AI learning phase, the models such as machine learning and deep learning are used to process the labeled input data for identifying complex patterns and relationships within the water systems. These models then generate insights and predictions, providing valuable outputs that include rainfall forecasting, flood predictions, water quality monitoring, assessments of water availability, and drought conditions. At the final stage, the generated insights and predictions lead to Smart Decisions, empowering human decision-makers to take early and wise actions. By doing so, the decisions can be made on a solid data driven platform for managing reservoir operations, allocating water resources, controlling pollution, and preparing for floods or droughts.

We have to understand that AI is not about replacing engineers,



Figure 2: Sri Lanka faces increasing extremes of flooding and drought

hydrologists, or environmental scientists. It acts as a powerful assistant to make the situation better in less amount of time.

AI as a new guardian of water resources

AI enriches water security in numerous ways. Even though the majority of people never see these systems directly, the latter increasingly facilitate scientists, engineers, hydrologists, farmers, and water managers to understand what is happening within the very complex water systems and to behave more efficiently in rapidly changing conditions.

One of the major challenges in water management is recognizing how much water will be required in the future. The water demand continuously increases with the population growth, expansion of cities, development of industries, and increased farming activities.

The weather conditions also play a significant role. Prior preparation is essential for managing sudden unexpected changes in the global climate such as dry spells or heavy rain. By analyzing historical data with real-time data, AI can recognize climate changes accurately since it provides a solid foundation for decision-making in advance. It is not an easy task for a manual analytical approach, as the data sets are more complex than ever before, with various inputs, which are available from satellite to water level sensors. With help of AI, this complex analysis can become realistic and generate more accurate forecasting in water management.

Continuous monitoring and analysis is another area where AI plays a leading role, for the purpose of identifying anomalies to make water management a proactive approach. Small water leakage may not be visible without continuous monitoring and analysis. Data generated from the sensors that continuously measure the pressure and flow rates can be analyzed by AI to identify unusual patterns that may indicate a leak. Identifying even a small leakage can lead to preventing a major water wastage in the future. The story of the "Kala Wewa" reminds us of how the identification of a small water leak in the water dam prevented a disaster.

The quality of water is another important fact in the discussion of water security. The water demand can be fulfilled not only by the quantity. It is an approach of both quantity and quality. With the help of modern technology, the characteristics of water, such as temperature, acidity, turbidity, and dissolved oxygen level, are visible for AI to analyze. With such analyses, AI can identify water pollution more efficiently. Early identification of water pollution creates space for authorities to respond more rapidly and reduce potential impacts on people and ecosystems.

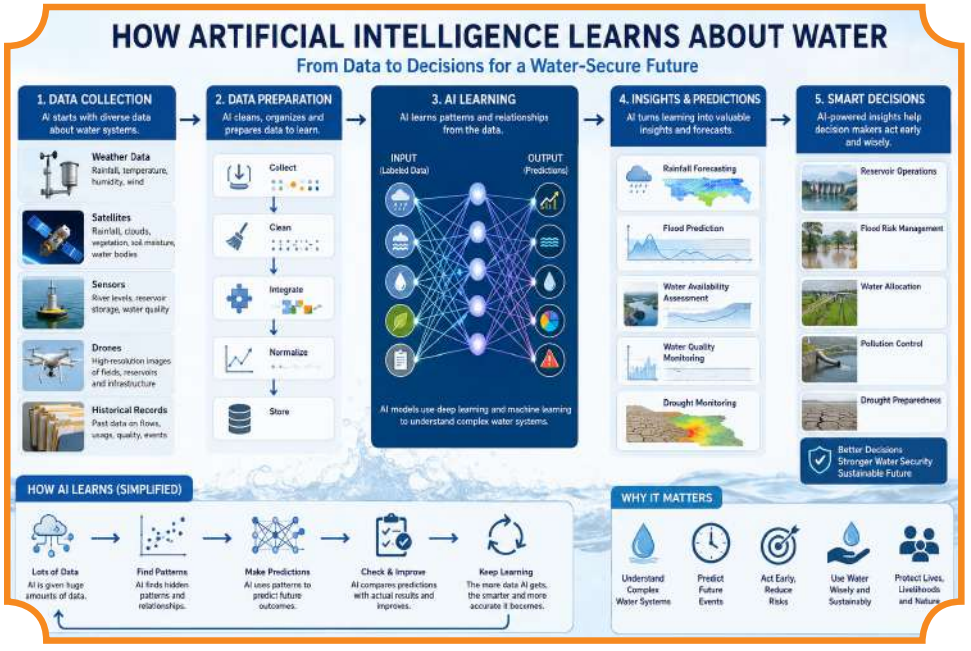


Figure 3: Process of AI learning from data

Nevertheless, agriculture also benefited from intelligent water management. Farmers have always depended on their own experiences, and local knowledge to decide at what time crops need water. Today, AI-integrated real-time water management systems can provide extra support by analyzing weather forecasts, soil moisture conditions, satellite images, and crop information. As a replacement for releasing



Figure 4: Application of AI for water security

water according to predefined fixed schedules, irrigation can be adjusted according to real field conditions. This helps save water while confirming that crops receive adequate water for healthy growth on time.

To reduce the risk from floods and droughts, early identification is a key factor. For this purpose, we need to generate a data set, which includes critical data such as rainfall readings, river flow, soil moisture, reservoir levels, and land use, in the form of real-time and historical data. AI can be used to analyze data for the purpose of generating more accurate forecasting. With such forecasting mechanisms, one can create early warnings to take preventive actions. Even with AI, hoping for a perfect prediction is still not realistic. But with more accurate forecasting, even a pre-warning within a few hours before the hazard, we are can still save life, protect property, and help authorities respond more effectively.

Altogether, these applications show that AI is rapidly becoming worthier than a computer technology. It is gradually growing into a powerful tool that helps society to understand, protect, and manage one of the world's most precious resources. By transforming large amounts of information into valuable knowledge, AI allows better decisions that support water security for societies, agriculture, industry, and the environment.

A future scenario for Sri Lanka

Let us think of a scenario in the near future viz., the AI-assisted predicting systems forecast heavy rainfall over the Central Province of Sri Lanka. The weather stations have been reporting the increase of rainfall, while satellites have shown dense cloud formation over the Province. The sensors located in the Mahaweli River have been detecting rising water levels. An AI platform is processing these data in real time to compare it with the past flood events. Within seconds, the system will be identifying a high risk of downstream flooding in the next 24 hours.

The reservoir managers are receiving recommendations on controlled water releases. Moreover, disaster management authorities are receiving early warnings. Farmers in the danger zone have been alerted through mobile apps. Also, communities in vulnerable areas will receive timely evacuation or safety notices.

Simultaneously, the AI system estimates future reservoir storage and advises on managing flood control and hydropower needs. Human decision makers remain in control. Hence, they now have a reliable data and information foundation for the decisions they are going to make.

In the near future, this will no longer be a science fiction. Advances in sensors, communication networks, cloud computing, and AI are increasing the practicality and reliability of such a water management system.

The Mahaweli system, where AI would make a real difference

When people think of using AI for water management in Sri Lanka, one project that stands

out immediately is, the Mahaweli Development Programme. As the country's biggest multipurpose river basin development project, the Mahaweli system supports irrigation, drinking water supply, hydropower generation, and flood management across a large part of the country.

Managing such a complex system is not an easy task. The water managers must make decisions continuously as to how much water should be stored, released for irrigation, or used for electricity generation. These decisions depend on large amount of factors, including rainfall forecasts, reservoir water levels, river flows, water requirements of agricultural practices, electricity demand, and environmental conditions. Making the right decision at the right time is often challenging due to weather conditions, which can rapidly change and many other factors that need to be considered simultaneously.

AI can scan thousands of data points simultaneously and identify patterns that would be difficult for humans to separately identify. By analyzing real time data from relevant different data sources and historical records, the AI systems can provide real-time actual conditions across the entire Mahaweli basin instead of analyzing each source of data separately. This is where AI could play a major role.

Another important application is the automating reservoir operation. AI can forecast weather and predict how much water is likely to receive by reservoirs in the coming days or weeks or months. Based on this information the AI system can automatically control as to whether water should be stored, released, or transferred to other parts of the Mahaweli system.

Currently, reservoirs within the Mahaweli project play a vital role in electricity generation. With the integration of AI for forecasting inflows, electricity demand etc., it is possible to make recommendations on the best operating strategies that increase power generation while confirming that a sufficient amount of water remains available for domestic use and agriculture.

Agriculture is one of the leading beneficiaries of efficient water management. With the ability of AI to combine weather forecasts, soil moisture information, satellite imagery, and crop data to estimate irrigation requirements more accurately, the release of water can be scheduled to comply with real demand instead of following a fixed schedule. This kind of approach leads to reduce wastage of water while supporting agricultural productivity.

Flood mitigation is another important area, which can be addressed with the integration of AI. The AI systems can analyze data to identify areas at high risk of flooding. During heavy rain seasons, the automated reservoir operators can receive recommendations on water releases prior to critical situations, while disaster management authorities can issue prior warnings to relevant communities. Therefore, reliable early warning systems can



Figure 5: AI can add value to the Mahaweli system

significantly improve community safety while decreasing the damage.

During drought conditions, AI can identify evolving shortages before they develop severely. Authorities will then be able to implement conservation actions, adjust water distributions, and develop contingency plans well in advance.

More than half a century ago, the Mahaweli Development Programme transformed Sri Lanka's approach to water resource management. In the near future, AI possesses the potential to become the next major step in the said journey, serving the country to manage its most valuable resource with better efficiency, resilience, and sustainability.

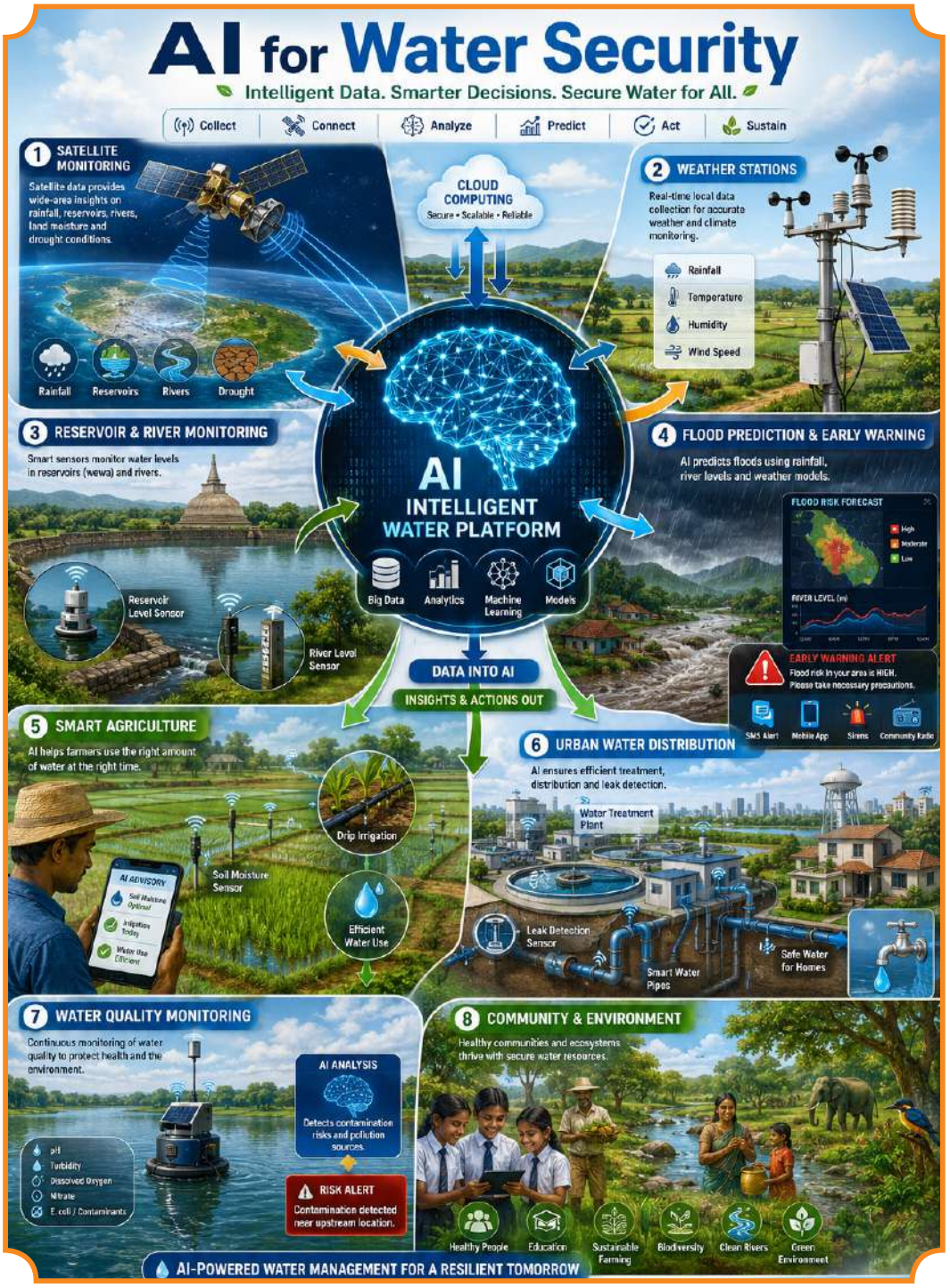


Figure 6: AI for a water management system in the future

The next chapter of Sri Lanka's water heritage

Although the development of water management systems in Sri Lanka continues from the ancient Wewa era, at present, the approach involves science, engineering, and technological innovation. The ancient engineers observed the environment to make decisions, the engineers today are equipped with new technologies such as satellites, sensors, computer models, and digital dashboards. Ensuring the

availability of quality water when and where it is needed remains the core concept of the water management system.

AI is not about replacing humans with robots. Instead, it is a new tool that complements human expertise. With the combination of Sri Lanka's hydraulic heritage and modern technology, Sri Lanka has the potential to build a more resilient and sustainable water management system in the future.

Conclusion

For any country, the ability to manage water intelligently has been one of the greatest strengths. Water has always molded the prosperity in Sri Lanka, throughout the history. New challenges such as rapid climate changes, population expansion, and modernized agriculture etc., demand novel solutions for water security.

AI stands as a valuable technology that can help us in achieving sustainable water security. Forwarding data collected from satellites, sensors, weather stations, and water management systems, to AI for analysis, can support to make better decisions with a solid platform, improve efficiency, and provide early warnings of potential problems. The better decisions that lead to helping farmers use water more efficiently, protecting communities from floods, monitoring drought conditions, would support the operation of large reservoir networks. Thus, AI offers a new approach to save this precious water resource.

More than a thousand years ago, Sri Lankan engineers built extraordinary water systems without modern knowledge and tools. Today, we have the opportunity to combine that same spirit of innovation with modern AI technologies. If used wisely, AI can help ensure that future generations continue to benefit from clean, reliable, and sustainable water resources. In doing so, we are not replacing the wisdom of the past, but we are rebuilding upon it.



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Artificial Intelligence (AI) for industrial safety

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Introduction: the limits of traditional safety

Industrial environments are inherently complex and risky. From construction sites to factory floors, safety depends on the coordination of people, machines, and environmental conditions. Over the years, regulations, inspections, and training programmes have reduced many risks. Yet, accidents continue to occur, often due to factors that were either unnoticed or recognized too late.

A key limitation of traditional safety systems is that they are largely reactive. Incidents are analyzed after they happen, and improvements are introduced to prevent recurrence. While necessary, this approach does little to prevent the first occurrence. Human supervisors, no matter how experienced, cannot continuously observe every worker, every machine, and every condition across a large industrial environment.



Figure 1: Evolution of industrial safety: from reactive response to predictive prevention using AI.

Artificial Intelligence (AI) introduces a different approach. Instead of depending solely on periodic inspections, AI enables continuous monitoring and early detection of risks. More importantly, it allows organizations to anticipate unsafe situations before they develop into incidents.

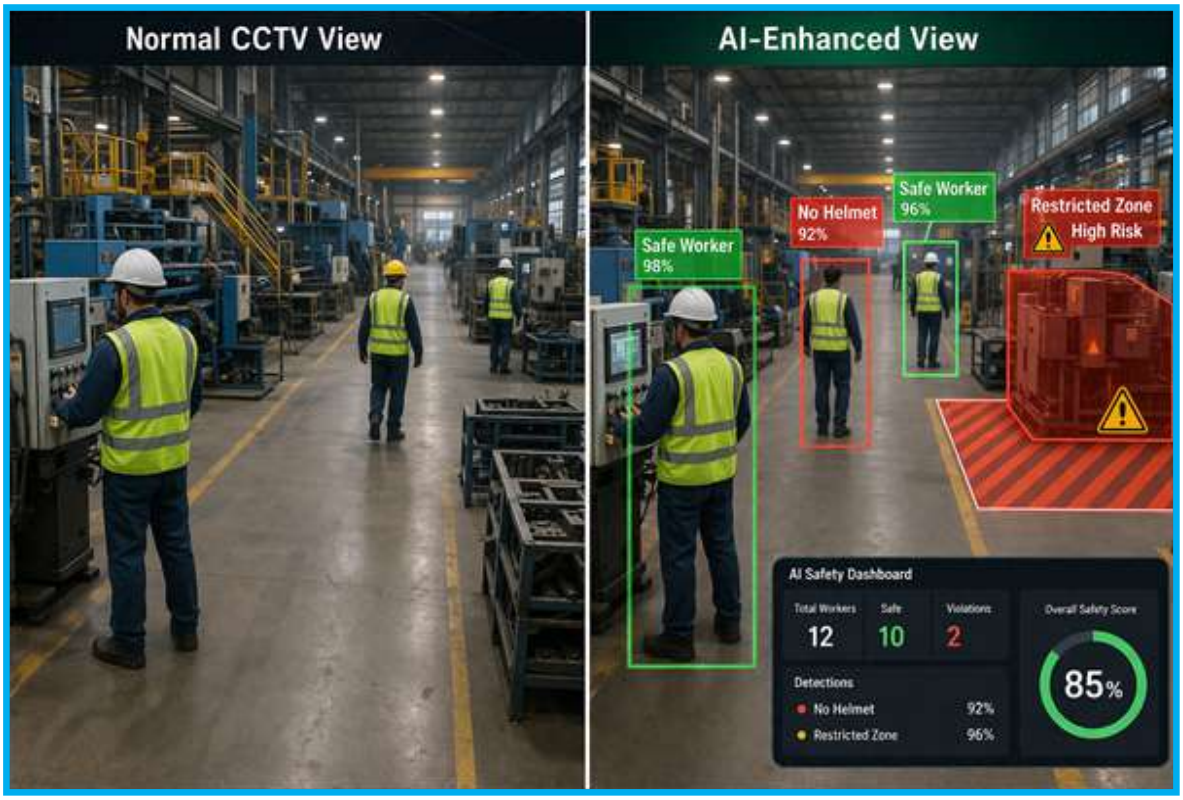


Figure 2: AI-based computer vision identifying safety violations in real time.

How AI enhances industrial safety in practice

One of the most widely adopted applications of AI for industrial safety is the computer vision. For example, in a large manufacturing plant, cameras installed above assembly lines can automatically detect whether workers are wearing helmets, gloves, or safety vests. If a worker enters a high-risk zone without proper equipment, the system can immediately trigger an alert to a supervisor. This removes the need for constant manual checking.

In construction sites, AI systems are being used to detect the fall risks. Cameras can identify whether workers are operating at height without harnesses or whether scaffolding areas are overcrowded. In some deployments, near-miss events such as a worker stepping into the path of a moving crane are automatically logged and analyzed. These insights help site managers identify patterns, such as the specific times of day or the locations where risks are higher.

Another example comes from warehouses and logistics centres. In such environments, accidents often occur due to interactions between workers and forklifts. AI-based systems can track both workers and vehicles in real time. If a worker comes too close to a moving forklift, the system can issue a warning to both the driver and the worker, sometimes even slowing down the vehicle automatically. These examples illustrate a key point: AI does not merely observe. It can be used to intervene at the right moment.

From detection to prediction: moving one step ahead

Beyond real-time monitoring, AI enables a shift toward prediction. In industrial equipment, sensors continuously monitor variables such as vibration, temperature, and pressure. Consider a thermal power plant or a cement factory. A slight but consistent increase in vibration in a rotating machine may not be noticeable to operators, but AI models can detect it as an early sign of mechanical failure. If such a failure occurs suddenly, it could lead not only to production loss but also to serious safety hazards for nearby workers. By predicting the issue early, maintenance can be scheduled

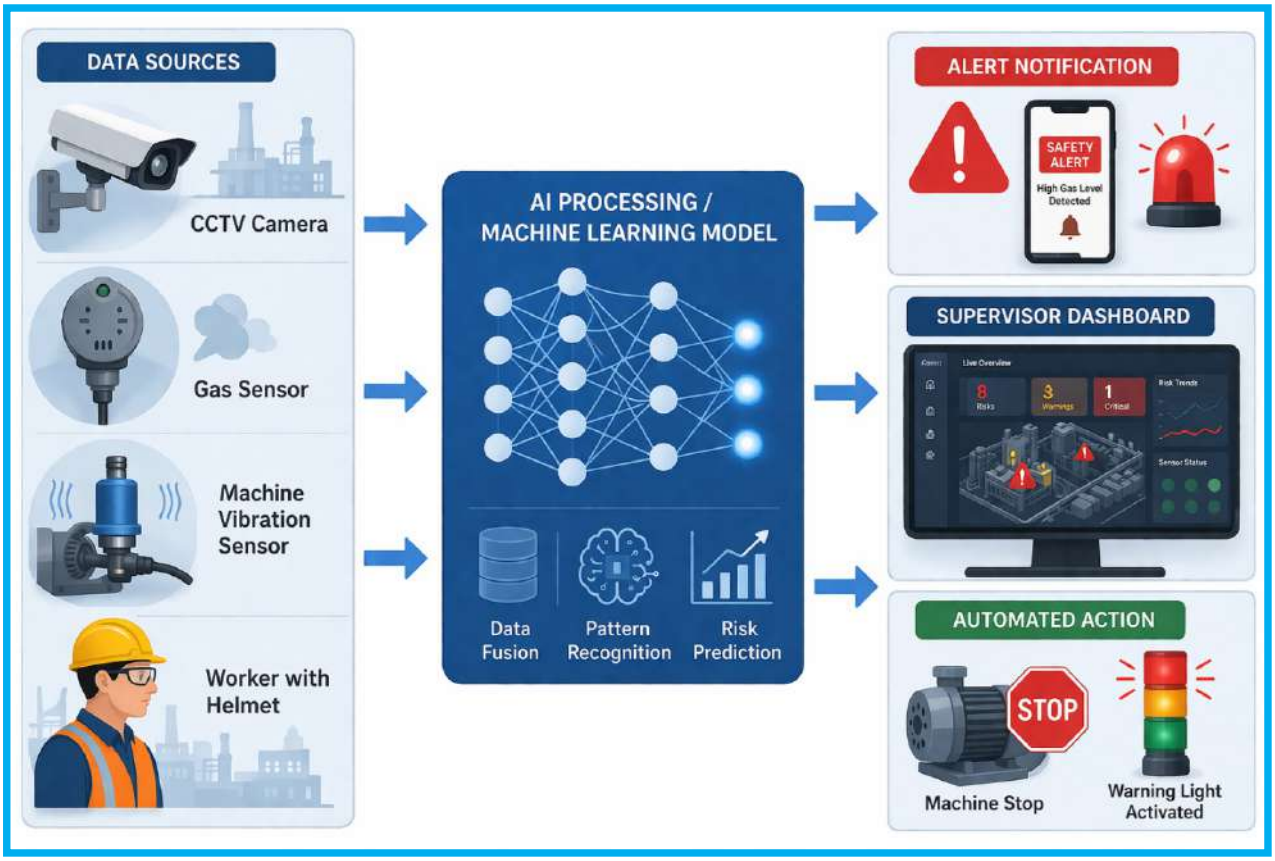


Figure 3: Typical architecture of an AI-driven industrial safety monitoring system.

before the situation becomes dangerous.

In the oil and gas sector, predictive models are used to monitor gas leaks. Instead of relying only on threshold-based alarms, AI systems analyze patterns in gas sensor readings. Subtle deviations from normal patterns can indicate early-stage leaks, allowing intervention before concentrations reach dangerous levels.

Another emerging example is the fatigue detection. In long-duration operations such as mining or transport logistics, worker fatigue is a major safety risk. AI systems using cameras inside vehicle cabins can detect signs such as eye closure patterns or head movements that indicate drowsiness. When such patterns are detected, the system can alert the operator or even trigger safety protocols. These capabilities demonstrate how safety can move from responding to hazards toward anticipating them.

Applications across industries: real-world impact

AI-based safety systems are now being used across multiple sectors, each addressing specific risks. In mining operations, autonomous haul trucks are increasingly being deployed. These vehicles navigate large mining areas without human drivers, reducing the risk of accidents caused by fatigue or human error. At the same time, AI systems monitor the surroundings to ensure that human workers are not within unsafe proximity.

In manufacturing, the robotic arms are often used alongside human workers. Modern AI-enabled systems ensure safe collaboration by continuously monitoring the distance between humans and machines. If a worker moves too close to a robotic arm, the system can slow down or stop the machine instantly.

In the construction industry, drones equipped with AI are being used to inspect sites. Instead of sending

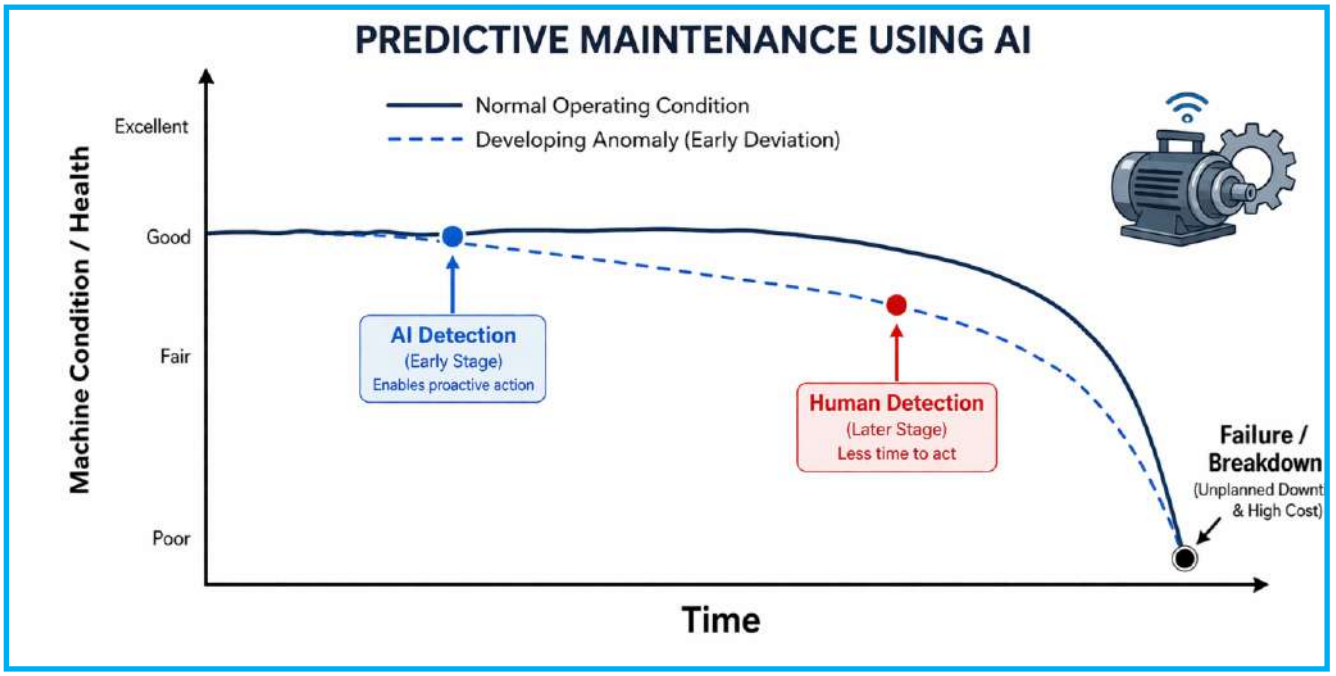


Figure 4: AI detecting early signs of equipment failure before visible breakdown occurs

workers into unstable or hazardous areas, drones can capture images and identify risks such as structural instability, unsafe material storage, or blocked emergency pathways.

Closer to the Sri Lankan context, similar approaches can be applied in industries such as apparel manufacturing, where worker density is high, or in the port operations, where heavy machinery and human activity coexist. For instance, AI systems can monitor container handling operations to detect unsafe positioning of workers relative to cranes and vehicles.

Across all these cases, the impact is not only in preventing accidents but also in improving awareness of risk patterns that were previously difficult to observe.

Challenges and ethical considerations

Despite its potential, the adoption of AI in industrial safety is not without challenges. One of the main technical issues is variability. A system trained to detect safety helmets in one environment may struggle in another with different lighting or camera angles. Ensuring consistent performance across sites requires careful design and continuous refinement.

Integration is another challenge. Many industrial facilities rely on older systems that were not designed for modern data-driven technologies. Incorporating AI into such environments requires both technical expertise and organizational commitment.

Equally important are the human aspects. Continuous monitoring can raise concerns about privacy and surveillance. If workers feel that AI systems are being used to monitor them too closely, rather than ensure their safety, resistance is likely.

To address this, organizations must be transparent about how systems are used. In many implementations, systems are designed to detect actions rather than identify individuals. Data can also be processed locally without long-term storage, reducing privacy risks. Ultimately, AI should be positioned as a tool for protection, not control.

Looking ahead: safer systems, and smarter decisions

The future of industrial safety lies in the integration of intelligence

across systems. AI is moving toward combining multiple data sources such as video, sensors, operational logs etc., into unified platforms that provide a comprehensive understanding of safety conditions. Instead of isolated alerts, systems will increasingly provide context-aware insights. For example, a combination of high temperature, increased machine vibration, and worker proximity could trigger a higher-level risk alert.

Another likely development is the emergence of real-time safety assistants. These systems could guide supervisors and workers by providing recommendations based on current conditions. For instance, suggesting temporary shutdowns, rerouting workflows, or adjusting staffing in high-risk areas. However, the success of these systems depend not only on technology but also on how they are integrated into practice. Safety remains a human-centred responsibility, and AI should enhance, not replace, human judgement.

Conclusion

Artificial Intelligence is transforming industrial safety by enabling a shift from observation to prevention. Through continuous monitoring, pattern recognition, and predictive capabilities, AI allows risks to be identified and addressed before they lead to incidents.

The real value of this transformation lies not in efficiency or automation, but in its impact on human lives. Every avoided accident, every prevented injury, and every safer workplace represents the true success of these systems.

As industries continue to evolve, AI offers an opportunity to move beyond reactive safety practices and build environments where safety is embedded into every moment of operation.



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Beyond the rocks: the life and legacy of Emeritus Professor C.B. Dissanayake

Prof. Rohana Chandrajith



The late Emeritus Professor C.B. Dissanayake stands among Sri Lanka's most distinguished scientists, a pioneer in geology whose influence extended far beyond the classroom and laboratory. Yet, behind the academic titles and global recognition, he was a man deeply devoted to family, community, and the pursuit of knowledge. He was not only a towering figure in geology but also a gentle, generous soul whose life touched countless others in quiet, meaningful ways. Professor C.B. Dissanayake will be remembered not just for his remarkable scientific achievements but for the warmth and humanity that defined him.

Born on January 8, 1944, in Kurunegala, his journey began with promise and purpose. Educated at Trinity College, Kandy, he entered the University of Ceylon, Peradeniya Campus, in 1964, where his academic brilliance quickly became evident. Initially trained in chemistry, he later followed his true calling in geology, becoming the first student to graduate with a First Class Honours degree in Geology in Sri Lanka. It was an early sign of a life destined for excellence, marking the beginning of a remarkable journey in earth sciences. His academic pursuits took him to the University of Oxford, where he earned his Doctor of Philosophy (DPhil) in geochemistry. In 1991, Oxford further recognised his exceptional contributions by awarding him the prestigious Doctor of Science (DSc) degree for his work in applied geochemistry, particularly in environmental and hydrogeochemistry.

Professor Dissanayake's professional life was closely tied to the University of Peradeniya, where he served with distinction as a Lecturer, Researcher, Professor, and eventually Head, and Emeritus Professor of the Department of Geology. Over the decades, he mentored generations of students while advancing research that brought international attention to Sri Lankan geology. His work spanned environmental geochemistry, medical geology, groundwater studies, and mineral resources of Sri Lanka. Importantly, his research connected science with society, addressing issues such as water quality and its implications for human health. With more than 200 publications in international journals and numerous books to his name, Professor Dissanayake's scholarly contributions are both extensive and influential. He presented over 100 research papers at conferences worldwide, firmly establishing Sri Lanka on the global geoscience map.His research explored diverse areas, including groundwater geochemistry and disease, the origins of graphite, gemstones, and gold deposits. His work not only advanced scientific understanding but also had tangible societal benefits. His remarkable contributions included the Hydrogeochemical Atlas of Sri Lanka, published by the National Science Foundation (then NARESA), and Introduction to Medical Geology, published by Springer, Germany. In addition, he

had authored several books related to Sri Lanka's mineral resources, particularly the gem resources.

At home, Professor Dissanayake was a loving husband and father who placed great importance on family life. Despite the demands of an illustrious career, he remained closely connected to his wife and daughters, nurturing a warm, curious, and learning environment. Those who knew him personally often recall his generosity, kindness, and ease at bringing people together. Whether among colleagues, students, or friends, he was known for his hospitality and genuine human connection. Yet he carried his achievements lightly, never allowing recognition to overshadow his humility.

Yet, despite these global accolades, he remained deeply rooted in Sri Lanka, dedicating his life to advancing knowledge and nurturing young minds at the University of Peradeniya.For decades, Professor Dissanayake also served as the Director of the National Institute of Fundamental Studies (NIFS) in Kandy several times. Many generations of students remember him not only for his intellect but also for his ability to inspire, making science come alive with relevance and purpose. He believed that knowledge should serve society, and his work reflected this conviction.

His engagement with society was equally remarkable. He played an active role in organisations such as the Lions Club of Kandy, and the Alliance Française de Kandy, contributing to charitable and cultural initiatives. He also held several leadership roles, including President of the Geological Society of Sri Lanka, and contributed actively to scientific and community organisations. His leadership helped elevate both scientific research and public awareness in the country.

In recognition of his immense contributions, Professor Dissanayake received numerous accolades, including the Vidya Jyothi, Sri Lanka's highest national honour for scientific achievement. He was also awarded honorary Doctor of Science degrees by the University of Peradeniya and the Sabaragamuwa University of Sri Lanka.These honours reflect not just his academic excellence, but the lasting impact of his dedicated work on science and society. In addition, he received many awards and fellowships. Among these are the fellowships from Alexander von Humboldt Foundation, Germany; World Academy of Sciences (TWAS), Italy; and the National Academy of Sciences, Sri Lanka.

Professor C.B. Dissanayake's legacy lies not only in his scientific achievements but also in the way he lived, with integrity, generosity, and purpose. His contributions continue to shape geology in Sri Lanka and beyond, while his personal values remain an enduring example for all.

He may no longer walk among us, but his influence, like the very earth he studied, remains deeply embedded and ever enduring. Professor Dissanayake's life is a powerful reminder of what it means to live with purpose. He pursued excellence not for personal gain, but for the betterment of others. He gave freely of his knowledge, time, and kindness, and in doing so, he left behind a legacy that will endure far beyond his years. As we bid farewell, we remember a scholar of great distinction, a teacher of lasting influence, and above all, a human being of exceptional grace. His absence will be deeply felt, but his spirit will continue to inspire quietly, steadily, and profoundly.

He may be gone, but the light of his soul remains.



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What have you learnt from the Vidurava April 2026 Issue? Scan your own memory!

1] **Leapfrog or fall behind: Sri Lanka's moment to embrace Artificial Intelligence (AI)**

True or False

1. The generative AI refers to a category of artificial intelligence systems that produce new content such as texts, images, audio, and many more.
2. Sri Lanka's AI adoption rate stands at approximately 10.8 percent, compared to a global average of 16 percent.
3. For the first time in history, people with no technology background can talk directly to a powerful AI system and get results of the highest quality.
4. The countries now building competitive advantage in medicine, agriculture, education, finance, and governance are doing so with AI.
5. The most capable AI tools require paid subscriptions priced in US dollars, which is insignificant relative to Sri Lankan incomes.

2] Artificial Intelligence (AI) for disaster mitigation: how smart technology helps save lives

True or False

1. By analyzing large amount of data, identifying patterns, and providing early warnings, AI can helps predicting disasters, improving emergency response, and supporting recovery efforts.
2. Mitigation parameters include building codes assessment, vulnerability analysis, hazard- zonation mapping, land use management, risk mapping only.
3. Flood prediction benefits from deep learning frameworks and video based severity classification systems that generate timely warning alarms using rainfall, soil and environmental data.
4. The applications in AI in disaster management are not composed with diverse methods of overcoming the challenges in disaster prediction, mitigation and response.
5. In CBRN disasters, machine learning algorithms are used for analyzing sensor data and detecting CBRN compounds quickly and accurately.

3] Artificial Intelligence (AI) and food security: growing more food with smarter decisions

True or False

1. Food security is not only about growing food but also involves transporting, storing, and processing the food efficiently.
2. In agriculture, AI works by collecting information from different sources such as satellites, drones, weather stations, cameras, mobile phones, and field sensors.
3. By analyzing large amounts of data and providing useful recommendations, AI can support farmers, food producers, businesses, and governments in making better decisions.
4. The AI system compares an image with thousands of examples stored in its database but may not able to suggest possible diseases or nutrient deficiencies.
5. AI can analyze historical weather records, satellite data, and climate information to generate forecasts and predictions, which help farmers prepare for potential risks.

4] Artificial intelligence for water security

True or False

1. With the climate changes that make rainfall less predictable, today Sri Lanka faces a different type of challenge with some regions experiencing severe floods, while other regions enduring long droughts.
2. By exploring a vast amount of data, which includes rainfall records, river flows, reservoir levels, and

weather patterns, AI is incapable of providing predictions on future weather conditions.
3. The modern engineers have found new approaches for managing water resources with the availability of new tools, satellites, sensors, computers, and AI.
4. Continuous monitoring and analysis is another area where AI plays a leading role, for the purpose of identifying anomalies to make water management a proactive approach.
5. AI is about replacing engineers, hydrologists, or environmental scientists and it acts as a powerful assistant to make the water crisis situation better in less amount of time.

5] Artificial Intelligence (AI) for industrial safety

True or False

1. Instead of depending solely on periodic inspections, AI enables continuous monitoring and early detection of industrial risks.
2. Artificial Intelligence (AI) introduces a different approach by not depending solely on periodic inspections, but still unable continuous monitoring and early detection of risks.
3. In the industrial sector, from construction sites to factory floors, safety depends on the coordination of people, and machines only.
4. In a thermal power plant or a cement factory, a slight but consistent increase in vibration in a rotating machine may not be noticeable to operators, but AI models can detect it as an early sign of mechanical failure.
5. In manufacturing, the modern AI-enabled systems ensure safe collaboration by continuously monitoring the distance between humans and machines.

Answers

01) 1. True, 2. False, 3. True, 4. True, 5. False
02) 1. True, 2. False, 3. True, 4. False, 5. True
03) 1. False, 2. True, 3. True, 4. False, 5. True
04) 1. True, 2. False, 3. True, 4. True, 5. False
05) 1. True, 2. False, 3. False, 4. True, 5. True



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