

ARTIFICIAL INTELLIGENCE RESEARCH CENTRE



A professional headshot of a man with dark hair, smiling, wearing a grey suit jacket, a white shirt, and a yellow tie. The background is a plain, light grey color.

Our Chancellor

My sincere gratitude to all contributors for their valuable articles, making this magazine a true reflection of innovation and excellence. I encourage everyone to read and engage with these transformative ideas

Mr. Praveen K. Pula.

A portrait of a man with dark hair, a beard, and glasses, wearing a dark blue button-down shirt. He is smiling slightly and has his arms crossed. The background is a plain, light grey color.

Our Vice President

We extend our deepest appreciation to the contributors whose expertise and creativity have made this edition a remarkable showcase of innovation and knowledge.

Dr. Raul Villamarin Rodriguez

A man with a mustache, wearing a dark suit, white shirt, and dark tie, stands with his arms crossed. He is wearing a watch on his left wrist. The background is a wall with a grid of small, square icons, each containing a different symbol or character. The overall tone is professional and modern.

Our Director

We invite you to explore these cutting-edge ideas and groundbreaking perspectives that shape the future of AI and technology.

Don't miss out—dive in and be inspired!

Dr. Hemachandran K.

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From the Editor

It is with immense pride that we present the inaugural edition of the Artificial Intelligence and Research Centre's Magazine. This publication marks a significant milestone for the Centre as we aim to share groundbreaking insights and thought-provoking perspectives on one of the most transformative technologies of our time: Artificial Intelligence.

The featured articles explore AI's diverse applications across disciplines, including education, healthcare, business, science, technology, law, architecture, and urban planning. Each piece offers a unique lens, fostering human ingenuity and addressing complex societal challenges.

This magazine is not merely about technology—it is fundamentally about people. It celebrates the researchers, visionaries, and pioneers who are pushing the boundaries of AI, inspiring us to envision ethical and collaborative applications across disciplines.

As you explore this edition, we hope you find inspiration in the stories of innovation, creativity, and purpose that define the essence of AI. It is our sincere hope that this magazine serves as a platform for meaningful dialogue, sparking curiosity and fostering connections within the global AI community.

We invite you to immerse yourself in this exciting journey of discovery and innovation.



The Editorial Team



Explorer's Edge

AI Research Centre

01



AI research continues to break new ground, exploring the untapped potential of machine learning, neural networks, and deep learning. This section highlights the latest advancements in AI research, showcasing how researchers are developing intelligent systems that learn, adapt, and solve complex problems across industries.

FEATURING

DR. DEBAJYOTI BOSE, MISS. ANAMYA N S,
DR RIYA BHATTACHARYA, DR. PRANJALI GAJBHIYE

AI Research Centre



Reimagining the Water-Energy Nexus and Microbial Fuel Cells through the lens of Artificial Intelligence and Machine Learning

BY DR. DEBAJYOTI BOSE | AI RESEARCH CENTRE, WOXSEN UNIVERSITY



“In India, China, and the United States, researchers are investigating scaling-up and commercialization potential using AI-driven simulations while coming up with novel MFC architectures and configurations.”

Don Corleone, the iconic character from "The Godfather," might describe the energy and water infrastructure in a manner that reflects his shrewd business acumen and pragmatic perspective. He probably would have said, "You see, my friends, energy and water, they're not just commodities; they're the foundation of our society. And those who control them, they hold the power."

Now, I'm not asking for favors; I'm asking for wisdom. Invest in our infrastructure, and you'll reap the rewards. Neglect it, and you'll suffer the consequences." His words, laced with wisdom and a hint of intimidation, convey the importance of prioritizing energy and water infrastructure for the well-being of society. Over the years, the growing global population and industrialization have

created issues about universal access to water and energy resources. There are over six billion people on the planet, with 9.4 billion projected for 2050. And there is no “magic bullet” to meet our energy and water needs. However, given such a long timeframe, it is likely new technologies coupled with artificial intelligence (AI) and machine learning (ML) could change this economic assessment. Every household and industry generates significant amounts of wastewater from everyday processes; these wastewater streams are treated in treatment plants using expensive chemicals. These are called microbial fuel cells, or MFCs. They use the breakdown processes of microbes in wastewater to turn organic materials into electricity. Novel MFC technologies have been effective in extracting energy from wastewater with bioelectricity in the range of 1500–3500 mW/m², or 1.5–3.5 Watts of electricity per square meter of the anode. With contamination removal reported in some studies as high as 85–90%.

Researchers in the last decade have experimented with different combinations to boost efficiency. Hence, AI can help model complex MFC systems using differential and algebraic equations. It can also help in forecasting power output and longevity of MFCs based on historical data. An important part of such research is to study these electron-producing microbes; experimental design and hypothesis generation using data-driven insights is now possible with AIML techniques. Modeling and simulation are important tools for analyzing complex systems and solving real-world problems. For MFCs, currently some investigators are working on developing computational models to simulate performance under different conditions in Belgium. In India, China, and the United States, researchers are investigating scaling-up and commercialization potential using AI-driven simulations while coming up with novel MFC architectures and configurations. Application areas for AIML-assisted MFC R&D include bioenergy production and wastewater treatment, bioremediation, and biosensing. The techniques used in these studies are a combination of supervised and unsupervised learning, deep learning including neural networks and convolutional neural networks, reinforced learning, and genetic algorithms. Some popular tools employed by the investigators include Python libraries such as scikit-learn and TensorFlow, the R programming language, MATLAB, and genome-scale modeling tools such as COBRA. Following that, researchers can speed up the development of MFCs, enhance efficiency, and uncover new applications—all of which will ultimately drive innovation in bioenergy and environmental sustainability—by utilizing AI and ML. Much work remains to be done, but hopefully we will agree that there is a bright and promising future for bioenergy that can form the foundation of a new generation of novel waste-to-energy extraction and global sustainability.

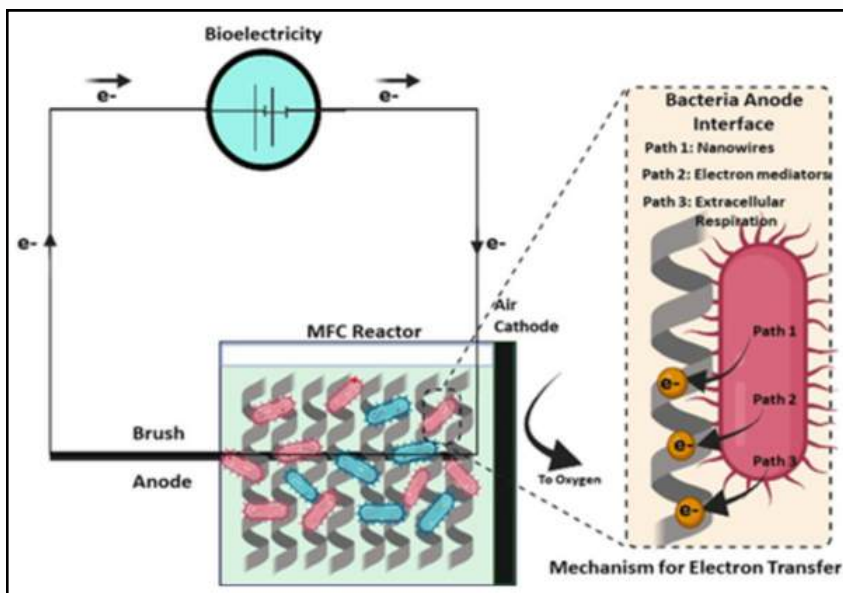


Fig: In an MFC, microbes oxidize organic matter on an electrode, producing electrons that travel through a series of respiratory enzymes, making energy for the cell in the form of ATP. Released electrons from the bacteria are accepted by the anode; they then travel the external electrical circuit and are reduced at the cathode. Bioelectricity is harnessed by putting an energy harvester in the middle of this circuit.

Antibiotic Resistance: A Complex Challenge

BY MISS. ANAMYA N S | AI RESEARCH CENTRE, WOXSSEN UNIVERSITY



Antimicrobial resistance (AMR) is a growing threat globally; countries with low to middle income are experiencing serious gaps in accessing resources and managing knowledge transfer; this, along with an increasing number of deaths associated with AMR, affects their growth and development in public healthcare.

The pandemic is worsening the situation side by side, and immediate cooperation from different science and technology sectors is required to fight against it. In South Asia in 2019, Globally, 1.27 million deaths were reported in 2019 alone associated with AMR. There is a considerable increase in bacterial and biofilm-associated multidrug resistance. The lengthy antibiotic and drug discovery process puts pressure on the healthcare system to manage this situation, and limited therapeutic measures are available to face this threat. Coupled with the high prevalence of self-medication, improper hospital and laboratory wastewater management has contributed to antimicrobial resistance genes (ARGs) proliferation. The wastewater disposal system becomes a breeding ground because urban and hospital wastewater is not treated or disposed of separately; this leads to the transfer of ARGs through plasmids. India is one of the 3rd world countries that is primarily affected by AMR because it is one of the largest producers and consumers of antibiotics

Considering the data evaluated between 2000 and 2018, the median usage of antibiotics increased from 48% to 67%. India is disproportionately taking the burden of AMR, considering that across 204 countries, the age-standardized mortality rate per 100,000 in India is the 60th highest globally and third highest among the five countries in South Asia in 2019.

A study on five hospitals in North India conducted by the Interdisciplinary Biotechnology Unit, Aligarh Muslim University and Washington University School of Medicine, St. Louis, Missouri, USA, showed that lack of wastewater management and open drainage systems in India have become a breeding ground for the transfer of ARGs and severe issues related to clinically relevant bacterial strains. Globally, this issue is being faced, like hospitals acquiring new multidrug-resistant pathogens and the increase in AMR deaths accompanied by a reduced number of newly approved antibiotics for human use and the lengthy vaccine development process. In the case of clinical infections, the severity and death are caused mainly by the coexistence of multiple ARGs and the notoriously complex microbial communities like bacterial biofilms. Urinary tract, respiratory, skin, dental, and implant-associated infections are now severe with antibiotic resistant bacterial biofilms of *E. coli*, *Pseudomonas sp.*, *Streptococcus sp.* and *Staphylococcus sp.* infections.

It is high time we addressed this issue with an approach that deals with large data sets. On the technology side, AI models are practically a more error-free way to deal with both a learning process and patient care.

Further, it can be used for preventive measures and to prepare the healthcare system. The system needs to work to raise awareness. and prepare the health care system for combating AMR. The lengthy drug development process can be effectively reduced by adapting the AI in the pipeline. Predictive analysis models have promising futuristic elements,

“India is one of the 3rd world countries that is primarily affected by AMR because it is one of the largest producers and consumers of antibiotics.”



and training Machine learning techniques (ML) with data can help in drug administration and finding alternative antibiotics more efficiently. Training the ML algorithm with vast data can help identify pathogen and resistance patterns, treatment outcome ruling, and drug and antibiotic discovery. A sustainable strategy for the disposal of laboratory wastes and hospital wastewater with international standards and proper public awareness of the responsible use of antibiotics through training using AI-based technologies can be more consequential.

Infectious Intelligence: Harnessing AI to combat Antimicrobial Resistance

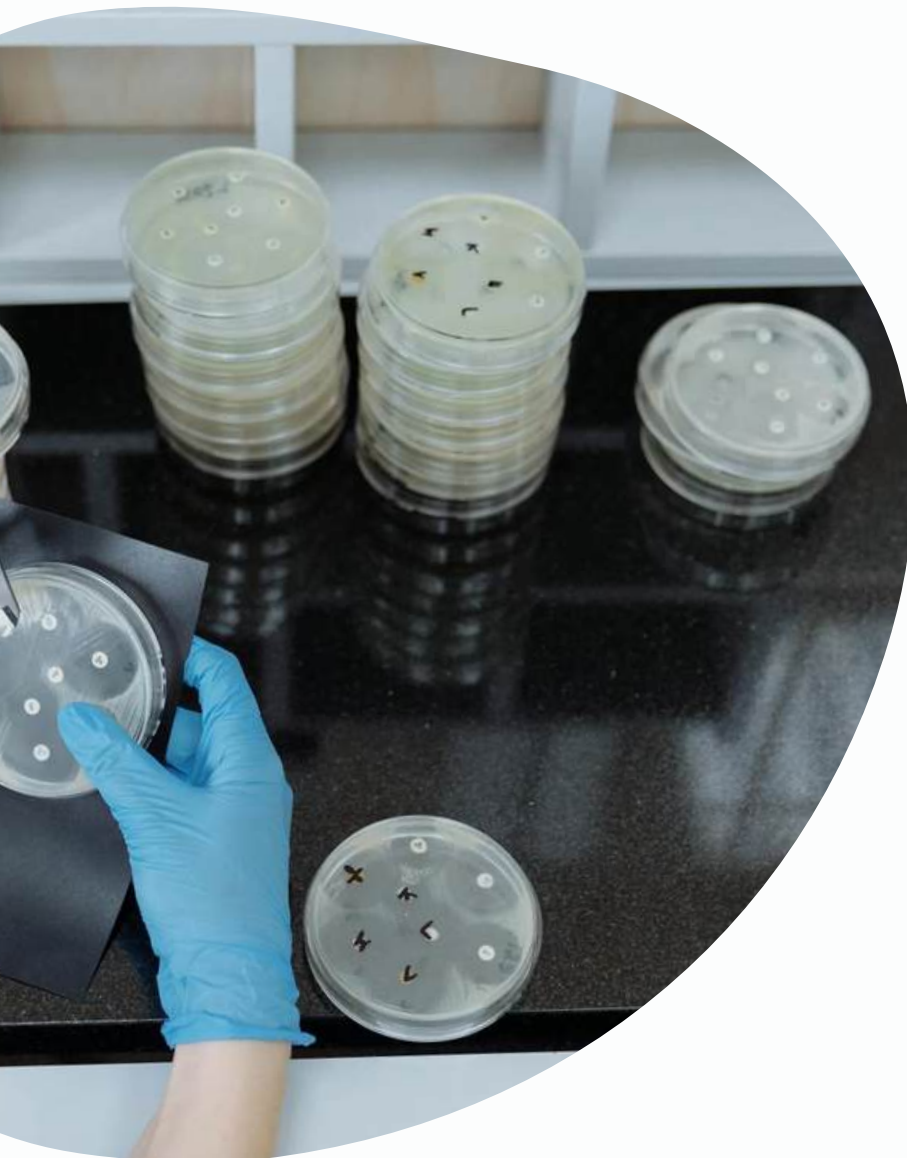
BY DR. RIYA BHATTACHARYA | AI RESEARCH CENTRE, WOXSEN UNIVERSITY

Antimicrobial resistance or AMR refers to the ability of microorganisms to survive exposure to antimicrobial drugs, making the treatment of infections caused by these organisms more difficult. This global health crisis has been exacerbated by the overuse and misuse of antibiotics, leading to the emergence of superbugs that are resistant to multiple types of antibiotics. Without effective interventions to combat antimicrobial resistance, we risk entering a post-antibiotic era where common infections could once again become life-threatening. Public health organizations are urging for better stewardship of antibiotics to slow down the development of resistance. It is crucial for healthcare providers to prescribe antibiotics only when necessary and for patients to complete the full course of treatment as prescribed. Additionally, new research and

“Artificial intelligence can help analyse vast amounts of data to identify patterns of resistance and assist in developing new treatments.”

development of alternative treatments are needed to combat this growing threat to global health. Collaboration between healthcare professionals, policymakers, and the public is essential to prevent a potential public health crisis. Understanding the mechanisms behind antimicrobial resistance is crucial to develop effective strategies to combat it and preserve the efficacy of current antibiotics. By studying how resistance develops and spreads, researchers can work towards developing new drugs and treatment approaches to stay one step ahead of evolving pathogens.

AMR is a pressing issue that not only affects individual patients but also has far-reaching consequences for global health. Failure to address this issue could lead to a future where common infections become untreatable and routine medical procedures become risky. The role of artificial intelligence or AI in addressing antimicrobial resistance is crucial, as it can help analyse vast amounts of data to identify patterns of resistance and assist in developing new treatments. By harnessing the power of AI, researchers and healthcare professionals can stay one step ahead of evolving pathogens and better combat this growing threat. Utilizing AI technology can also aid in the early detection of resistant strains, allowing for prompt intervention and containment.



Furthermore, AI can streamline the drug discovery process by predicting potential resistance mechanisms and guiding the development of effective antibiotics. With the integration of AI into healthcare systems worldwide, we can work towards preventing the spread of antimicrobial resistance and safeguarding the efficacy of existing treatment options for generations to come. By harnessing the power of AI, researchers and healthcare professionals can stay one step ahead of rapidly mutating pathogens, ensuring that new antibiotics are developed in a timely manner. This proactive approach is crucial in the fight against antimicrobial resistance, as it not only saves lives but also reduces the economic burden associated with prolonged illnesses and ineffective treatments. As we continue to leverage AI in the field of healthcare, we can look forward to a future where antimicrobial resistance is no longer a looming threat, but a conquerable challenge.



The Future of AI in Healthcare: Transforming Treatment, Diagnostics, and Beyond

BY DR. PRANJALI GAJBHIYE | AI RESEARCH CENTRE, WOXSEN UNIVERSITY

Artificial Intelligence (AI) is rapidly revolutionizing the healthcare sector, transforming treatment, diagnostics, and operational efficiencies. From early disease detection to personalized medicine, AI is reshaping how healthcare is delivered. However, along with its promises come critical challenges, ethical concerns, and hurdles in software development. Let's explore the multifaceted future of AI in healthcare. AI's role in treatment is expanding, enabling precision medicine

that tailors interventions to individual patients. To predict the best treatment paths, machine learning algorithms analyze vast datasets, including genetic information, lifestyle factors, and previous medical records for personalized medicine, robotic surgery, telemedicine, and virtual care. AI has emerged as a game-changer in diagnostics, reducing the time and cost of disease detection while improving accuracy in early disease detection, genomic analysis, and wearables. Devices: smartwatches and

“Machine Learning for personalized medicine, robotic surgery, telemedicine, and virtucare.”



biosensors, equipped with AI. Despite its benefits, AI in healthcare raises significant ethical challenges that must be addressed for responsible deployment. The reliance on patient data for AI models brings concerns about data security and patient consent. Adopting strict compliance measures like HIPAA and GDPR are crucial. AI systems trained on unbalanced datasets may produce biased outcomes, impacting minority groups disproportionately. Determining the balance between AI recommendations and Human clinical judgment is critical to maintaining trust in healthcare systems. However, developing AI software for healthcare is a complex process involving several unique challenges. Ensuring compliance with regulations such as the FDA or EMA for AI-based medical devices is time-consuming and costly. Healthcare AI models require vast amounts of high-quality, annotated data, which is often fragmented and stored in incompatible systems. Seamless integration with existing hospital systems (like EHRs) remains a technical bottleneck for developers. AI tools need rigorous testing and validation in clinical settings. to ensure reliability and safety.

In the future, predictive models will shift the focus from treatment to prevention, reducing healthcare costs and improving quality of life. AI will assist doctors in diagnosing and selecting treatment plans. improving efficiency and reducing errors. AI has the potential to bridge healthcare disparities by providing affordable diagnostic tools in underserved regions. To gain clinician trust, XAI will help explain how decisions are made. ensuring transparency and accountability. AI in healthcare holds immense promise for improving lives. revolutionizing treatment and diagnostics, and addressing global healthcare challenges. However, the road to full-scale implementation is paved with hurdles that require collaborative efforts from technologists, clinicians, and policymakers. Balancing innovation with ethical responsibility will define the success of AI in healthcare.

Business Frontiers

AI Research Centre

02



AI is transforming business practices by enhancing operational efficiency, driving innovation, and reshaping strategies. From predictive analytics to automation, this section delves into how AI is helping businesses improve decision-making, streamline processes, and deliver better customer experiences.

FEATURING

DR. DEVENDRAN A, PROF. SOMDUTTA
BANERJEE, MISS. NISTHA JAIN, DR. JOYDEB
BHATTACHARYYA, DR. AFZALUR RAHMAN,
MISS. GAYATHRI KUMALIKA

AI Research Centre

Integration of IQ tests with Artificial Intelligence

BY MISS. NISTHA JAIN | SCHOOL OF BUSINESS, WOXSEN UNIVERSITY

“Intelligence can be defined as an individual’s ability to think rationally, act purposefully, and deal effectively with the environment.”

~ Wechsler, 1958

The very conception of the revolutionary notion of measuring intelligence in the form of Intelligence Quotient (IQ) by Binet changed the perspective of viewing intelligence as merely a single trait, especially in the field of education. With the inception of the idea, it has been believed to be multi-faceted, which itself is not free of controversies, including the genetic component, single trait, ethnicity, and gender. Intelligence Quotient tests have quintessentially been used as a tool to assess the relative intelligence of an individual. Wechsler Intelligence Scales, Stanford-Binet, etc., to name a few, are the most widely used and can only be assessed on individuals who are literate and adept in the language these tests have been constructed in. Presently, the IQ assessments, even the ones that are culture-fair and/or performance-based, have their focus solely on visual and abstract recognition. Another restriction was that IQ tests that relied on verbal or numerical comprehension were designed with the assumption that test takers already understood the material and had prior exposure to the subject.



However, someone who has never been exposed to those verbal or numerical activities is undoubtedly prone to failing. Does that imply that the person has a lower IQ or is less intelligent than others? Not at all. The integration of artificial intelligence (AI) as an assistive technology would make it a handy tool for the educators and psychometricians to administer it as a group test and streamline the assessment. Identification of the student’s grey area would help them tailor their curriculum, leading to an experience of personalized learning. AI’s adaptive algorithms could create dynamic assessments that change in real time to the responses of the test takers and result in a much more tailored assessment of intelligence. These might even take the form of multimodal, AI-based tests that assess emotional intelligence, problem-solving, and creativity in addition to other identified tasks not covered by linguistic or mathematical skills. Admittedly, AI has the potential to make IQ testing a more thorough, fair, and perceptive instrument, enabling psychologists and educators to promote significant learning and development.



On the Quest for the Dimensions of Artificial Intelligence: Its Advancements, Ethical Applications, and Future Trends – A Relook

BY DR. JOYDEB BHATTACHARYYA | SCHOOL OF BUSINESS, WOXSEN UNIVERSITY

“What are the practical uses of AI, how has it changed over time, and what moral dilemmas does it raise?”

From the futuristic idea, artificial intelligence (AI) has evolved into a crucial component of modern life and international activities. However, what precisely propels this potent field? What are the practical uses of AI, how has it changed over time, and what moral dilemmas does it raise? AI has expanded much beyond its early roots and now affects almost every facet of human life. On diagnosis and treatment suggestions, even for rare disorders, AI algorithms that analyze patient data provide precise diagnoses and treatment alternatives. AI-

powered technologies increase the precision and speed of X-ray, MRI, and CT scan abnormality detection. For finance, the businesses first think of customer support through natural language processing (NLP)-powered chatbots offering round-the-clock help, increasing the effectiveness of customer support. AI is also lending its hands to market predictions through the usage of predictive analytics. Herein, autonomous vehicles, businesses like Waymo and Tesla are leading the way in developing computer vision and deep



learning-based self-driving cars. In the production process, predictive maintenance has successfully reduced downtime and maintenance expenses by using AI algorithms to anticipate equipment faults before they happen. In personalized learning, AI has powerfully improved engagements and academic results by tailoring learning experiences to each student's needs.

Hence, unprecedented capabilities have been made possible by the quick development of AI technologies. In deep learning and neural networks, AI systems that imitated the human brain can now solve complicated problems, recognize images, and synthesize speech as well with high perfection. Contextual language production and understanding are made possible by tools such as GPT, BERT, and others. AI can very effectively identify and classify photos for use in security, healthcare, and other fields, while in the latter, it can be technically used in cell phones, airports, and other security systems.

AI agents resort to reinforcement learning (RL) algorithms, which underpin robotic process automation and game AI, learning the best course of action through trial and error. Although AI has a lot of promise, there are serious ethical and societal issues with its developments. It included the algorithmic bias wherein injustice and discrimination result from training data that frequently reflects societal biases. Balancing security and privacy happened to be one of the biggest challenges, and finding a balance between protecting individual privacy and utilizing AI for security requires paramount attention

.Transparency and accountability are known as "black-box AI", as it can be difficult to comprehend how decisions are made because many AI models are still not well interpretable by humans.

Although AI opens up new possibilities, it also parallelly poses a danger to employment that can be automated.

The standards and guidelines are that the institutions, such as the European Union and the IEEE, have created moral standards for the application of AI. Now the question is, what does AI's future hold? AI systems can help achieve global sustainability goals by improving climate modeling, predicting natural disasters, and optimizing energy use if properly implemented, keeping the balance of choices and practices. The creation of thorough AI legislation will expectedly influence its future effects and will also probably guarantee its ethical and safe implementation. In conclusion, it can be said that the world has already been changed by artificial intelligence, and its potential is only going to grow. As we go further, we must be careful to make sure AI is used for the benefit of humanity, advancing advancement while respecting moral principles and human rights.



Digital Detox: How to Take a Break from Screens and Why It Matters

BY MISS. GAYATHRI KUMALIKA | SCHOOL OF BUSINESS, WOXSEN UNIVERSITY

In a world where we are constantly connected, the idea of unplugging may seem nearly impossible. Phones, tablets, and computers have become such integral parts of our lives that many of us can't imagine a day without them. But being "always on" has downsides. Studies have shown that too much screen time can increase stress, interfere with sleep, and decrease our ability to focus.

Introduce the concept of a digital detox by explaining how technology, while useful, can also feel overwhelming when we spend too much time on screens. Mentioning that taking small breaks from screens can improve our mood, focus, and health.

A digital detox means setting aside specific times or days where we limit or completely avoid the use of electronic devices. This doesn't mean abandoning technology altogether but rather creating mindful boundaries.

The detox can be as simple as setting aside an hour each day to unplug or as committed as going screen-free for an entire weekend. It's not about rigid rules; it's about finding a routine that brings relief, relaxation, and renewal. The benefits of Digital detox - Research shows that the blue light from screens can reduce melatonin production, the hormone that regulates sleep. When we spend time on screens before bed, it can take longer to fall asleep, and sleep quality can suffer. A digital detox, especially before bedtime, can help restore natural sleep rhythms. Social media, news feeds, and email notifications create a sense of urgency and stress.



“Digital detoxes remind us that we don’t have to be constantly plugged in to live a fulfilling life.”

Constant updates can make us feel like we're always missing out or need to catch up. A detox gives us a break from this overload, reducing feelings of stress and improving mental clarity.

Research suggests that multitasking, especially with digital devices, reduces productivity by up to 40%. Digital detoxes allow our minds to reset, making it easier to concentrate on single tasks and achieve more in less time. In-person interactions build stronger connections than digital ones. When we're less distracted by our devices, we become better listeners and are more present with others, which can deepen our relationships. Digital detoxes help us be more aware of the present moment, paying attention to our surroundings, thoughts, and feelings. This mindfulness is a powerful antidote to the distractions and overstimulation of digital life.

Signs you might need a Digital detox is when you feel anxious when you're away from your phone, you're checking social media more often than intended, you struggle to focus without feeling the need to check your phone, you feel "wired but tired"—exhausted but unable to relax, and you're noticing that screen time is affecting your relationships or quality of sleep.

How to start a digital detox - Start small : If going completely screen-free sounds overwhelming, start with short breaks, like 15–30 minutes per day. Gradually increase your screen-free time as you get comfortable, Create tech free zones: Designate certain areas of your home, like the bedroom or dining room, as tech-free zones. This can help establish healthy boundaries with devices and encourage more face-to-face interactions, Use Screen Time tools: Most smartphones have features to help track and limit screen time. Set daily limits on apps that tend to consume your time, or enable "do not disturb" modes during focused work hours, Take social media breaks: Social media can be a major source of screen fatigue. Try logging out or deleting social media apps for a few days. Many people find it refreshing to step away from the pressure of constant updates and notifications, and Schedule regular breaks: Set specific times each day or week for digital breaks. For example, go screen-free for the first hour of your morning or the last hour before bed to reate a calming routine.

Few alternative activities to try during a detox - spending time in nature, whether it's hiking, biking, or simply going for a walk. Studies show that even a short time outdoors can reduce stress and improve mood, move your body through yoga, dancing, or working out. Exercise releases endorphins, which help lift your mood and boost energy, make an engagement with drawing skills, painting skills, or journaling to express yourself without distractions, reading a book (instead of an e-book) offers mental engagement and can reduce stress, while giving your eyes a break from screens, and try meditation, deep breathing, or even mindful cooking to stay present and unwind.

Remind yourself that taking a break doesn't mean you'll miss anything important. Most things can wait, and social media will still be there when you're ready to return.

If work involves a lot of screen time, consider taking micro-breaks. Step away from the screen for a few minutes every hour to refresh your mind and body. Let friends and family know you're on a detox, so they understand if you're slower to respond. You might even inspire them to join you!

I conclude that reminding users that taking a break from screens doesn't mean giving up technology entirely. Instead, a digital detox is about finding a balance that makes us feel better and more present. Emphasize that even a few minutes of screen-free time each day can make a big difference in how we feel.

Digital detoxes remind us that we don't have to be constantly plugged in to live a fulfilling life. A few mindful breaks can improve our mental health, strengthen our relationships, and bring us back to the present moment. Whether you go screen-free for an hour, a day, or an entire weekend, the benefits can be profound. A balanced relationship with technology allows us to enjoy the best of both worlds—connection when we want it, and peace when we need it.

By taking short breaks from screens, we can boost our sleep, reduce stress, increase productivity, and improve relationships. A simple detox is a powerful tool to help us reconnect with the real world and achieve a healthier, more mindful lifestyle.



Artificial Intelligence and Emerging Technologies in Higher Educational Institutions in India

BY DR. DEVENDRAN A | SCHOOL OF BUSINESS, WOXSEN UNIVERSITY

Artificial intelligence (AI) and other innovative technologies such as machine learning, blockchain, virtual and augmented reality, and the Internet of Things that are contributing to the changes in different industries worldwide. India's higher education is undergoing a dynamic phase as these technologies not only transform the learning approach but also enhance the operational efficiency. In fact, institutions of higher learning (HEIs) in India are taking to the adoption of AI in their operations at a faster rate with the improvement of the training of students to enable them to fit in the competitive market. From IITs, IIMs, WOXSEN, and other top engineering and management institutes in the country to many private universities, education has set up AI Research Centers and embraced courses on artificial intelligence and data science. The key applications of AI and emerging technologies in higher education include customizable learning systems and personalization, improvement in student support and engagement, predictive analytics for student performance, research and development, virtual and augmented reality for immersive learning.

To create more artificial intelligence and emergent technologies in higher education, Indian institutions should aim at creating inter-institutional linkages with the technology sector, creating the environment of innovation and research development, and acquiring advanced systems. Furthermore, the ongoing backing of the Indian government in the form of the Atal Innovation Mission and Skill India Program is also a propellant for the use of AI in education. In conclusion, the incorporation of artificial intelligence and emerging technologies in the higher educational institutions in India can potentially improve the education system, reach out to more learners, and avail a skilled manpower that the industries are begging for. Conversing on the requirements, if appropriate investment is made and there is a will to enhance the digital alphabetization, the higher education system in India can usher in a new generation that will be ready to take up its position in a high-tech society of globalization.

AI in education market in India expected to grow at a CAGR of 48% from 2022 to 2028.

₹13,000 crore (\$1.6 billion) allocated for education technology in the 2023-24 budget.

60% of IITs, IIMs and WOXSEN University offer courses in AI, machine learning, and data science.

VR and AR market in Indian higher education projected to grow by 55% annually.

India ranks 3rd globally in AI research publications, contributing 12% of global AI research.





Artificial Intelligence and Emerging Technologies in Women Entrepreneurship and Empowerment

BY PROF. SOMDUTTA BANERJEE | SCHOOL OF BUSINESS, WOXSEN UNIVERSITY

As a woman entrepreneur navigating the challenges of building and scaling a business, I have witnessed firsthand how Artificial Intelligence (AI) and innovative tools, can be a game-changer for women. AI advancements can empower women to break barriers and redefine success, especially by equalizing opportunities in previously male-dominated sectors and facilitating access to global marketplaces. Launching an Entrepreneurial venture and running a business comes with a never-ending list of tasks, from purchasing to marketing to customer management.



It is common for new business owners to be overwhelmed by the sheer volume of administrative work that takes them away from strategic decisions early on in their journey. This is where AI-powered tools become invaluable. Platforms like HubSpot and Salesforce automate routine tasks like tracking customer interactions and running targeted marketing campaigns. These tools not only save time but also help make data-driven decisions that fuel growth.

AI has transformed how women-owned businesses can compete globally. Platforms like Shopify and Etsy, which use AI to personalize customer experiences and suggest pricing strategies, make it easier for women artisans and small-business owners to showcase their work beyond local markets to turn their passions into thriving businesses.

Gaining access to capital is often a daunting challenge for women entrepreneurs. Many women in business are initially told to “prove” that their business is worth the risk; despite having a solid business plan and market validation. Emerging technologies, especially AI, are helping bridge this gap. Fintech innovations like Tala and Paytm have created new pathways for women to get credit, even in areas where traditional banking systems exclude them. AI algorithms assess alternative credit data such as mobile payment patterns or community lending histories, giving women with limited formal credit history a fair shot at securing loans. These tools are not just about access to money; they are about trust, something many businesswomen have fought hard to earn in their entrepreneurial journeys.

Two decades earlier, when I started my new venture, I did not have years of business experience that is needed to make a venture successful. But platforms like Coursera, Khan Academy, and Google’s “Women Will” initiative, helped me acquire the knowledge and confidence to run my business effectively. These platforms have made high quality education accessible, regardless of one’s location or resources. Many of my fellow women entrepreneurs have learned digital marketing, financial planning, and even coding through such courses, which allowed them to transition from being aspiring entrepreneurs to successful ones.

“Trade unions like Self-Employed Women’s Association (SEWA), has harnessed AI to support rural women in agriculture and crafts.”

Emerging technologies like virtual reality (VR) have also opened doors for skill development. Women from underserved communities use VR training to gain expertise in fields like healthcare and manufacturing. These are women who, just a few years ago, might not have imagined having such opportunities.

Stories of empowered women using technology in the real world, inspire us every day. SheWorks, for example, is an AI-driven platform that connects women with remote job opportunities. Women who were forced to leave the workforce, due to caregiving responsibilities or lack of local opportunities, are able to reclaim their careers through this platform. Another example is that of Womentum, a crowdfunding platform, that provides a helping hand to women entrepreneurs in developing countries by combining funding with accountability. AI tracks the impact of donations on their platform, ensuring that every dollar creates tangible outcomes. Additionally, trade unions like Self-Employed Women’s Association (SEWA), that has harnessed AI to support rural women in agriculture and crafts, empowers women to make informed decisions, increasing their income and independence, by using mobile apps for financial tracking and AI for crop yield prediction. These examples prove that AI and technology is not just for the privileged few, it is a force multiplier for women entrepreneurs everywhere.

AI in Finance and Fintech: Enhancing Fraud Detection and Customer Experience

BY DR. AFZALUR RAHMAN | SCHOOL OF BUSINESS, WOXSEN UNIVERSITY

“Blockchain, for instance, will allow international payments with lower transaction fees and faster transaction times”

In today's world, blockchain and artificial intelligence (AI) are used in finance and fintech to improve payment, customer service, and fraud detection. Hence, through the safe transaction layer of the blockchain and AI risk assessment and credit scoring capabilities, banks can create a fast, secure, and more customer-focused financial system.

In financial services, AI is one of the key drivers of better customer experiences. Artificial intelligence-powered services lead to a higher level of satisfaction for customers with tailored financial products and personalized interactions, as studies show. AI could, for example, analyze the customer data and offer individualized recommendations that will improve brand experience and increase customer loyalty. AI's ability to provide instant communication and service means that financial institutions are able to respond quickly to consumer demands and needs, thereby driving higher retention rates. Additionally, the overall customer experience was facilitated by the mediation of trust in AI interactions, since the customer is inclined to interact with services that they find to be easily accessible and reliable.

Artificial intelligence systems can analyze large data sets in credit scoring and risk classification to detect patterns and predict



possible lending problems. This capability enables banks to make fast-paced, accurate decisions, decreasing the risk of fraud and default. Aside from streamlining the process, AI deployments in these domains improve the precision of computations that are critical to maintaining the integrity of financial networks. Additionally, AI is incorporated into CRM to enable financial institutions to better understand and predict consumer behaviors, thereby improving their risk management process. Blockchain technology enhances artificial intelligence and provides a safe and transparent environment to exchange goods. Due to the decentralized nature of blockchains, no transaction can be rewritten, which greatly reduces fraud risk and increases trust among members of the financial ecosystem.



Banks could leverage blockchain technology to develop more secure, efficient, and faster payment solutions. Blockchain, for instance, will allow international payments with lower transaction fees and faster transaction times, overcoming many of the inefficiencies that traditional payment methods have. The opportunity to change payments by making them less vulnerable to operational risks and fraud lies in combining the encrypted transaction protocol of blockchain with the intelligence of AI.

Moreover, blockchain and AI integrations can further enhance the overall consumer experience through safe and secure transactional processes. While blockchain makes all transactions transparent and auditable, AI can automate the client engagements and onboarding. This combination increases not only the efficiency of operations but also the customer's trust by ensuring that their data is safe and trustworthy. Hence, we can say that the future of Finance will be driven by AI-blockchain collaboration.



Digital Horizons

AI Research Centre

03



At the core of the technological landscape, AI is pushing the boundaries of what's possible. This section explores how AI is powering cutting-edge technologies, from artificial intelligence in software development to innovations in hardware, enabling smarter devices, systems, and digital ecosystems

FEATURING

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AI Research Centre

The Future of Fire Safety: AI-Powered Drones Revolutionize Emergency Response

BY DR. BHARGAV PATHRI, MR. KRISHNA VAMSHI GANDURI | SCHOOL OF TECHNOLOGY, WOXSSEN UNIVERSITY

In today's world, fire outbreaks in buildings, warehouses, and residential apartments pose a critical threat to human safety and property. Traditional fire detection systems like smoke detectors and heat sensors, while widely used, have significant limitations in speed, accuracy, and adaptability to complex environments. Recognizing this gap, Woxsen University's latest research focuses on developing advanced firefighting drones powered by deep learning and real-time object detection algorithms.

These drones are equipped with cutting-edge YOLO models (You Only Look Once), particularly YOLOv8 and YOLO-NAS, which offer unparalleled accuracy in detecting flames and smoke, even in challenging conditions. By using a carefully curated dataset of over 12,000 images from established sources like BowFire, FiSmo, and Flame, along with new indoor fire scenarios, the drones are trained to identify fire patterns with precision. The drones also utilize onboard thermal and RGB cameras, enabling them to detect and monitor fire hotspots while simultaneously assessing structural safety and locating individuals in need of rescue.

Firefighting drones represent a significant leap forward in emergency response technology, offering applications that enhance safety and efficiency. These drones can detect fires early with advanced thermal and RGB cameras, minimizing potential damage. By carrying payloads like fire extinguisher balls, smoke bombs, and water



sprinklers, they are capable of suppressing fires in inaccessible areas, reducing risks to human firefighters. Moreover, their ability to monitor fire spread and assess structural integrity through real-time imaging provides crucial data for disaster management teams. Drones also excel in search and rescue missions, locating individuals in low-visibility conditions with thermal sensors and ensuring swift evacuation.

Looking ahead, the future of firefighting drones is poised to be transformative. The integration of autonomous navigation will enable drones to independently assess risks and respond without human intervention,

while real-time data sharing with ground teams and command centers will streamline coordinated operations. Expanding their capabilities to manage urban and forest fires on a larger scale could revolutionize disaster management. Additionally, linking drones with smart IoT-enabled building systems will create a seamless network

for fire detection, suppression, and safety monitoring. As AI and robotics continue to evolve, firefighting drones have the potential to become indispensable in ensuring public safety and minimizing fire-related losses.



Ultra-Modern Trends in Architecture: The Role of AI Shaping the Future

BY PROF. ADITYA PASUMARTHI | SCHOOL OF TECHNOLOGY, WOXSEN UNIVERSITY



As Artificial Intelligence became an integral part of many domains, it is important to understand its importance in large-scale sectors like the manufacturing industry, building industry, medical, administration, finance, agriculture, law, retail, media, transportation, etc. As per the statistics, AI could contribute \$15.7 trillion to the global economy by the year 2030 and by adopting AI, the construction industry could contribute \$1.6 trillion globally, according to McKinsey analysis. AI is significantly transforming the way architects think through, plan, and carry out their projects as per the needs of creativity and sustainable development. Here is a glimpse of AI-driven architecture, compelling statistics, and its future potential.

According to a 2023 report by McKinsey & Company, generative design tools have led to a 30-40% reduction in design time and a 15-20% decrease in overall project costs for large-scale buildings. Accenture predicts that by 2027, AI-driven urban management systems will reduce traffic congestion by 25%, decrease energy consumption by 15%, and reduce pollution levels by 20%. According to a 2024 Gartner report, buildings designed with AI-supported tools consume 20-30% less energy than traditional structures and have a 15-20% lower carbon footprint during the construction phase.

A 2024 study by Forbes revealed that 80% of architects and urban planners now use VR/AR tools in their design processes, and 65% believe that AI-driven VR/AR technologies will become critical in client presentations in the next five years. In 2024, Deloitte projected that the use of AI and robotics in construction could reduce labour costs by up to 40% while accelerating project timelines by 25-30%. A Bain & Company report from 2024 highlighted that AI in building management could reduce operational costs by up to 30% while enhancing occupant comfort and improving asset lifespan. Finally, AI is altering the construction business by enabling intelligent building design and autonomous system integration, such as 3D printing. Its applications include all stages of a project, increasing efficiency, sustainability, and innovation while lowering costs and environmental effects. As AI advances, its function as a catalyst for a new era of construction becomes clear. AI is no longer a faraway concept; it is already vital to defining the future, with ethical considerations guiding its responsible development and application in industry.



Recent Booming Trends of Cyber Security

BY PROF. MEHER TIWARI | SCHOOL OF TECHNOLOGY, WOXSEN UNIVERSITY

As we approach 2025, several cybersecurity trends are poised to become more prominent, spurring increased research and development to address emerging threats and challenges. These trends reflect the evolution of cyber threats, advancements in technology, and the increasing complexity of digital ecosystems. Below are key areas where significant research will likely emerge:

The zero-trust security model, which operates on the principle of "never trust, always verify," is becoming a key approach for safeguarding modern networks, especially as remote work and cloud computing become more pervasive. Companies like Google have implemented "BeyondCorp," a zero-trust model, to secure access to corporate resources without relying on traditional VPNs.

Research Focus: As businesses expand their digital footprint, researchers will focus on enhancing zero-trust frameworks, developing more scalable models, and

improving identity management to ensure robust verification and access control.

With the increasing global emphasis on data privacy, technologies that allow for secure data analysis while maintaining privacy are crucial. Tools such as homomorphic encryption and differential privacy are becoming key areas of research.

Real-World Examples: Apple's iOS features privacy-centric features, such as App Tracking Transparency, and Google is exploring privacy-preserving machine learning techniques, like federated learning, to train models without compromising user data.

As more businesses move their operations to the cloud, securing these environments is critical. In 2020, a misconfigured Amazon S3 bucket exposed sensitive data for millions of individuals. Research will focus on improving identity and access management, encryption protocols, and multi-factor authentication (MFA) in cloud systems.

DevSecOps: Integrating security into DevOps practices ensures that security is considered throughout the software development lifecycle. Companies like GitHub are already integrating security testing directly into their CI/CD pipelines to detect vulnerabilities as code is developed.

Quantum computing poses a potential threat to traditional encryption methods, leading to a rise in research focused on developing quantum-resistant encryption algorithms. For example, the National Institute of Standards and Technology (NIST) has already begun evaluating cryptographic standards that will withstand quantum attacks.

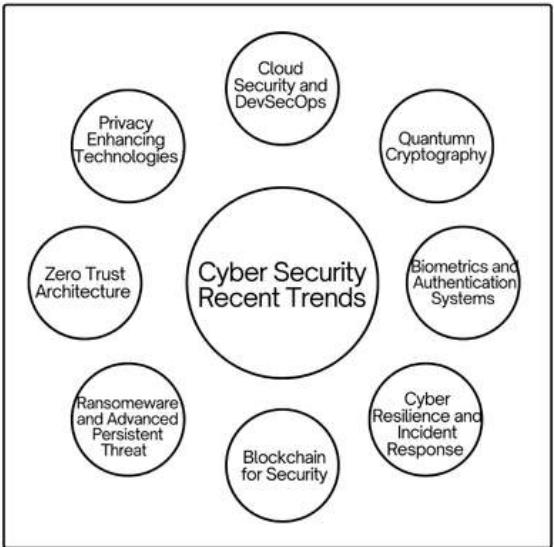


Fig: The upcoming research trends of Cyber Security

Quantum Key Distribution (QKD): While still in early stages, technologies like QKD offer a promising way to secure communications using quantum principles. Companies like ID

“The decentralization and immutability of blockchain make it an attractive tool for improving transparency and security in various sectors.”

Quantique are working on commercializing quantum encryption solutions to safeguard sensitive data.

As passwords become increasingly vulnerable, biometric systems such as fingerprint scanners, facial recognition, and even behavioral biometrics are being implemented to enhance authentication security. For example, Apple’s Face ID technology provides a secure way for users to unlock their devices without passwords.

Research Focus: Research will likely focus on improving the accuracy of these systems, ensuring they are resistant to spoofing, and addressing privacy concerns related to the collection and storage of biometric data.

With cyberattacks becoming more frequent and destructive, organizations are focusing not just on prevention but also on recovery. Cyber resilience aims to ensure that systems remain operational even after an attack.

Automated Response: Automated systems that can detect, respond, and even recover from attacks without human intervention

are becoming increasingly important. For example, the use of automated containment strategies can help organizations mitigate the damage of ransomware attacks. Beyond its role in cryptocurrency, blockchain has potential applications in enhancing data integrity, secure voting systems, and identity management. Companies like IBM have already experimented with blockchain for supply chain security, ensuring that products are tracked securely across the entire supply chain.

Research Focus: The decentralization and immutability of blockchain make it an attractive tool for improving transparency and security in various sectors, including healthcare and financial services.

Ransomware attacks continue to surge in scale and sophistication, affecting high-profile targets such as hospitals, municipalities, and even the Colonial Pipeline in the U.S. in 2021.

These attacks often involve sophisticated social engineering and encryption techniques. Research Focus: Researchers will likely work on advanced threat-hunting systems and tools to detect ransomware earlier in the attack lifecycle, as well as improve incident response and recovery procedures.

The cybersecurity landscape in 2025 will be shaped by a combination of emerging technologies and increasingly sophisticated threats. Areas such as AI, quantum computing, cloud security, and zero trust will drive significant research efforts aimed at securing digital systems, protecting privacy, and ensuring resilience against evolving cyberattacks. Real-world incidents, like the SolarWinds breach and the Colonial Pipeline ransomware attack, highlight the urgency of addressing these challenges, pushing organizations and researchers to innovate and develop more robust security measures.



Scientific Endeavors

AI Research Centre

04

AI is accelerating the pace of scientific discovery, transforming fields like biology, chemistry, physics, and environmental science. Explore how AI is being utilized to analyze vast datasets, simulate experiments, and uncover insights that are shaping the future of scientific research.

FEATURING

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MUKESH KUMAR SINGH

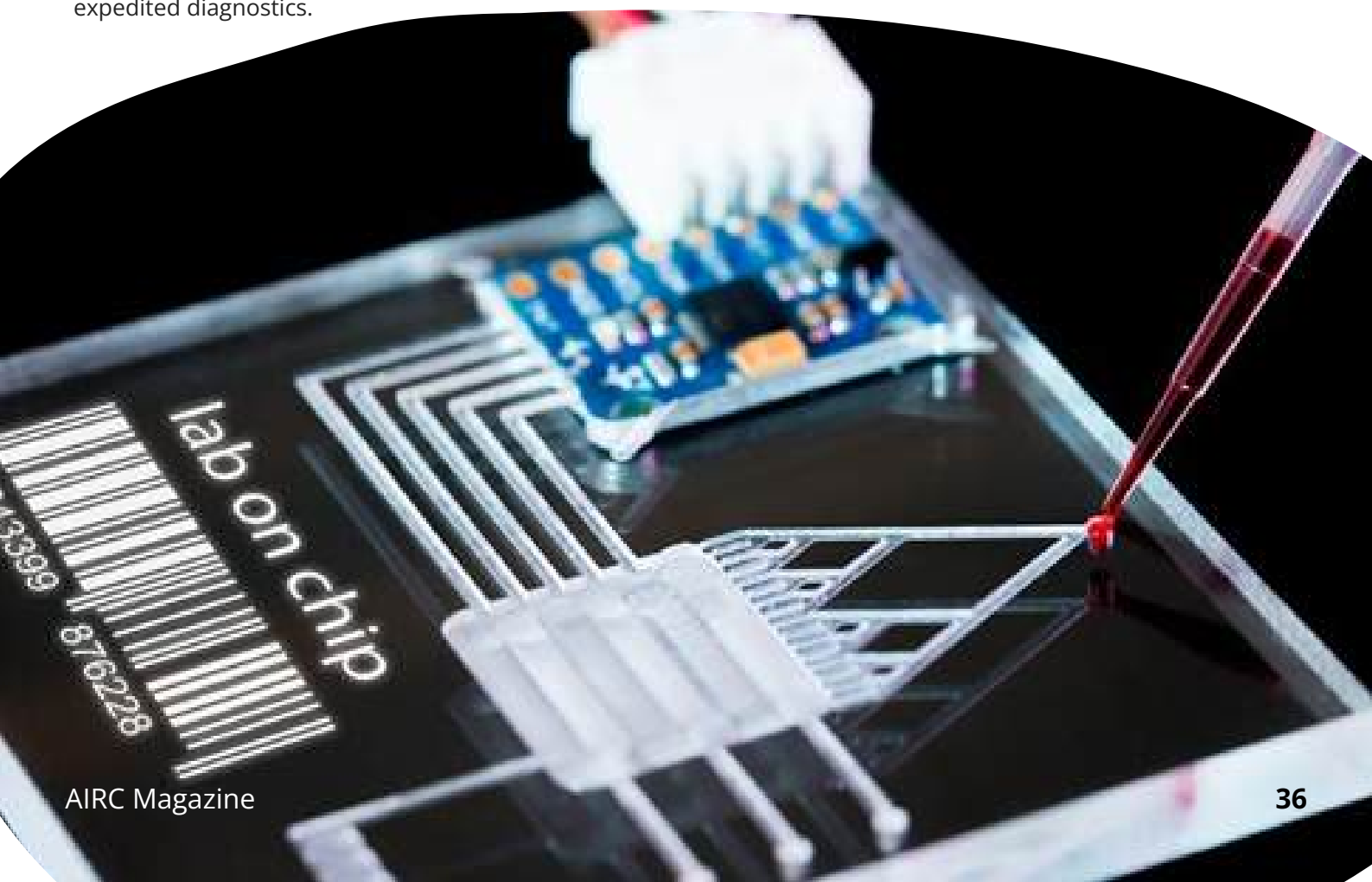
AI Research Centre

Chip of the Future: AI-Driven Microfluidics Transforming Lab-on-a-Chip Tech

BY DR. AMIT KUMAR SINGH | SCHOOL OF SCIENCES, WOXSEN UNIVERSITY

The dynamic field of biomedical engineering and diagnostic technology is witnessing a substantial paradigm shift, driven by the integration of artificial intelligence (AI) into microfluidics. This convergence heralds a transformative era for lab-on-a-chip technologies, poised to redefine the landscape of research, diagnostics, and therapeutic interventions. Microfluidics, the science of controlling fluids at the microscale, has significantly influenced medical diagnostics and biological research. Lab-on-a-chip devices miniaturize and consolidate laboratory processes onto a single platform, facilitating high-throughput analysis, reduced reagent consumption, and expedited diagnostics.

However, the transformative factor has been the integration of AI into this field. The synergistic combination of microfluidics and AI has led to the emergence of novel diagnostic and therapeutic solutions. AI has a multifaceted role in the field of microfluidics, extending to the design, optimization, and operation of lab-on-a-chip devices. By harnessing machine learning algorithms, researchers can now more accurately predict the behaviour of complex fluids within microchannels. This advanced capability is pivotal for designing more efficient chips capable of handling intricate tasks, such as cell sorting, and DNA sequencing with unparalleled precision.



A key application of AI in microfluidics is enabling personalized medicine. AI-powered microfluidic platforms can analyse small biological samples to identify disease biomarkers associated with conditions such as cancer or diabetes far earlier than conventional techniques. This enhanced diagnostic capability facilitates prompt and customized therapeutic interventions, ultimately enhancing patient prognosis.

AI enhances the automation of microfluidic devices. Traditional lab-on-a-chip technology requires significant manual effort to control fluid flow and sequence biochemical reactions. However, with AI, these processes can be automated, enabling continuous monitoring and real-time adjustments based on the data collected and analysed by the chip. This automation improves the efficiency of experiments and tests while reducing the risk of human error.

The integration of AI is also enabling the creation of advanced microfluidic devices that are more intelligent and adaptable. These devices can learn from past experiments, continuously improve their performance, and forecast future results based on previous data. Such capabilities are essential for complex diagnostic and research applications where conditions fluctuate considerably.

As the convergence of AI and microfluidics progresses, new opportunities will emerge in diverse fields such as environmental monitoring, food safety, and even bioterrorism detection.

“The synergistic combination of microfluidics and AI has led to the emergence of novel diagnostic and therapeutic solutions.”



The ability to rapidly analyse and respond to biological threats in real-time could significantly enhance public safety and health. Furthermore, the ongoing evolution of this technology will undoubtedly reveal new scientific discoveries, redefining the capabilities within the confines of a chip. This represents not just an incremental step in lab technology, but a transformative leap towards a future where sophisticated diagnostics are readily accessible anywhere and anytime — a true new era for lab-on-a-chip technologies.

Artificial Intelligence: Shaping Industries, Enhancing Innovation, and Redefining Ethical Boundaries

BY DR. KIRAN SIRIPURI, MUKESH KUMAR SINGH | SCHOOL OF SCIENCES, WOXSEN UNIVERSITY

AI is revolutionizing industries worldwide and opening new frontiers of innovation, but at the same time, it brings with it ethical challenges that we cannot afford to ignore. Whether it's expanding healthcare with predictive diagnostics or making financial trading better through machine learning, AI is revolutionizing industries. This article presents the real-time applications of AI, its technological progression, and the moral aspects of using it as an everyday phenomenon. It also presents Adversarial Fairness Learning (AFL) for tackling the AI bias and ensuring fair decision-making. And also, the necessary trade-off between AI innovation and ethical responsibility through real-time solutions, advancements in AI technologies, and exploration of new algorithms. Artificial Intelligence (AI), which has moved from a science fictional concept to a ubiquitous technology, embedding itself in many industries, becoming an essential part of our everyday lives by transforming the traditional business processes. Deep learning, reinforced learning, and natural language processing have created rapid progress in the AI landscape since 2010 with many breakthrough discoveries like healthcare, finance, manufacturing, and autonomous systems. However, such is the level of sophistication people have reached that those ethical conversations surrounding fairness, accountability, and transparency in AI are more about if it functions than how it manifests. There are real-time applications of artificial intelligence in various fields.

AI has started to change the healthcare sector today with areas such as diagnostics and personalized medicine. Machine learning can analyze large datasets in real time and has applications for medical imaging, genomics, and clinical records. A recent study by Liu et al. An AI algorithm showed a diagnostic accuracy of 95% for breast cancer detection, outperforming human pathologists in some trials in 2024. AI is improving everything in finance from fraud detection to algorithmic trading. Global Financial Institutions—JPMorgan Chase and Goldman Sachs recently started using machine learning models for real-time detection of fraudulent transactions. Such systems can study historical data, detect abnormal behaviors, and forecast market trends, thus enhancing the quality of decision-making.



Figure: AI-Powered Diagnostic Workflow in Healthcare

Moreover, robo-advisors powered by AI offer individualized financial advice to all people, thus democratizing finance. Today, AI in Manufacturing Predictive maintenance and production optimization have been the use cases that AI is creating an impact from a manufacturing perspective. AI algorithms analyze sensor data to provide predictive analytics, allowing manufacturers the ability to predict single equipment failure and reduce unplanned downtime.

Traditional organizations like GE and Siemens have brought in AI-based technologies to automate the production lines and supply chain management, resulting in higher productivity at lower cost. Over the years, there have been continuous technological advancements in AI. The use of quantum computing reshapes perception of the potential of AI due to its exceptional power. The ability to handle complex data more efficiently than classical models by quantum AI algorithms is important for optimization, cryptography, and drug discovery. One such task was demonstrated to have reached quantum supremacy by Google, which requires thousands of years to solve yet fits directly into the AI toolbox by way of two critical components. Also, instead of sending data to central servers, Edge AI processes it locally on devices. Such technology is important for real-time decision-making applications such as autonomous vehicles and wearable health devices. Edge AI is also helpful in the case of autonomous vehicles, where data from sensors and cameras needs to be processed immediately so that appropriate actions can be taken by the vehicle to prevent accidents. However, AI models can unintentionally reproduce biases found in training datasets, resulting in biased results when using the models for hiring law enforcement and lending. This is especially troubling in high-stakes decision systems that impact people's lives directly. In an attempt to solve this issue, the

authors proposed the Adversarial Fairness Learning (AFL) algorithm. Again, they focus on adversarial training to reshape the decision-making process of AI systems, enforcing that no protected attribute should yield a discriminatory outcome in terms of fairness. AI systems have been known to rely on large amounts of data, often personal and sensitive. With AI technologies being used more frequently in surveillance, facial recognition, and decision-making, this poses risks for data privacy and accountability.

Efforts just like the General Data Protection Regulation (GDPR) of the EU; in addition, AI Act legislation is preferably needed so that AI systems could be clear and their privacy may not be violated. As the future is in AI, there are hyper-personalized experiences driven by AI's ability to analyze so much data and predict the behavior of consumers. While AI has shown immense potential in performing tasks that were previously restricted to humans, its purpose is not to replace human beings but to enhance creativity and productivity! Across sectors, from art to music and literature, even highly specialized fields such as scientific research on drug discovery or clinical trials, AI tools often act as just that: a crowd-sourced ideation and content generator. Artificial intelligence is changing entire industries and the future of human-machine interaction. The rapid growth of AI means that we need a solid ethical framework to make sure it serves society as effectively and equally as possible. AI can benefit from the development of new algorithms, including something called Adversarial Fairness Learning (AFL), and become more transparent, accountable, and fair, thus reducing the biases still inherent in so many decision-making systems today. When combined with ethics, AI can be the catalyst for human development while maintaining equity and providing everyone the chance to participate.

Legal Insights

AI Research Centre

Q&A



AI is revolutionizing the legal field by automating routine tasks, predicting case outcomes, and streamlining legal research. This section delves into how AI is enhancing the efficiency of legal practices while raising important ethical and regulatory questions within the justice system.

FEATURING

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DR. ADITI SINGH

AI Research Centre



Artificial Intelligence and Emerging Technologies in the Healthcare Sector: Navigating Legal Issues and Challenges

BY DR. PARAMITA CHOUDHURY | SCHOOL OF LAW, WOXSEN UNIVERSITY

“NITI Aayog constitutes the beginning of envisioning an outline for the codification of responsible AI usage by GOI.”

Integrating Artificial Intelligence (AI) and other new technologies in the healthcare sector brings forth opportunities and challenges in the Indian context. Enhancing healthcare is challenging for the country, whereas adopting AI can transform service delivery, improve patient outcomes, and enhance systemic inefficiencies. This includes increasingly recognized

applications in machine learning and robotics technologies that can find an important place in the improvement of healthcare delivery in India, especially in underserved regions.

For instance, the Ayushman Bharat scheme, which is the inclusion of AI within the present health insurance frameworks, exemplifies how AI can be integrated into

existing frameworks to improve service delivery and patient experiences. Despite a great potential for adoption, its implementation in India faces many challenges. It takes time for the adoption of new technologies to get rolling in the healthcare sector due to inadequate infrastructure, incomplete training of health personnel, and issues related to the security of data and privacy issues of patients.

Given that planning for AI applications in healthcare is at a foundational level with a sense of immense urgency for a systematic approach, comprehensive policies in place help bridge the challenges. Issues involved in using AI in healthcare are, in legal terms, particularly complex for India. The initiative of NITI Aayog constitutes the beginning of envisioning an outline for the codification of responsible AI usage by the Government of India, though an improved understanding of policy will be required as this terrain continues to evolve.



So, while artificial intelligence and emerging technologies have the potential to change the face of healthcare in India greatly, such integration can happen only through a holistic approach that covers legal, ethical, and operational dimensions. Hence, there is a need for developing healthy regulations and customized training programs for the healthcare staff so that the dangers of artificial intelligence are minimized and its benefits are maximized. Thus, through the collaborative efforts of multiple stakeholders, including governmental agencies, healthcare providers, and inventors in the sphere of technology, this dance will emerge as India advances in healthcare innovation.



Artificial Autonomy vs. Human Responsibility: A legal perspective on Misguided Action in India

BY DR. ADITI SINGH | SCHOOL OF LAW, WOXSEN UNIVERSITY

"Artificial autonomy acts; human responsibility directs."

The ever changing dynamics of the modern world necessitates integration of artificial intelligence (AI) to compliment and supplement human intelligence. It has evolved from AI to Machine Learning (ML) (Supervised, unsupervised and reinforced learning) to Deep Learning (Convolutional or recurrent neural network), to such an extent that the global market for AI is estimated to increase from \$148.8 billion in 2023 to reach \$1.1 trillion by 2029, at a compound annual growth rate (CAGR) of 39.7% from 2024 through 2029.

Initially AI was entrusted to preform cognitive tasks but it has evolved in ways exceeding its original purpose and is now being used in fields such as healthcare, agriculture, education, smart cities and infrascture, smart mobility and transportation, manufacturing, retail, energy, finance to name a few, along with the branding of #AIforAll in India, especially deploying deep learning and Artificial (Narrow) Intelligence.

The ability of these systems to operate independently, making decisions sans human intervention on the basis of algorithms is (artificial) autonomy. Even though for the sake of increasing efficiency and innovation one must switch to AI but it also necessitates an ethical and legal regulatory mechanism to avoid inherent bias and discrimination, avoid misuse,



ensure accountability (ethical & legal), privacy violations, placate liability correctly, security threats, intellectual property, ensuring protection of fundamental human rights.

Essentially, all AI decisions are based on data algorithms that work on first training the system, testing to ensure its effectiveness and efficiency and subsequently validating the said data. However, there is scope of bias in this equation, firstly, at the stage when data is being fed, it is prone to both apparent and inherent bias. Secondly, once the validation stage is over the algorithm works by itself, feeding off of the data that has already been fed to it. Thirdly, the algorithm relies heavily on the personal data collected from the consumers, infringing the right to privacy. The question to be asked here is, when a faulty prediction is made, where to

place the liability? The system itself has not acquired legal personhood, therefore the closest option would be to place de facto blame on developer, or the deployer or even the end user for not doing due diligence.



All these issues need to be addressed by the law of the land. However, there is a lag in maintaining a harmonious equilibrium between the evolving landscape of technology and the regulatory mechanism. At the global level, The World Ethical Data Foundation (WEDF) exists, consisting of AI experts, data scientists, including staff of tech giants such as Microsoft, Google and Samsung. They are given a framework of 84 questions to consider before starting a project based on AI. Similarly, in the USA, EU and UK there are white paper guidelines to eliminate in-built or acquired algorithmic biases.

In India, the present legal framework is too primitive, narrow and superficial to address the concerns of identifying blame and accountability especially with respect to machine learning. The Information Technology Act, 2000, The Digital Data Protection Act, 2023 and The Information Technology Rules, 2021 currently address AI activities. India follows a pro-innovation approach, however lacks clarity in terms of implementation and potential risks.

The Ministry of Electronics and Information Technology (MEITY) has issued an advisory to seek explicit permission before any AI deployment to regulate unreliable models, only to later take it back. The NITI Aayog has also developed seven responsible principles for ethical usage of AI. More recently, companies like Microsoft, IBM, and Google also has suggested regulatory approach especially for India.

The only takeaway from all this confusion can be that mitigation of harm is the most essential to both individuals and the society. A risk assessment can be done on case to case basis commensurate to the aggregate impact of the technology. That can be done by developing algorithms which are risk based, not harm based, because once the harm has happened, not much can anyway be done then. These risks can be developed in line with the risk assessment report done by the UK government, which talk about three risks: malicious use risks, risks from malfunctions, and systemic risks.

Risks can also vary according to the stage of development (e.g., during design, development, or deployment), the scope (systemic risks), the time scale (short, medium, or long-term), and the source of risk (inputs vs. outputs). Scholars at the Massachusetts Institute of Technology (MIT) have established a repository of over seven hundred AI risks as of 2024, despite the ongoing evolution of our comprehension of AI risk. Additionally, certain governments have integrated these risk taxonomies into their legislative frameworks.

India can consider the entirety of the literature available and subsequently regulate the use of AI in accordance with its technology-driven approach, while also being cognizant of the potential risks. Before their final deployment, these various categories of hazards can be thoroughly investigated as the increased autonomy in AI must be accompanied by increased collective responsibility of all parties involved.

Design and AI Nexus

AI Research Centre





AI is playing a key role in the evolution of architecture and urban planning, enabling more efficient designs and smarter city layouts. This section explores how AI is optimizing building designs, improving sustainability, and helping planners create resilient, future-ready urban environments.

FEATURING

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DAMARLA SAI PUNEETH

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AI for Inclusive Urban Design: Creating Barrier-Free Environments

BY AR. ANJANA J NAIR | SCHOOL OF ARCHITECTURE AND PLANNING, WOXSEN UNIVERSITY



Urban spaces have an immense impact on our day-to-day life; far too many cities do not accommodate the needs of all their residents. Creating environments that are accessible, equitable, and user-friendly for all, including people with disabilities, the elderly, and children, is the focus of inclusive urban design. Barriers to accessibility include not only mobility difficulties but also communication and digital barriers. In this context, Artificial Intelligence (AI) has proven to be a transformative tool in providing innovative solutions. for accessible and inclusive urban spaces. Urban planning using traditional tactics tends to generalize and sometimes manual surveys may skip individuals who do not own a personal vehicle. The answer lies in the fact that AI fills this void by providing evidence-based insights and forecasting trends allowing for a more open planning approach. Here are the main ways that urban design is being reshaped by AI! Virtual AI systems assess data through sensors, cameras, and crowdsourcing to determine accessibility gaps for where to intervene. Tools for predictive modeling— predicting how people of different abilities, ages, and social and economic statuses interact with urban spaces—provide designers with the opportunity to predict what challenges may arise and to adapt plans accordingly. Real-time help is provided by AI-driven navigation systems,

AI also improves citizen engagement. in terms of linguistics and accessibility, adapting public communication forms to serve citizens in different languages while creating a more user-friendly city for people with disabilities, such as the hearing impaired or those unable to speak. AI is already being used by cities around the globe to support inclusive practices. Singapore: AI-powered navigation apps help visually impaired residents navigate complex urban terrain Smart city schemes in Toronto employ AI to identify and solve live accessibility issues, allowing citizens to enjoy barrier-free mobility. These are shining examples of how AI is turning the idea of digital inclusivity into practice.

Nevertheless, there exist challenges with the incorporation of AI into urban planning. Unintentional exclusion of some groups because of bias in AI algorithms, and the high cost that naturally comes with implementing such technology acts as hinders adoption, especially in developing regions AI is shaping the future. of equitable cities. If cities adopt new technology, they can become places in which anyone, regardless of ability, can flourish. Inclusive and equitable urban design moves forward with innovation, empathy, and collaboration, leaving no one behind. We can build cities that everyone owns together.



Intelligent Urban Planning: AI Strategies for Climate Change

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UNIVERSITY



“Combining big data with climate prediction and urban systems optimization using AI for more resilience.”



Climate adaptation strategies powered by AI are showing cities how to prepare for and respond better to environmental challenges. Such technologies use artificial intelligence to combine big data with climate prediction and urban systems optimization for more resilience. AI can predict floods, heatwaves, and other extreme events with incredible accuracy by analyzing data from a range of sources, including historical weather patterns, satellite images, and real-time sensors.

Moreover, the application of AI in urban climate adaptation is smart infrastructure and resource management. AI algorithms optimize energy grids, dynamically matching supply and demand to minimize carbon emissions and maximize system resilience against climate-driven stresses. Similarly, the AI-assisted water management system preserves this precious resource for cities by predicting consumption patterns, identifying pipeline leaks, and effectively modulating distribution.

The part that AI plays in climate-adaptive urban planning and design is algorithmic-software-based links to examples of how geoen지니어ing, digitalization, and advances in environment-technology interaction have changed people's behaviors and, by extension, efforts to stop climate change. AI also helps to raise citizen engagement while encouraging more sustainable behaviors. AI-driven platforms are enabling bottom-up community adaptation, linking citizens to local climate action initiatives and real-time environmental data. AI-powered adaptation mechanisms for cities will become even more essential as urban areas struggle with climate change consequences. With the help of data and machine learning, urban regions can shape climate adaptation and mitigation to be more responsive, slicker, and high-impact—all in preparation for creating resilient cities that can withstand changes for generations.

BONNUS

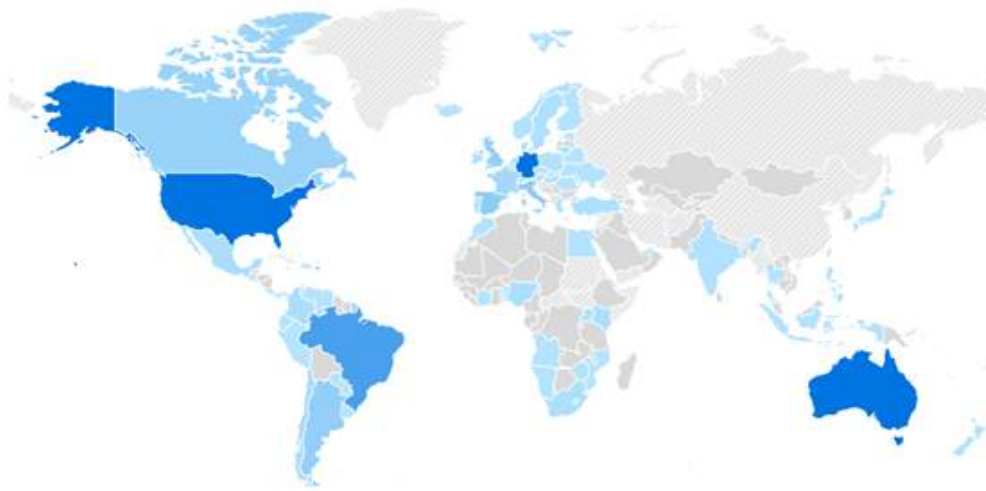
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SARAH MARIAM, PROF. SUNAINA ARYA

Top countries

Listeners • Last 28 Days • Worldwide

Last 28 Days	Listeners
1 United States	3,257
2 Australia	1,207
3 Germany	388
4 Brazil	231
5 Italy	83
6 Spain	82
7 Argentina	72
8 United Kingdom	71
9 Canada	60



On Generative AI for a Dead Language in Modern Songs

BY PROF. PEPLUIS R. ESTEVA, DR. KONRAD GUNESCH, DR. ADITY SAXENA, PROF. SARAH MARIAM, PROF. SUNAINA ARYA | WOXSSEN UNIVERSITY

“Transformer-based models, have demonstrated the ability to generate multi-instrument compositions and raw audio music with singing and lyrics.”

The fusion of artificial intelligence (AI) and music has ushered in a new era of creativity, transforming how music is composed, performed, and experienced. Advances in machine learning and deep learning have enabled AI systems to analyze vast amounts of musical data, uncovering patterns and structures that were previously inaccessible. These systems can now generate music that not only emulates existing styles and genres but also creates novel compositions exhibiting complexity and expressiveness comparable to human creations. Between 2020 and 2023, significant progress has been made in AI-driven music generation.

Transformer-based models, such as OpenAI's MuseNet and Jukebox, have demonstrated the ability to generate the ability to generate multi-instrument compositions and raw audio music with singing and lyrics, respectively. MuseNet utilizes deep learning techniques to produce coherent musical pieces that blend various genres and instruments creatively. Jukebox advances this capability by generating music in raw audio format, conditioned on artist and genre, incorporating complex structures and vocal performances. Google's Music Transformer introduced relative attention mechanisms to better

capture long-term musical structures, enhancing the generation of music with sustained coherence over time. Despite these advancements, challenges persist, especially when attempting to generate music in languages with limited available data. Recreating music in a dead language like Late Ancient Latin presents both a fascinating challenge and a unique opportunity for generative AI.

The Late Ancient Latin comprised the Latin language spoken in the III to V centuries AD. The scarcity of contemporary musical data in Late Ancient Latin makes it difficult to train AI models directly on relevant datasets. Moreover, the phonetics, pronunciation, and grammatical structures of Late Ancient Latin differ significantly from modern languages, posing additional challenges for AI models primarily trained on modern language data. Addressing these challenges requires innovative methodologies. Transfer learning allows AI models to leverage knowledge from related languages or domains, adapting to Late Ancient Latin despite limited data availability. Data augmentation techniques, such as synthetic data generation and back-translation, can expand the dataset by creating new examples that capture the linguistic characteristics of the target language. Phonetic modeling and grapheme-to-phoneme conversion systems may be valuable for accurately representing the pronunciation of Late Ancient Latin in synthesized vocals. This research aims to explore the feasibility and the adoption of using generative AI to create music in Late Ancient Latin, addressing the challenges of data scarcity and linguistic complexity. By leveraging advanced AI techniques, with the goal to seek to generate authentic and engaging musical compositions that honor the linguistic and cultural heritage of Late Ancient Latin. The objectives include investigating methods to overcome data scarcity, producing original compositions

across various modern genres, and evaluating the quality and authenticity of the generated music through expert reviews and listener feedback. Although the significance of the research extends beyond the technical achievements. Successfully generating music in a dead language can aid in preserving cultural heritage and promoting interest in historical languages and traditions.



“AI technology can contribute to cultural preservation,”

It demonstrates how AI technology can contribute to cultural preservation, providing new avenues for education and engagement. Moreover, developing methodologies for handling low-resource languages pushes the boundaries of AI capabilities in natural language processing and music generation, potentially benefiting other languages facing similar challenges. Tools used for the purpose are neural networks and deep learning, generative adversarial networks (GANs), transformers and attention mechanisms, variational autoencoders (VAEs), raw audio generation, and cross-modal and text-to-music models. As final thoughts, the integration of artificial intelligence and historical linguistics presents a unique opportunity to revitalize interest in ancient cultures and languages. By leveraging modern technology, one can create new forms of artistic expression that honors the past while engaging contemporary audiences. This research demonstrates that AI has the potential not only to advance technological frontiers but also to enrich our cultural and educational landscapes, fostering a deeper connection with our shared human heritage.

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Monthly Newsletter

By the AI Research Centre, Woxsen University

Future Tech Summit: Shaping Tomorrow's Innovations



The AI Research Centre (AIRC) successfully organized the **Future Tech Summit** from December 19 – 20, 2024, drawing leaders and experts globally. This three-day event included insightful sessions, exhibitions, and keynote presentations, focusing on advancements in emerging technologies like generative AI and intelligent machines. The summit addressed the implications of these innovations across multiple sectors, including healthcare and life sciences. It provided a platform for meaningful discussions, fostering collaboration and contributing to the ongoing evolution of technology.



Shri Jayesh Ranjan, IAS, Special Chief Secretary, Department of I&E&C, Department of Industry and Commerce honored the **Future Tech Summit** as the Chief Guest. His participation underscored the significance of technological innovations in driving industrial growth and enhancing governance.

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