



**NILE UNIVERSITY
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6TH INAUGURAL LECTURE

Titled

NAVIGATING THE FUTURE OF AI IN RESEARCH: INNOVATIONS, ETHICS, AND GLOBAL IMPACT

To be delivered by

**Professor
Prema Kirubakaran**

Professor of AI and Quantum Computing

January 29, 2026





Navigating the Future of Ai in Research: Innovations, Ethics, and Global Impact

6th Inaugural Lecture

Delivered By
Prof Prema Kirubakaran,
Professor of AI and Quantum Computing

January 2026

National Anthem

Nigeria we hail thee,
Our own dear native land,
Though tribe and tongue may differ,
In brotherhood, we stand,
Nigerians all, and proud to serve
Our sovereign Motherland.

National Prayer

O God of all creation,
Grant this our one request,
Help us to build a nation
Where no man is oppressed,
And so with peace and plenty
Nigeria may be blessed.

National Pledge

I pledge to Nigeria my Country
To be faithful, loyal and honest
To serve Nigeria with all my strength
To defend her unity
And uphold her honour and glory
So help me God.

PROTOCOL

The Chairman of Council and Pro-Chancellor
Members of the Governing Council
The Vice Chancellor
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The University Registrar
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The University Librarian
Provost, College of Health
Dean, School of Postgraduate Studies
Deans of Faculties
Professors and other Members of Senate
Dean of Student Affairs
Directors
Head of Departments
Academic Staffs
Members of Congregation
My Family Members
Great Students of Nile University of Nigeria
Members of Alumni
My Lords, Spiritual and Temporal
Esteem Guests and Friends
Gentlemen of the Press
Distinguished Ladies and Gentlemen

PREAMBLE

Thirukkural 641:

Tamil: செல்வத்துட் செல்வஞ் செவிச்செல்வ மச்செல்வ
நச்செல்வங் களுளெல்லாந் தலை.

Translation: Among all forms of wealth, the wealth of listening (knowledge gained by ear) is the foremost wealth; it is the best of all. Use this to emphasize the value of knowledge and attentive listening to the audience.

Application: As the Thirukkural reminds us, the greatest form of wealth is the wealth of listening. In an age where Artificial Intelligence is reshaping our world, our ability to listen, learn, and respond wisely will determine how effectively we navigate this transformative technology.

The Vice Chancellor, esteemed guests, respected colleagues, ladies and gentlemen, I begin by expressing profound gratitude to Almighty God for His grace and faithfulness, which have made this inaugural lecture possible. It is with deep humility and immense joy that I welcome you to this intellectual engagement on Artificial Intelligence an area that has evoked both global enthusiasm and profound reflection regarding its promise and its perils.

Artificial Intelligence (AI) stands at the forefront of contemporary technological evolution, ushering in an unprecedented era of innovation across diverse sectors including healthcare, finance, education, transportation, and creative industries. Powered largely by advances in machine learning, AI systems are reshaping economic ecosystems and influencing everyday human activity at remarkable scale and speed [1], [2].

Contemporary developments such as generative AI, large language models, and emerging 3D and multimodal systems continue to redefine human-machine interaction. Initiatives aimed at democratizing AI further highlight the urgency of responsible access, ethical governance, and human oversight [3]. This lecture therefore introduces the foundations of computer science through the prism of AI and traces its convergence with quantum computing.

Despite their computational superiority in data-intensive and repetitive tasks, machines remain devoid of intrinsic creativity, moral reasoning, and ethical consciousness. The future of intelligence lies in a synergistic integration of Artificial Intelligence and Quantum Computing (QC), combining computational power with human judgment and values [4].

Professor Prema Kirubakaran

Professor of Artificial Intelligence and Quantum Computing

TABLE OF CONTENTS

Dedication	
Protocol	
PREAMBLE	1
INTRODUCTION:	2
PART 1: EVOLUTION OF COMPUTERS-TRANSITIONING TO AI ERA	
Understanding Computers	5
Hardware versus Software	4
Generation of Computers	5
PART 2: EMERGENCE OF ARTIFICIAL INTELLIGENCE	
Evolution of AI	8
The Dawn of AI: The Origins	8
AI in 2026: Frontiers and Adjacencies	9
Comparative Analysis of AI, Machine Learning and Deep Learning	10
Two Fundamental Principles of AI	11
Categories of Machine Learning Algorithms	11
PART 3: MY SCHOLARLY JOURNEY - ORIGIN AND IMPETUS	
AI Era in My Career	13
Demonstrating AI Related Courses	13
Engaging With Research, Innovation and Societal Progress	14
PhD Contribution - Digital Image Processing	15
Contribution of the Research	18
PDF Contribution-Quantum Image Processing	18
Need for Quantum Computers	21
Existence of Quantum Computers	21
Data Collection	22
Purpose of the study	24
Research Objectives	24
Implementation	26
My Contributions so far	28
SDG Goals	37
Nile University Students' Projects Using AI as Supervisor	38
AI Framework for Nile University of Nigeria	39

PART 4: CHARTING NEW HORIZONS: NAVIGATING THE FUTURE OF AI RESEARCH: INNOVATIONS, ETHICS, AND GLOBAL INFLUENCE

Training and Capacity Enhancement	40
AI Models Evolution	41
ChatGpt	41
AI Smart Homes	42
Drones Applications: Agriculture	43
Scouting/Monitoring Plant Health	44
Monitoring Field Health	45
Planting and seeding	45
Spraying Application	46
Drone Pollination	46
UAV	47

PART 5: ENVISIONING AI – THE FUTURE 2026 & BEYOND CONCLUSION AND RECOMMENDATIONS

Conclusion	48
Recommendations	50
REFERENCES	54
BRIEF PROFILE OF THE INAUGURAL LECTURER	56
ACKNOWLEDGEMENTS	62

INTRODUCTION: A TREASURED MOMENT

Respected Vice-Chancellor, Deputy Vice-Chancellor (Academics), Registrar, Principal Officers of the University, Deans, Heads of Departments, distinguished members of the academic community, mentors, colleagues, family, friends, and my dear students good evening.

This treasured moment has been shaped by many who journeyed with me through seasons of growth and challenge. Born and educated in India, a bold decision that was made by my parents to educate a girl child in 1980s, I stand here today as the first girl child to get graduated in the family, the first to complete masters, the first to complete PH.D followed by PDF, the first to take up a job all these were made possible by divine providence and institutional opportunity, grateful for the platform to explore, discover, and contribute. All praise be to God.

It is with deep appreciation that I deliver the 6th Inaugural Lecture of this University. This milestone provides an opportunity to reflect on the evolution of Artificial Intelligence, its research trajectory, ethical implications, and its convergence with quantum technologies. This lecture, titled Navigating the Future of AI: Research, Innovation, Ethics, and Global Influence, examines AI's interdisciplinary relevance and societal significance [1], [5].

Artificial Intelligence was not the first step in my career. I started learning computers from 1990's as it was made a compulsory subject in all schools in India and now still learning, this is the field where innovation happens every second. Research starts with questioning and when I was a kid, I used to ask my mom to talk about the revolving earth and she used to explain patiently with the knowledge what she had, but my mind wanted to explore more. In quest of more knowledge, I wrote to Late Yashpal Rana, a scientist who started answering questions to enthusiastic learners through television and my question was "Why does the water not falling down from the earth?". The answer I received at the age of 10 as gravity was something new to me, but I later understood the meaning of gravity at the age of 13 through my Physics teacher. Generally, learning starts with more exploration and questions. When I had a quest to learn, I needed to read a lot, venture into extensive questioning without being timid, and the people around me were ready to answer my questions. This encouraged me to gain more knowledge through a question-and-answer phase

As I was growing by age, Computer grew by many inventions and innovations. There were lot of revolutions starting as Industrial revolution 1.0 until today with Industrial revolution 5.0 and the next on board. With all these advancements we started adapting them slowly into our life and today Computer Science has taken different branches, versions and has

branched out too many activities that occupy 100% of our everyday life. What we learned inside a classroom helped us only a few percentage (%) in our career, the rest were our own interest and quest to acquire more knowledge of what we intend to do, and I was blessed to have excellent teachers who guided well to achieve the goal and grateful to my parents, my husband, kids and family who supported me to acquire what I wanted. I wish and pray my students should also give me the same acknowledgement as I do for my teachers.

Having lived through the transition into the Y2K era as a postgraduate student, I directly observed the large-scale systemic risks posed by legacy software systems, particularly within the banking and financial sectors. The Y2K issue exposed critical vulnerabilities in date-handling logic and system interoperability; however, rapid remediation and coordinated recovery efforts ensured operational continuity. This experience reinforced my commitment to designing robust, scalable, and future-proof software systems with strong validation, error handling, and preventive safeguards against similar technological failures. Additionally, the COVID-19 pandemic was also witnessed in my era, which necessitated an abrupt shift to fully an online education system. This transition required rapid adoption of digital learning platforms, remote collaboration tools, and virtual assessment mechanisms technologies that were largely unfamiliar to many educators and represented a significant transformation in traditional pedagogical and IT infrastructures.

My passion for teaching made me choose this profession, the only job where we live with young generations and young minds. The excuses they give for missing their lectures to their research questions make us learn each day. Thus, we should be ready and equip ourselves to answer every of their questions at all levels. Knowing fully well that AI's impact is more on them and handling them with answers for each question reminds me of my teachers who did it without the help of these tools. I would like to reiterate here that we were not born with AI, but because we were born without AI but now the kids from the womb start to experience AI tools, so their growth and AI impact is more, and we are all witnessing it .At the end of this lecture, a thorough navigation into the world of AI will be better understood, which would in turn help everyone to understand how AI is now and then in future. As AI advances, it challenges us to rethink its usage and understanding of the tools.

Despite these successes, contemporary AI systems face inherent limitations. The exponential growth in model size demands vast computational resources, enormous energy consumption, and access to massive datasets. Furthermore, optimization challenges and diminishing performance gains reveal the constraints of classical computing architectures. Built on binary logic and transistor-based hardware, classical computing is approaching fundamental physical and practical limits, prompting the search for alternative computational paradigms.

Quantum Computing offers such a paradigm shift. By harnessing the principles of superposition, entanglement, and quantum interference, quantum computers can explore exponentially large state spaces that are infeasible for classical machines. This transformative capability opens new possibilities in areas such as drug discovery, climate modeling, cryptography, energy optimization, material science, and intelligent agricultural systems domains where classical AI alone struggles to scale effectively.

The convergence of Artificial Intelligence and Quantum Computing therefore represents more than a technological enhancement; it signifies a fundamental rethinking of intelligence itself. Quantum Intelligence envisions intelligent systems that leverage quantum computational power to overcome the limitations of classical AI, enabling faster learning, more efficient optimization, and deeper insights into complex problems.

This lecture seeks to clarify the foundational concepts underpinning Artificial Intelligence, Quantum Computing, and their convergence, trace the historical evolution of computer science, machine intelligence, and highlight my own scholarly contributions to this emerging field. Ultimately, it invites us to reflect on the future of intelligence human, machine, and quantum and the profound implications this convergence holds for science, society, and humanity at large.

PART 1: EVOLUTION OF COMPUTERS-TRANSITIONING TO THE AI ERA

Understanding Computers

A computer is fundamentally an electronic system capable of accepting data, processing it according to a set of instructions, storing information, and producing meaningful output. Modern computing systems comprise two inseparable components: hardware and software [6].

Hardware refers to the physical components of a computer system, while software constitutes the set of instructions that guide hardware operations. This foundational distinction enables non-specialist audiences to engage meaningfully in advanced discussions in computing.

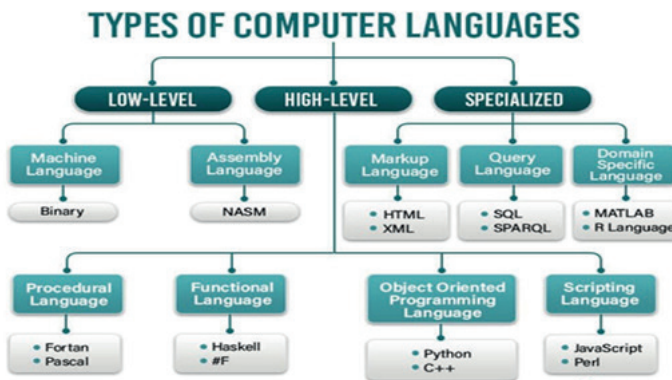


Figure 1: Classification of Computer Language (Source: Adapted from [7])

Hardware versus Software

To better understand computers as displayed in Figure 1, we would discuss the two components that all computers share: software and hardware. Components of a computer that has a physical structure, like the keyboard or mouse, are considered hardware. As we can see in the picture below, it also includes every internal component of the computer.

Software is any collection of instructions that specify what needs to be done and how considerably to be done by the hardware. Word processors, games, and web browsers are examples of software. Initial understanding of a computer starts with the diagram displayed below, so let's familiarize ourselves with it.

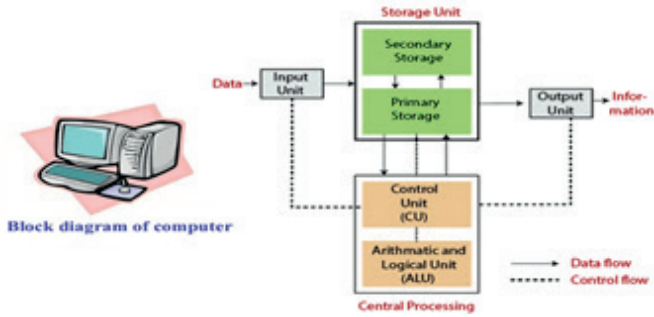


Figure 2: Block Diagram of a Computer (Source: Adapted from [6])

The growth of computers as reflected in Figure 2, such as hardware and software, was parallel and with the industrial revolution the need for machines and automation was equally enormous. Every day new technology plays an important role in upgrading computers. The era of computers started with the first generation (1940-1956) which made use of vacuum tubes, the second (1956-1963) transistors, the third (1964-1971) integrated circuits, and the fourth (1971) microprocessors. The fifth generation currently is in enormous development, spotlights artificial intelligence and advanced computing [1].

Table 1: Generations of Computer (Source: Compiled from [7])

Generations of Computer	Time	Key Technology	Characteristics
First Generation	1940–1956	Vacuum Tubes	Large, power-intensive, slow, machine language
Second Generation	1956–1963	Transistors	Smaller, faster, used assembly language
Third Generation	1964–1971	Integrated Circuits	Compact, introduced keyboards and monitors
Fourth Generation	1971–Present	Microprocessors	Personal computers, GUIs, networking
Fifth Generation	Present & Beyond	AI and Nanotechnology	Self-learning, natural language processing
Sixth Generation	Emerging & Future	Quantum Computing	Qubits, superposition, future potential

A Tongue Twister

Hardware makes use of Software to make Hardware that Software can run on

As demonstrated in Table 1, we have reached the point where software is literally building the hardware that will build the software for the hardware. In our various labs, AI systems control industrial robots that carve, drill, weld, and assemble components with sub-millimeter precision and others where the machines aren't just executing simple routines. They're learning patterns, optimizing movements, detecting defects, and adjusting their own workflow in real-time. A single robot can run thousands of cycles without stopping. It can analyze vibration patterns, compensate for tool wear, and make micro-corrections on its own while the parts it produces meet exact engineering tolerances. This loop is what makes the moment so surreal. In addition, the code running these designs helps create the next generation of machines that will run even more advanced code. Here, we could say software shapes the hardware and in turn shape the software, creating full technological feedback loops in motion.

PART 2: EMERGENCE OF ARTIFICIAL INTELLIGENCE (AI)

Artificial Intelligence is defined as the capability of machines to perform tasks that typically require human intelligence, including perception, learning, reasoning, and decision-making [1], [2]. AI encompasses machine learning, deep learning, natural language processing, robotics, and expert systems.

Artificial intelligence is the ability of machines to be programmed to think, learn, and solve problems in a manner that impersonates humans. It is predicated on computer programs created to perform tasks that require human intelligence, such as speech recognition, decision-making, problem-solving, and visual perception. Artificial intelligence (AI) encompasses a wide range of technologies, including robotics, machine learning, deep learning, natural language processing, expert systems, [2]. Numerous industries are changing because of AI systems significant innovations and advantages which are evident in efficiency and productivity.

AI-driven applications in healthcare, language translation, and intelligent virtual assistants exemplify its transformative potential. These systems improve efficiency, accuracy, and accessibility while reducing cognitive and operational burdens [8].

- **Healthcare:** AI-driven tools help medical professionals identify illnesses, forecast patient outcomes, and create individualized treatment regimens. By lowering errors and producing quicker, more precise diagnoses, this technology has the potential to save lives and enhance patient care.
- **Translation:** AI transforms language translation by using algorithms to instantly analyze and translate text. Text is automatically translated amongst languages by machine translation tools. This implies that you can enter text in the source language then into machine translation software, and it will translate it into the target language right away.
- **Virtual Assistants:** Google Assistant, Alexa, and Siri use AI algorithms to understand and respond to voice commands, providing users with information and performing tasks. These virtual assistants are becoming more and more integrated into people's daily lives, helping with tasks like scheduling appointments and controlling smart home appliances. As AI advances, its impact on businesses, industries, and daily life is anticipated to grow as human-like technologies there by relieving people from time-consuming and tiresome tasks.

Foundations of Artificial Intelligence

Artificial intelligence or AI simply means software used by computers to mimic aspects of human intelligence [2]. For example, a program that recommends what you should read based on previous books you've bought or a robot vacuum that has a basic grasp of the world around it. From bringing an innovative idea, artificial intelligence (AI) is now a major force behind both technological and social change. Machine learning has become extremely powerful [3]. This has become everything from deep mind's world champions playing with AI systems to Google translation and face recognition algorithms to digital assistants such as amazon Alexa. In times past, programmers gave instructions to computers and now it is performed by machine learning, AI that gives a complete list of instructions to complete a task. Now it has gone so far that AI systems have learnt to do all tasks by themselves, and it is achieved through a software called Neural Networks that gets trained by examples.

EVOLUTION OF AI

Artificial intelligence (AI) focuses on new ideas which is now a major force behind technological and societal advancement. Here it examines the field's early indications, highlights important turning points, and talks about its current state in 2024 to highlight artificial intelligence's incredible journey.

The Dawn of AI: The Origins

With Alan Turing's groundbreaking research and the development of the Turing Test, which put forth a standard for machine intelligence, the field of artificial intelligence got its start in the middle of the 20th century [2]. With pioneers like John McCarthy, who first used the term "Artificial Intelligence" in 1956 and followed by the Dartmouth Conference which happened in the 1950s, saw the official beginning of AI research.

The Year of Development: Advancements and Failures

Significant progress was made in the 1960s and 1970s with the creation of basic algorithms and the idea of machine learning. But the field also experienced "AI winters," which are times when interest and funding in AI research decline, mostly because of unfulfilled expectations and technological constraints.

The Renaissance: The Emergence of Data and Machine Learning

The introduction of the internet, the proliferation of data, and the notable advancements in computing power, all contributed to the resurgence of AI in the late 1990s and early 2000s. Machine learning and deep learning became popular during this time, and AI systems started to perform better than humans on some tasks.

The Integration Era: AI in Everyday Life (2020 and Beyond)

By 2020, artificial intelligence had permeated every aspect of daily life. AI has been adopted by a variety of industries, including healthcare and finance, due to its ability to make predictions, automate processes, and improve decision-making. Since AI has been incorporated into commonplace devices like smartphones and home assistants, it has become an indispensable part of our contemporary life.

AI IN 2026: FRONTIERS AND ADJACENCIES

From 2026, AI will lead many new innovations across all sectors. Advances in quantum computing and in the design of neural networks have allowed AI to broaden its capabilities. AI ethics & governance, however it, has become a core theme, considering issues like bias, transparency and the impact of AI on the employment market. AI systems contribution to overcoming global challenges, such as climate change and human health, demonstrates that the field not only is an enhancement of human capacity, but it could also serve as an impetus for positive impact on society.

From its conception until the present day of 2026, artificial intelligence has advanced at an astounding rate. It is now a cornerstone of modern technology and society, having developed from an emerging discipline. “Now that we are in the future, the potential of AI has sunk much deeper into the thought that it will transform all aspirations again, some with the headline promise of trot in nest amazons.”

As shown in Figure 3, Artificial Intelligence (AI) is a field that is constantly on the verge of the next big discovery, changing our world and the very fabric of human experience. AI develops into a multimodal, agentic technology that improves user experiences and drives advancements across numerous industries. Expect more accessibility, silo-busting, and solutions to global issues as AI advances [10].

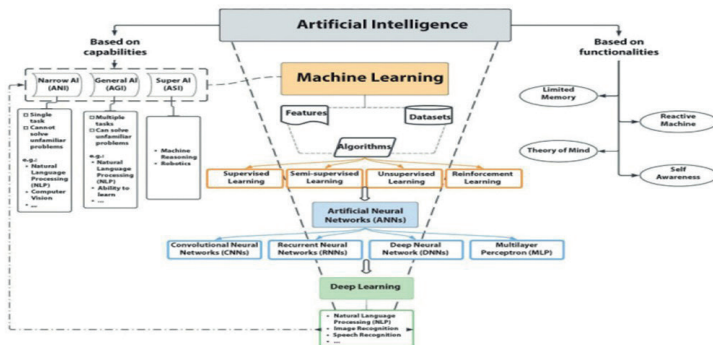


Figure 3: AI Evolution - Diagram Establishing Relationships amongst Artificial Intelligence, Machine Learning, and Deep Learning (Source: Adapted from [9])

COMPARATIVE ANALYSIS OF ARTIFICIAL INTELLIGENCE (AI), MACHINE LEARNING (ML) AND DEEP LEARNING (DL)

Machine learning, a core subset of AI, enables systems to learn from data without explicit programming. Deep learning, inspired by biological neural networks, further enhances this capability by enabling unsupervised and representation learning [9].

Artificial intelligence and machine learning are not synonymous, even though they are often used interchangeably. As displayed in Figures 4 and 5, the broader idea of artificial intelligence encompasses the simulation of human intelligence in machines. It involves creating intelligent systems that can recognize speech, solve problems, and make decisions tasks that typically require human intelligence.

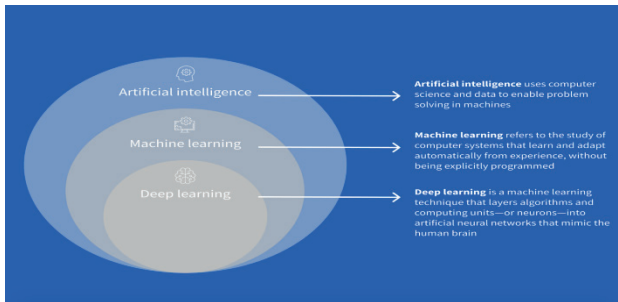


Figure 4: AI, ML and DL (Source: Adapted from [9])

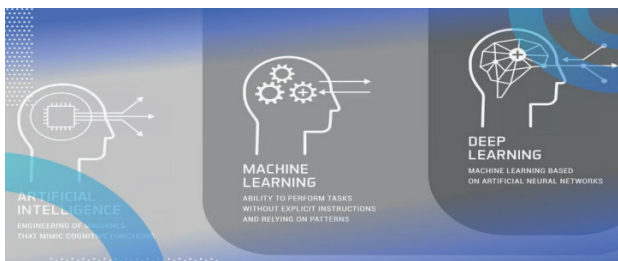


Figure 5: Defining AI, ML and DL (Source: Adapted from [9])

Enabling machines to learn from data and improve their performance without explicit programming is the aim of machine learning, a subfield of artificial intelligence [6]. The process of developing analytical models is automated by this data analysis method. AI systems can analyze large datasets using machine learning algorithms, which then make predictions or decisions based on the patterns and trends discovered in the data.

TWO FUNDAMENTAL PRINCIPLES OF AI

Machine Learning- This looks like nothing but a largescale correlation. Therefore, Machine Learning helps you, based on large amount of data, to build and predict. ML by and large solves supervised algorithms, because we must give lots of data into that.

Examples: Email automation and spam filtering: Successful machine learning leads to email automation, and spam filtering is one of its most overlooked features. Effective spam filtering adjusts and identifies undesirable patterns in email content.

Deep Learning- Mimics the functioning of the human brain as shown in figure 6 below. Thus, you can solve what are known as unsupervised algorithms in deep learning. Unsupervised algorithms that use deep learning and neural networks have a much higher potential to perform tasks and more closely resemble humans because deep learning uses the data it must create new program branches of conditions before making decisions [9].

Examples include image recognition tasks that use a variety of AI techniques. For example, the algorithm may learn to associate specific features in an image, like an object’s shape or color, with the appropriate label, like “dog” or “cat.”

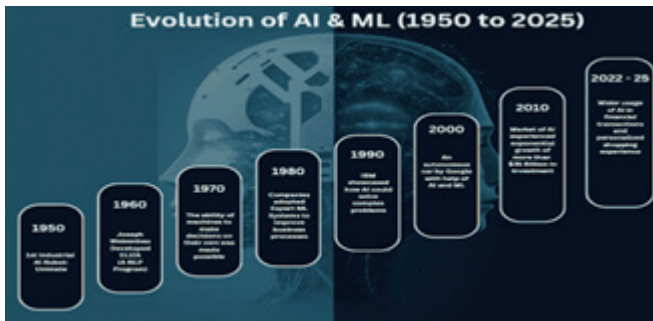


Figure 6: Evolution of AI (Source: Adapted from [13])

CATEGORIES OF MACHINE LEARNING ALGORITHMS

There are three types of machine learning algorithms: reinforcement learning, supervised learning, and unsupervised learning.

Supervised learning: For tasks like image recognition and machine translation, this algorithm can find patterns in data after being trained on labeled data with known outcomes.

Unsupervised learning: Algorithm trained on unlabeled data, this type is used in clustering, anomaly detection, and recommendation systems, to find patterns and relationships without help.

Reinforcement learning: The agent learns by interacting with its environment to maximize rewards and making decisions that maximize cumulative rewards over time in applications such as self-driving cars, robotics, and gaming.

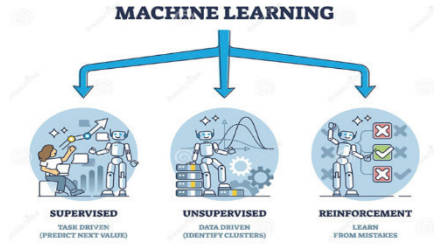


Figure 7: Three Categorizations of Machine Learning (Source: Adapted from [22])

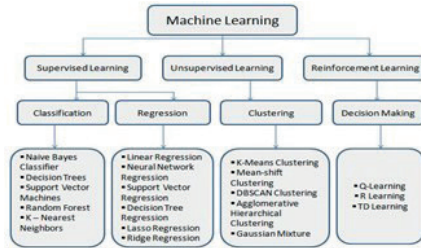


Figure 8: Classical Machine Learning (Source: Adapted from [23])

These classified algorithms are used in everyday research as reflected in Figures 7 and 8, to achieve different processes that make our life easy. In my research work I have implemented both supervised and unsupervised learning methods. As next level of my work focusses on drones, reinforcement learning is established to achieve the goals of training the drone models to work efficiently- a novel venture, since the algorithms listed under supervised and unsupervised learning are being used and trained by me and my students in the research work that is going on now.

PART 3: MY SCHOLARLY JOURNEY: ORIGIN AND IMPETUS

AI ERA IN MY CAREER

Mr. Vice Chancellor sir, I have devoted a significant amount of my academic and research career life journey in imparting knowledge, developing curriculum in the fields of artificial intelligence, image processing, quantum computing, and other computer-related courses. To make sure that students not only comprehend the underlying ideas but that they also know how to apply them to practical problems, it has been my responsibility as an educator to connect theoretical ideas with real-world applications. My approach to teaching places a strong emphasis on creating an interactive classroom, where students are inspired to experiment, come up with new ideas, and use cutting-edge technology. To witness these, students have presented and published research articles successfully in various National and International Journals. They have also exhibited their projects in various project competitions and have won and got recognized globally. Further to continue these projects have been patterned and now waiting for grant approvals under various levels and sectors.

I have been actively involved in teaching artificial intelligence to both undergraduate and post - graduate students at Nile University of Nigeria. My strategy has been to give students strong foundation in quantum computing, pattern recognition, artificial intelligence, and image processing. The course design allows students to gain skills that are applicable in a variety of industries, such as robotics, autonomous systems, smart cities, smart agriculture, and quantum computing. It covers both theoretical foundations and real-world applications. Additionally, I use project-based learning, an approach through which students work on real-world issues and use the skills they have learned to come up with creative solutions. To help students gain the knowledge they need to navigate this rapidly expanding and complex technological world, my research and teaching have been expanded into several departments worldwide. The lecture differentiates between when and where to apply and implement various topics, including hardware, algorithms, computer science, and information technology. This method teaches students how to collaborate in cross-functional teams, which is a skill that is becoming increasingly crucial in the modern world.

DEMONSTRATING ARTIFICIAL INTELLIGENCE RELATED COURSES

My expertise in artificial intelligence (AI) has impacted on the development and operation of multiple graduate and undergraduate programs that give students the skills they need to thrive in this rapidly evolving field. These courses address both basic ideas

and more recent developments in a variety of topics, such as image processing, pattern recognition, and quantum computing. Rigid problems in AI are solved by operators like “MMO-Mathematical Morphological Operator,” which are bonded with KNNs and cluster algorithm. I consistently recommend techniques and algorithms with a classical mathematical bent. This method gives students the ability to apply concepts to real-world scenarios, such as improving AI models and resolving complex problems seamlessly.

Additionally, my lectures on research techniques go deeper into preparing students to engage with state-of-the-art AI tools that generate music, images, and text. Furthermore, the systems that allow massive AI applications to store enormous amounts of data are the major focus of my quantum computing courses. Collectively, these courses provide a comprehensive education in AI, preparing students for research and business careers.

ENGAGING WITH RESEARCH, INNOVATION, AND SOCIETAL PROGRESS

The development of AI in my era compelled me to focus more on it, nitty gritty and hence, I started shifting my quest on research. AI, which sounded like transformative discipline, made me astonished to witness the vast growth of these two letters into gigantic automative systems. The growth was not only on the automated systems it also spans with-it networks, communication, and media all developed in parallel form. In 2001, as a PG student, my first project ever was an online dictionary that converted from my mother tongue Tamil to English using web app development with SSI-3rd Agenda technologies. The launch of this web app tickled my inner thoughts to do more research and hence I stepped boldly into reading and learning more on the emerging AI tools in the early 2000’s. Then, after that with AI, I progressed graciously to conversion of palm leaf scripts into digital media.

When the world started to digitize with CD’s my idea focused on topics that did not exist, but I have always heard my parents telling us to focus on impossible concepts, since everything is possible. Hence, I decided to convert all palm leaf scripts to digitized platforms and that bagged my master’s in philosophy (M.Phil.). Most palm leaf manuscripts are typically available in deteriorated states, such as insect bites, moisture and humidity discoloration, and cracks. Such a manuscript is considered challenging in the field of research. With the guidance of my supervisor Prof. A. Kannan from Anna University, I started to explore more on the palm leaf manuscripts and the methodologies to convert it into digitized forms. About 213 Purananuru dataset samples were used, including authoritative texts on Tamil grammar, discipline, and mortal health, were collected from Tamil palm leaves. As a result, a high-quality raw dataset was gotten using a Nikon camera, pre-enhanced samples were created using editing software, and the Otsu threshold was applied to capture the ground images through binarization as easily accessible content. This was a very time-consuming

task, but it was crucial in transferring the text using image processing techniques with AI tools.

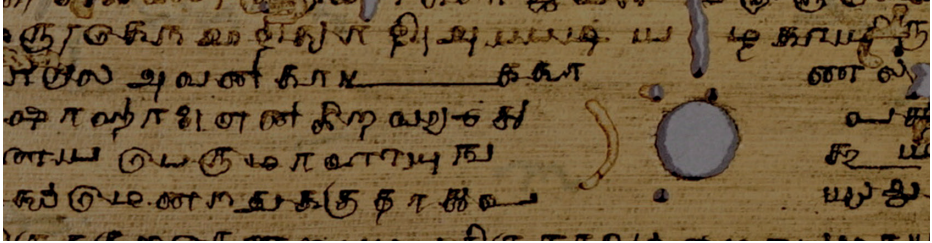


Figure 9: Palm Leaf Script of Purananuru (Source: Adapted from [24])

As highlighted in Figure 9, Purananuru: Sometimes referred to as Puram or Purappattu, the Purananuru (Tamil: புறநானூறு, Puranānūru, literally “four hundred [poems] in the genre puram”) is a classical Tamil poetic work that is traditionally the final of the Eight Anthologies (Ettuthokai) in the Sangam literature.

PHD CONTRIBUTION - DIGITAL IMAGE PROCESSING

Computers are necessary in today’s world, for tasks involving complex computation, data analysis, and information extraction that deal with quantity. Human eyes are a great tool for analyzing images in nature, particularly when it comes to extracting higher level information. Computers can’t yet fully replace human analysts in a variety of applications, such as remote sensing, security, and medicine [8]. As a result, human visual perception models serve as the inspiration for many crucial image analysis tools, including edge detectors and neural networks. For making decisions, the data gathered from various applications needs a suitable method for obtaining knowledge or information from sizable repositories.

The advancement in the digital era encouraged me to focus more on digital image conversion with AI techniques. Moving further, my research area turned to identifying holes, cracks and flaws in oil pipelines. Since my husband is an oil & gas pipeline engineer and I saw him examine x-rays to identify holes, cracks & any kind of flaws in an oil pipelines. This made him and his friends have various issues in their vision (Long & Short sightedness increase). This issue made me think of an impossible to make it possible, hence the idea emerged to convert this image into readable computer formats of 0’s & 1’s and to capture the defects in an oil pipeline[15].

Digital image analysis is mostly used in place of analog to carry out computerized tasks on images. Digital image processing is the only practical technology for categorization,

extraction of features, pattern recognition, projection and multi scale signal analysis. Among the methods employed in digital image processing are pixelization, linear filtering, principal component analysis, independent component analysis, hidden Markov models, anisotropic diffusion, partial differential equations, self-organizing maps, neural networks, and wavelets [9].

Digital images are processed and altered on a digital computer. Though it focuses primarily on images, it is a subfield of signals and systems. The goal of digital image processing is to design a computer system that can process images. The system receives a digital image as input, processes it using effective algorithms, and outputs an image. Technique for identifying colors, shades, and relationships that the human eye is unable to perceive are used in picture analysis. In fields like forensic medicine and the production of weather maps from satellite imagery, image processing is utilized to address identification issues. It works with digital camera or scanned-in images in bitmapped graphics or any other image format.

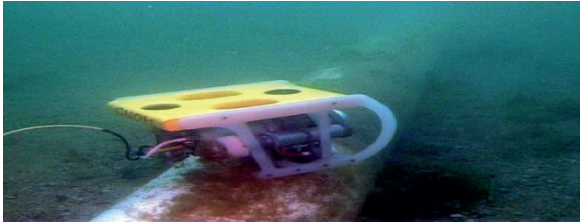


Figure 10: Manual Pipeline Intervention inside Water Level (Source adapted from [15])

This research work, as shown in Figures 10 and 11 employs the high frequency filter-GTO which detects discontinuities method for image recognition, done with mathematical morphological operators, edge detection principles, and an unsupervised learning algorithm. A digital camera that is attached to a fiber optic cable is first inserted into the pipe, where it takes pictures. These pictures are saved as bits after being transformed into raster images. These images are then processed to view hidden points using an unsupervised cluster algorithm. Once the hidden points have been evaluated, the crack's length must be measured in order to pinpoint its location, which is accomplished by creating a mathematical morphological operator - MMO.



Figure 11: Pipeline Showing Crack with Measurement (Source adapted from [15])

One of the main challenges in picture detection appears to be the extraction of hidden patterns from many data recognition activities. Although a pipeline is typically 22 meters in length, the length needed to take an image can be shortened to 10 meters and then the remaining distance to avoid the issue of huge data. When moving any material via a pipeline, environmental and human safety are crucial. Because of this serious security risk, image detection has grown in popularity as a part of image processing and analysis.

Traditional manual detection systems have high false data rates and require a lot of time from the manual operator to analyze the data. Effective and efficient techniques are desperately needed to distinguish between unique picture displays that are very huge, high in dimensionality, and complicated, as well as those that are unknown and unexpected, via a pipeline network. Because they are more accurate and require less manual processing time, and input from human experts, pattern recognition-based image analysis detection methods have been selected.

To help the system, operator with maker-processing, classification, labeling, and mitigating the results of image data, this research also concentrated on resolving issues in image detection communities. Pre-processing the data is challenging for the system administrator. Even though it was completed successfully, the task is a failure due to the overwhelming number of images produced, and occasionally the images are not identified.

Data must be updated frequently to get out of this predicament. Hence, four main image analysis and processing methods involving pattern recognition tasks have been introduced to lessen the administrator's workload. This study used image detection datasets, and the suggested algorithms were implemented using the MATLAB and VB platforms. In this study, several well-known algorithms, including the Kohonen-cluster algorithm, Canny's edge detection algorithm, and the mathematical morphological operator algorithm for image simulation, were used to classify network data.

Moreover, providing enough information to enable readers to understand and potentially apply the derived technique is a crucial technical objective. By comparing an image database, the study's output creates a system for locating oil pipe flaws.

Image processing is any type of signal processing where the input is an image, like a picture or a frame from a video. The result of image processing can be an image, or a collection of parameters or attributes associated with the image. Most image processing methods treat the image as a two-dimensional signal and process it using standard signal processing methods.

Contribution of Research

The main contribution of this research is the replacement and improvement of manual evaluation as follows:

1. Discovered a mechanism for the replacement of manual pipeline intervention technique. This mechanism is applicable for any type of pipeline transportation.
2. The position and size of the pixels are defined. The required number of bits are evaluated and stored in the buffer area.
3. Image without defects were evaluated using the algorithms developed. The algorithms are independent of each other. The speed of processing is more. Hence, the evaluation of the images was achieved without any hurdles.
4. Computed data points between the old and new bits of each pixel group that were generated in clusters.
5. Finally, the proposed computer-based monitoring system was tested with different sets of images. The results show that the proposed image analysis and processing model using HFF-high frequency filter and GTO[25] and implemented through mathematical morphological operator is better than the existing manual systems.
6. Testing of images were carried out using AI algorithms for bits search in raster images generated using the MMO algorithms.

Finally at the end of the research work, it was concluded that the size of the digitized camera can be reduced to a miniaturized system and implemented to be a robotized camera, thus avoiding the use of fiber optic cable. Different cluster algorithms can be developed to evaluate mass data and with that, seconds taken to evaluate an image can be reduced to nanoseconds. Future studies can be undertaken, keeping these points in mind to enhance the performance of the proposed CBMS model. In future, we hope these proposed algorithms will collaborate with different applications as an interdisciplinary approach to detect novel methods in identifying an image with defects. Appropriate time to bit rate evaluation must be adjusted. The buffer area to store the bits can be enhanced and improved to have a permanent set of data stored. The barrier to rules and regulations by the oil production board has reduced the area of open discussion. If this approach is ruled out, further results can be discussed, and the area of this research paper can be extended as future prospective work with the introduction and implementation of neuron based neural network theory.

Post - Doctoral Fellowship (PDF) Contribution - Quantum Image Processing

After the completion of my PhD, I started working towards my PDF in 2019 but due to the COVID pandemic, situations were not favorable to continue and had to wait until 2021 to apply for my PDF and finally got into smart agriculture with Quantum image processing Techniques (QIPT-). I started with image processing (IP), then into digital image

processing(DIP) and now landed in Quantum image processing (QIP).My supervisor advised me not to take up quantum computing as it was only in a budding stage, but the research quest urged me to choose the area of research as quantum computing. With the great support of my mentors Dr. I V Murali Krishna, Prof Ramana Murthy and my Research Supervisor Prof. Mithun Chakravarthy I stepped into quantum computing. I chose this because this question was continuously running in my mind, as the usage of data is increasing where are we going to store the data next and this connected me with quantum servers and with numerous quantum computing. To understand quantum computing you need to know little about mathematics and physics. As the research commenced, learning started along with it. A rigorous study about the difference between classical and quantum computers was read and reviewed. This review gave very fascinating records, which are shown below in table 2.

Table 2: Showing Comparison of Classical Computers and Quantum Computers (Source: Adapted from [11])

Vital Comparison	Standard Computer	Quantum Processor
Computer Basics	A massively integrated general-purpose computer based on classical physics	Quantum Mechanics Based High Speed Parallel Computing
Data Storage	Bit-wise data storage using voltage/charger	Information storage uses a quantum bit (qubit) with electron spin
Bit Standards	A bit has a value of either 0 or 1 and can have a value at any time	Qubits have values 0, 1, sometimes negative and can have two values simultaneously
Numeral of Probable States	The number of possible states is 2 which is either 0 or 1	It knows that the number of possible states is infinite given any combination of 0 or 1 and some complex information.
Output	Determinism – repeated calculations on the similar input give the same output	Probability – (super state gives probability answer for repeated computations)
Gates used for Handling	Logic gates process data sequentially, such as AND, OR, NOT, etc.	Quantum logic gates process data in parallel

Scope of Possible Explanations	The algorithm provides a clear and defined response due to the design	Consider probability and multiple responses due to the properties of superposition and entanglement
Operations	Processors use Boolean Algebra	Linear algebra and functions with unitary matrices
Circuit Employment	Circuits are implemented in fast and scalable macro technologies such as CMOS.	Circuits are actuated using slow and slight microscopic methods such as nuclear magnetic resonance

The first research work was to analyze the text, which kindled the research work of reading the palm leaf inscriptions and converting them to digital videos. This was extended to image processing in oil pipelines, to find the holes and cracks. The successful completion of this work helped to extend the work to have more storage space for the data collected during image processing. The search started with how to improve the storage space with the latest emerging technology that resulted in quantum computing. This is the latest technology that involves Quantum Image Processing (QIP-) [17]. The shift from traditional computers to quantum computers is happening gradually. This made the way to organize the detection of diseases in plant leaves using QIP techniques.

QIP is an exciting and promising new field. If an image is expressed using quantum information, all the unique quantum properties, like superposition or complication, can be used to describe it. In this work, different quantum models were looked at and compared. Then a traditional computer is used to simulate a quantum image. Quantum computing is a new approach to using mainframes based on the exciting science of quantum mechanics. Physics, Mathematics, Computer Science, and Information Theory to name a few that make a sublime mixture. These research contributions begin with the origins of distributed computing and discuss all the changes and improvements made to date due to computer limitations. Deliberately, we explore how quantum computing works and the quantum properties that come with it, such as superposition, entanglement and interference. In line with this research, efforts can be focused more on the architecture, hardware, software, designs, types, and mechanisms required for quantum computers. Practically, quantum is a great way to understand the full potential and challenges of computing and bring them to market.

The capabilities of quantum computers are proving to be life-changing in network security, traffic optimization, medicine, and Artificial Intelligence (AI).

Finally, we have considered what quantum computers are, how important they are, and what their pros and cons are. Recently, small quantum computers were being made. The high potential of this development and the progress being made in research point to a bright future. Earlier, focusing on what a universal quantum processor is and considering how powerful the new technology is, it's a good idea to look at where classical computing comes from and what it can and cannot do. This information helps us figure out what might be hard about making technology unique and competitive. It will also show us how things are changing in this field.

Need for Quantum Computers

Research by scientists and engineers has shown that quantum computers can easily solve many problems that classical computers cannot solve. Quantum computers promise to open new ways of communicating privately and challenge existing cryptography methods. Quantum computers need to learn more about the physics behind quantum mechanics, such as processor chips, communication devices, power technologies, scientific instruments, sensors, clocks, and materials that can help transform the way quantum mechanics is produced at working scales. Quantum computers assist us with studying, modeling, and control other quantum organizations [11]. In the 1950s, it was hard to imagine how computers and related technologies would be used today. In the same way, we may be surprised by the uses that come up for quantum processors.

Classical computers and quantum computers have some of the same features. For example, most chips, circuits, and logic gates are found in both types of computers. Their actions are controlled by algorithms, which are basically a list of steps to follow in a certain order. A binary code can be provided to collect information consisting of 1s and 0s. In both kinds of computers, the ones and zeros are written with physical things. In older processors, bits can be stored in two states: when the power is turned on or off, or when a magnet is up or down. Quantum computers use qubits to process data in a very different technique than consistent bits. A classical bit is continuously mentioned to as representative either one or zero while a qubit can measure its formal as one and zero. Also, the conditions of more than one qubit can be entangled, which resources they are linked to quantum mechanism. It turns out that quantum computers can do things that classical computers cannot, putting into account the superposition and quantum entanglement. Ions of charged atoms or electrons can be manipulated to create qubits. Photo lithography can also be fabricated by nano engineering artificial atoms such as superconducting qubit circuits using a printing method [12].

Existence of Quantum Computers

Quantum computers have been everywhere for over a decade in different procedures.

Several technological companies already have great working conditions with quantum computers and sell them along with associated programming languages and software improvement tools [13]. The qubits can then be sent in a restrained chamber that cools the quantum state to proximate zero and protects it from magnetic and electrical interference. Most such computers operate under 100 qubits and quantum gates that control qubits with logic operations are in the initial stages of expansion with many requests.

In 2019, quantum computers successfully came up with calculations within a period limit that it would take a conventional supercomputer to do. This is called “proof of principle,” and such quantum computers are expected to be used for many years to solve real-world problems. Quantum annealing is another form of quantum computing that goes even further, but it only performs one type of computation [26].

In this manner, quantum computers embedded in cryogenic refrigerators use thousands of qubits to promptly find optimal keys to compound problems. This method is only applicable to mathematical problems called “binary optimization problems”, which have many variables and possible interpretations. Some companies and management agencies purchase computers or lease new representations to solve problems in planning, design, logistics, and procurement [15].

To conclude, the method of implementing quantum computers with AI, we would look at the definition displayed below:

Quantum computing is a hardware that leverages quantum machines to perform complex calculations, while AI is the software and methodology enabling machines to learn, reason and make decisions.

Quantum computers could offer immense processing power for simulating complex biological systems, potentially leading to breakthroughs in understanding and even creating advance biological intelligence that might inform future quantum system designs. This propelled me to choose the most needed problem to be considered for deriving a solution with quantum. So, I decided to start my research with smart agriculture as food is the most essential part for every one of us.

Data Collection

Data for the research work was collected based on famine, food scarcity and then later it was understood the correlation between productivity and shortage of food, less productivity breeds increase in food shortages. This was one of the major causes, though other reasons are available for food scarcity, this is one of the vital reasons. Hence my research focused towards identifying the diseases in paddy crops. Diseases were identified by the color of the

leaf, and an index was used to measure. This discoloration as reflected in Figure 12, is due to chlorophyll and nitrogen deficiency. Both nitrogen and chlorophyll are dependent on each other. Prediction of one will help to identify the other. Various methods are involved in finding defects in leaves due to nitrogen and chlorophyll deficiency. Both destructive and non-destructive methods are available, but as the research relies on quantum image processing, a non-destructive method had been opted for. Many methods are available based on image processing that emerged into quantum image processing.



Figure 12: Video Scope Installation (Source: Adapted from [17])

This work was the first one based on quantum computing. A low-cost and non-destructive method was developed that is also easy to use for accessing the health status of plants, based on the estimation of nitrogen and chlorophyll content of leaves using a borescope non-destructive sensor. A new algorithm with the utmost efficiency is proposed through this research work. Quantum image processing is a developing new field that applies both quantum computation and quantum information processing to create and manipulate quantum images. This work helped us to learn the methods of handling the representation of quantum images on quantum computers and to process, prepare, and retrieve the data. The two powerful concepts of quantum computation such as entanglement and parallelism gave an advantage to the concept of quantum image processing [4].

As the first step images were encoded to get quantum states. To encode the gray level images two methods were used; FRQI- Flexible Representation of Quantum Images and NEQR- Novel Enhanced Quantum Representation [16], as the techniques are advanced both methods are applied but the NEQR method gives better results to identify the discolored leaf that ends in finding out the nitrogen content of a plant. Since the NEQR method uses the basis state of a qubit sequence to store the gray-scale value of every pixel for the first time, it generates better qubits identification when compared to the FRQI method. Therefore, with the generated data sets using Qiskit [27] it is proposed that NEQR quantum image model is more flexible and better suited for quantum image representation than other models. Hence this result paved way for the hybrid combination of FRQI and NEQR into Flex-R-NovEnd (Flexible Representation and Novel Enhanced) [27] quantum representation image identification technique to predict the level of Nitrogen

and Chlorophyll content in Paddy Crop.



Figure 13: Courtesy Paddy Fields in Namakkal -Tamil Nadu - My Hometown

(Source: Adapted from [17])

As displayed in Figure 13, quantitative image processing techniques were used to gather data. The data was collected from the paddy fields of Tamil Nadu mostly from Namakkal and Arcot regions. Image samples of more than 1000 were captured and analyzed for further processing using the QIP(Quantum Image Processing)[17] techniques. Data was collected over a period of one year due to seasonal growth of the plant and to get plants with leaf discoloration, a minimum wait of three months was required. When the plant was yet to grow, findings in a leaf were difficult, only when they started growing inch by inch was the process implemented. Because the initial stage plant was too small giving a look of attachment to the ground.

PURPOSE OF THE STUDY

The objective of these studies was to control the measurement of nitrogen and chlorophyll in rice leaves. This research study was very much focused on knowing the percentage level of these two mixtures in the leaf. Once the cause is determined proper measurement will be adhered to avoid the mixture levels in the leaf thus leading to an increase in the crop yield.

RESEARCH OBJECTIVES

Aim of this research:

- i. Identify the deficiency of nitrogen and chlorophyll content in the leaf.
- ii. Explore the deficiency in (i) using QIP techniques by implementing Mathematical Morphological methods using FRQI and NEQR methods.
- iii. Evaluate the hybrid technique of combining FRQI and NEQR to derive an accurate result.

DATA PRESENTATION AND DISCUSSION

The Data is presented in qubits form, obtained through gates. The captured image is measured under the parameters of leaf height, color, and age of the plant calculated in terms of number of days from plantation and texture.

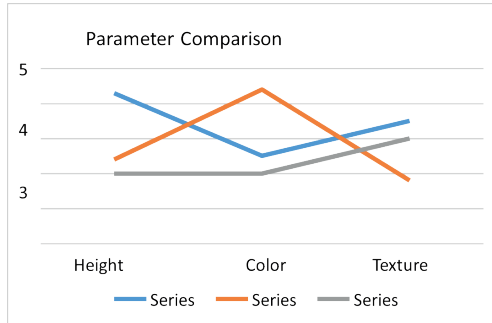


Figure 14: Parameter Comparison (source adapted from [16])

The above figure 14 illustrates the various levels of the parameters versus the duration. Data was presented systematically and chronologically, according to the data retrieved from the images. The study’s purpose was spelled forth alongside the research objectives. Qiskit, a computer application, was used to examine data. To summarize the results, descriptive statistics in the form of percentages were employed, as well as pie diagrams and bar graphs. Literature references supporting the findings were also included where applicable. A summary of the findings, conclusions and recommendations can be found as follows. Images for evaluation combine erosion and dilation operations that are used to find the quantum image local feature point frame extraction. This was achieved by implementing novice quantum binary image morphology operation methods that are briefed in the Mathematical Morphological Operator.

By merging quantum computing and image processing, a new quantum- based image processing process that integrates multiple quantum logic gates and quantum image storage, a quantum charging arrangement, and a buoy search algorithm concurrently to improve their performance were proposed.



Figure 15: Dilation of the Paddy Defective Leaf (Source adapted from [17])

The above Figure 15 shows the defect in the leaf, these defects should be identified at a

near stage using the proposed algorithm that will help to give proper pesticide to improve the yield of the crop. The implementation of image processing through erosion and dilation using mathematical morphological operators helps to identify the defects, the existing methodology is only for classical computation, and this proposed methodology is defined through the quantum computing application using quantum image processing techniques. Instead of evaluating bits, the conversion bits to qubits are performed and the images are assessed to rectify the defects. Qubit[16] is obtained by identifying the defected part then light or magnetic fields are used to create superposition, entanglement, and other related properties to source the identification of damaged parts in the paddy leaf.

IMPLEMENTATION

This research work can be implemented in two methods using MATLAB in basic applications or Qiskit for accurate image results. But Qiskit was used as it gives very clear values on image analysis and classification. By using the FRQI states quantum images were represented as:

$$|I(\theta)\rangle = \frac{1}{\sqrt{2^{2n}}} \sum_{i=0}^{2^{2n}-1} (\cos\theta_i |0\rangle + \sin\theta_i |1\rangle) \otimes |i\rangle$$

$$\theta_i \in [0, \pi/2], i=0, 1, \dots, 2^{2n}-1$$

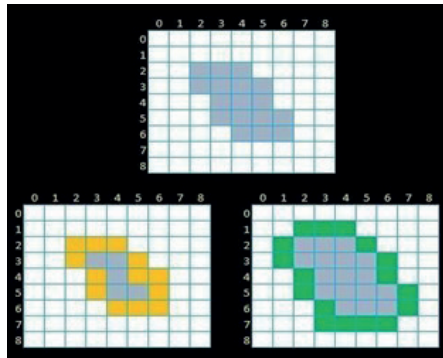
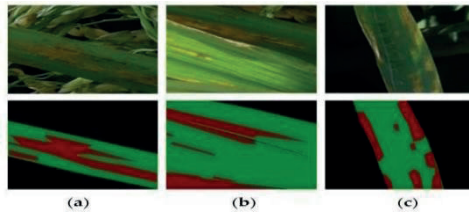


Figure 16: Image Showing the Conversion of Bits to Qubits through Erosion and Dilation Algorithms (Source: Adapted from [27])

Qubits are used to code the defective bits’ location by applying quantum operators. Designing the algorithm depends on the nature of the qubits position. If the bit positions are in clusters they should be trained under any unsupervised k-means cluster algorithm to remove the tangles and should be proceeded for the evaluation of defected bits position. The fundamental steps in any image processing method are erosion and dilation which help to extract many basic features. It is important because it extracts the basic geometric

shapes that are fed into higher algorithms to identify and recognize the objects. In this research work, as shown in Figure 16, an improved quantum methodology was implemented, to understand the dilation and erosion applications in the processing of an image. Information retrieved is stored as quantum bits. These bits are used to encode each pixel's state and other information and to use quantum operators, which are implemented with quantum gates. Qubits result in accurate identification of defective leaf images. Though there are advantages to their natural representation which leads to challenges in designing quantum algorithms, this research work was targeted to solve this problem and enhance the productivity rate.

Figure 17: Image Showing Bacterial Streak Disease after Dilation Process



(Source: Adapted from [28])

Quantum image processing gives better results when compared to classical image techniques, as displayed in Figure 17. As many problems occurred during the conversion of bits to qubits, the application of erosion and dilation using MMO helped to obtain fined image that helped to identify the defects in the leaf images. Sharpening and smoothing of the image was a challenging task when compared to classical images, maybe in the future by applying various possible techniques this can be achieved without any hardships.

This method of applying quantum image processing techniques was very challenging, but the quest to learn more about the algorithms of QIP and Qiskit helped to solve the issues in a better way. As a budding trial, this research was taken over. The sample dataset is fed as real datasets from the paddy field across Tamil Nadu. As the crop grows this research work also gets developed by capturing real images. The sample dataset is fed in with Qiskit where it is compared with the defective image, to achieve better results.

MY CONTRIBUTIONS SO FAR –

Publications in SCI/Scopus - Google Scholar: Figure 18 below, has the display outcome of my citations on google scholar, of which I'm still growing and impacting scholars.

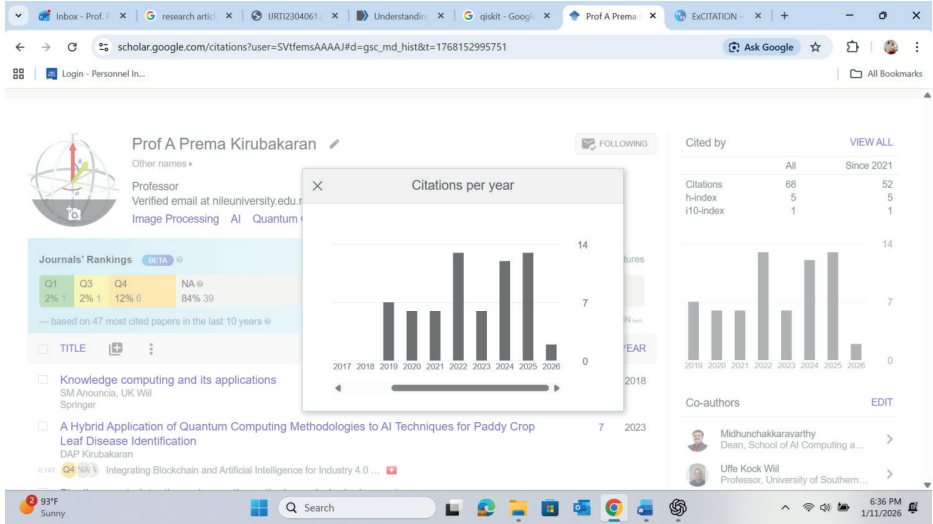


Figure 18: Google Scholar Publication

PATENTS

Patent -UK

1. Patent published in Official Journal Certificate of Registration for a UK Design with design no: 6390386, granted date:30/09/2024, Registered date: 12/09/2024, Title of the invention: **Computer Vision based Scanning and detecting device.**
2. Patent published in Official Journal Certificate of Registration for a UK Design with design no: 6390386, granted date:30/09/2024, Registered date: 12/09/2024, Title of the invention: **Fingerprint and camera-based door handle.**
3. Patent published in Official Journal Certificate of Registration for a UK Design with design no: 6316327, granted date:09/10/2023, Registered date: 30/09/2023, Title of the invention: **Oxygen Dispenser Unit with Image Processing.**

4. Patent published in Official Journal Certificate of Registration for a UK Design with design no: 6304728, granted date:30/09/2023, Registered date: 22/08/2023, Title of the invention: IOT Antenna Signal Quality Monitoring Device.
5. Patent published in Official Journal Certificate of Registration for a UK Design with design no: 6294605, granted date:13/7/2023, Registered date:06/07/2023, Title of the invention: Cloud Computing Server device for Data Analytics.

Patent-India

6. Patent published in Official Journal of The Patent Office with Application No.202541018999 A- INDIA, Date of filing of Application: 04/03/2025, Title of the invention: **A System and method for minimizing qubit usage and reduced circuit depth in near-term quantum computing**, published on 14/03/2025(Submitted for Grant)
7. Patent published in Official Journal of The Patent Office with Application No. 202341001680-Docket No: 61179- INDIA, Date of filing of Application:09/01/2023, Title of the invention: **“Remote Aquatic Environmental Monitoring using Internet of things”**, published 20/01/2023.
8. Patent published in Official Journal of The Patent Office with Application No.202141042980 A- INDIA, Date of filing of Application: 22/09/2021, Title of the invention: **Smart Agriculture Using Sensors in the Internet of Things (IoT)**, published on 01/10/2021
9. Patent published in Official Journal of The Patent Office with Application No.202141020623 A- INDIA, Date of filing of Application: 06/05/2021, Title of the invention: **An Initial Step to Implement Smart Bins in Chennai Local Trains**, published on 14/6/2021
10. Patent published in Official Journal of The Patent Office with Application No.201941029682-Docket No: 61179- INDIA, Date of filing of Application: 03/6/2019, Title of the invention: **Process on Image for Earthquake Damage Assessment**, published on 23/7/2019

Copyrights

1. Copyright published in The Nigerian Copyright Commission with Registration no: LW12457, on 27/7/2023, for the Title: Prediction of Crop Disease using FRQI methods in Quantum Image Processing.
2. Copyright published in The Nigerian Copyright Commission with Registration no: LW12454, on 27/7/2023, for the Title: WULF-An Automated Trading Platform.

Projects

- Feeding Hens in poultry farms using IOT techniques, Amount Rs.3,00,000/- for Vijay feeds Namakkal, duration one year from 15/12/22 -14/11/2023
- Quantum Computing using AI techniques to find the resolutions in the Paddy field, Amount Rs.1,25,000, for Aristaa Solutions Pvt., Ltd., duration one year from 23/03/2022-22/03/2023.
- Metaverse in Data Science, Amount Rs.1,00,00 for Aristaa Solutions Pvt., Ltd., duration one year from 23/02/2022-22/03/2023
- Online Vocabulary Development (2001-3rd Agenda Technologies, Chennai, India) Tools: Java, Servlets, ODBC, and JDBC
- Real Time Project for Hill Brook Mineral Water, Chennai (1999), Tools: Foxpro in DOS

Books

1. Prof A Prema Kirubakaran, published a book titled “Foundations of Cyber Security Principles,Threats and Defense Mechanisms, by Imaginex Publishers on 18/2/2025 with ISBN-978-81-982083-0-9
2. Dr A Prema Kirubakaran, published a book titled “Web Application Development-A Beginner’s Vision, by Imaginex Publishers on 21/3/2024 with ISBN-13:978-8197065491, ISBN-10:8197065497
3. Dr. A. Prema Kirubakaran, published a book titled “QIPAT” by Imagines Publishers, December 2023,with ISBN no:978-81-965852-6-6
4. Dr. A. Prema Kirubakaran, published a book on IOT Design and its applications

using emerging technologies as Volume I & II, published by ESN Publications, India. The book entered into **Guinness world record attempt** held in August 2023 for the thickest book in the world, titled “World 2023”, with 100,100 pages measuring 19ft 0.34 inches, organized by ESN publications and certified by the London Organization of Skills Development, UK on August 27th, 2023.

5. Dr. R. Vijayarangan, Dr.R.Anandan, Dr.A.Prema Kirubakaran, Er.V.Thirumurugan published a book titled “An Internet of Things(IoT) Application for predicting the Quality of future heart attack patients”, Kalaivani Publications, November 2022, ISBN:978-81-954343-7-4
6. Dr. A. Prema Kirubakaran, Dr.R.Renugadevi, Ms.Viswapriya, Ms.Priyanka published a book titled “Python programming for beginners”, IIP publishers, September 2022, ISBN:978-93-92591-97-6. Available in Amazon, Kindle, Instamojo.Amazon; https://www.amazon.in/dp/9392591977?ref=myi_title_dp, Flipkart Link <https://www.flipkart.com/python-programming-beginners/p/itm4251e2fff9ef3?pid=9789392591976>. Instamojo Link: <https://iip.stores.instamojo.com/product/3441701/python-programming-for-beginners-8889b/>
7. Dr. A. Prema,Dr.R.Renugadevi,Ms.Priyanka,Ms.Vishwapriya-Firewall & its Internet Security, Jayalakshmi Publications, June 2022, ISBN-978-9391987-21-3
8. Dr. Ramkumar, Dr.R.Renuga Devi, Dr.A.Prema Kirubakaran& Ms. V.Vishwa Priya, Basics of Internet with WEB Design, ESNPublications, September 2021, ISBN:978-93-90781-66-9
9. Dr. A. Prema Kirubakaran & Ms.B.Mahalakshmi, Problem solving using Python, ISBN no:978-93-8970-54-8,Publishers:Charulatha Publications Chennai, India (2020)-November
10. Dr. A. Prema Kirubakaran & Mr.S.Gopala Krishnan, Object Oriented Programming Language, ISBN no: 978-93-89051-26-1, Publishers: Charulatha Publications, Chennai, India (2019)-July
11. Dr. R. Renuga Devi, Dr. A. Prema, and A. Thirumurthi raja, Software Engineering Fundamental Concepts, 1st Edition, volume 1, Jayalakshmi Publications,ISBN: 978-93-86712-85-1(2019)-August
12. Mr. S. Gopala Krishnan,Dr. R. Renuga Devi,Dr. A. Prema, Software Metrics,

Book Chapters

1	<p>Chapter in Book: Prof. A. Prema & Dr Ridwan</p>	<p>Advancing Financial Forecasting with Hierarchical Gaussian Mixtures: The Adaptive Generative Meta-model for Financial Environments (AGM-FE)</p>	<p>Generative AI in FinTech: Revolutionizing Finance Through Intelligent Algorithms https://link.springer.com/book/10.1007/978-3-031-76957-3 Part of the book series: Information Systems Engineering and Management ((ISEM,volume 26))</p>	<p>DOI: https://doi.org/10.1007/978-3-031-76957-3_8 Published on 20th March 2025 Publisher: Springer Nature Link-Springer Cham</p> <ul style="list-style-type: none"> • Print ISBN978-3-031-76956-6 • Online ISBN978-3-031-76957-3 • eBook Packages Intelligent Technologies and Robotics Intelligent Technologies and Robotics (RO)
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2	<p>Chapter in Book: Dr. A. Prema & Dr Mithun Chakkaravarthy</p>	<p>A Hybrid Application of Quantum Computing Methodologies to AI Techniques for Paddy Crop Leaf Disease Identification</p>	<p>Integrating Blockchain and Artificial Intelligence for Industry 4.0 Innovations pp 69–83 Part of the EAI/ Springer Innovations in Communication and Computing book series (EAISICC)</p>	<p>DOI https://doi.org/10.1007/978-3-031-35751-0_4 Published 04 October 2023 Publisher Name Springer, Cham Print ISBN978-3-031-35750-3 Online ISBN978-3-031-35751-0 eBook Packages Engineering Engineering (R0)</p>
3	<p>Chapter in Book: Dr. A. Prema & Dr. R. Renuga Devi</p>	<p>Lockdown Impacts on education system COVID-19 effects and Recovery</p>	<p>Lockdown Impacts, compiled under COVID-19 and its impact Pgno:34-47</p>	<p>ESN publications on 30th January 2021, ISBN:978-81-947019-41-1</p>
4	<p>Chapter in Book: Dr. A. Prema School of Computing Science- VISTAS VELS University</p>	<p>A Study to Convert Image Data Using Data Analytics Methodologies</p>	<p>Recent Advances in Computational Intelligence pp 163-171 Part of the Studies in Computational Intelligence book series (SCI, volume 823)</p>	<p>DOIhttps://doi.org/10.1007/978-3-030-12500-4 Copyright Information Springer Nature Switzerland AG 2019 Publisher Name - Springer, Cham eBook Packages- Intelligent Technologies and Robotics Print ISBN 978-3-030-12499-1 Online ISBN 978-3-030-12500-4</p>

5	Chapter in Book: Prof.I V Murali Krishna Dr.A.Prema	Pipeline crack detection using Mathematical Morphological Operator	Knowledge computing and its applications, Publisher: Springer Singapore	https://link.springer.com/book/10.1007%2F978-981-10-8258-0 Print ISBN: 78-981-10-8257-3 Electronic ISBN: 978-981-10-8258-0
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AWARDS & HONORS

- Prof A Prema Kirubakaran received the “Vidya Ratan Award 2025”, by Bharat Education Excellence Awards-BEEA 2K25 jointly organized with Govt. of Andhra Pradesh and AICTE
- Dr A Prema Kirubakaran received the “Jyestha Award 2024”, by Bharat Education Excellence Awards-BEEA 2K24 jointly organized with Govt. of Andhra Pradesh and AICTE on 21st April 2024@Dr. YVS Murty Auditorium, Andhra University, Visakhapatnam, Andhra Pradesh
- Dr. A. Prema Kirubakaran received “Most Innovative Educationist 2023”,by Imaginex Inks Publications on 17th September 2023
- Dr A Prema Kirubakaran received “Remarkable award 2023 under the category of Education & Research”, by Greater Media Society, NewDelhi on July 14, 2023.
- Dr. A. Prema Kirubakaran was one of the Editor for the Official attempt of thickest book in the world held on 27/8/2023 in Chennai, organized by ESN publication & UK world record organization.
- Dr A Prema Kirubakaran is appointed as “International Educational Ambassador” by Bestow Edutrex International, Mumbai-October 2022
- Dr .A. Prema is appointed as Treasurer for the International Conference to be held in December 2022 by Region 7-Computer Society of India(September ’22)
- Dr. A. Prema is acting as a reviewer for the 7th International conference on Internet of Things and Connected Technologies,IIT Patna-September ’22
- Dr. A. Prema Kirubakaran received “Award of Excellence in Research 2022”,by Novel Research Academy on 05th September 2022
- Dr.A.Prema Kirubakaran received “Faculty Excellence award 2021”,by VISTAS on 16th April 2022

- Dr.A.Prema Kirubakaran received Unique Star Award under the Category “Excellence in teaching ”,by Azhuba Management & RR Media works Pvt Ltd., on October 16th, 2021
- Dr.A.Prema Kirubakaran receivedthe “Best Research Supervisor Award ”,to commemorate Teacher’s day 2021 from the Teachers day achievers award committee, Tourism Malaysia, CIBAF & Chennai Softechon on September 22nd 2021
- Dr A Prema Kirubakaran received the “International Researcher Award” from International Research Association, United Kingdom virtually on 12th July 2021
- Dr.A.Prema Kirubakaran& Dr R.Renuga Devi Chapter titled “Lockdown impacts on education system COVID 19 effects and recovery”, for the book of LOCKDOWN IMPACTS, compiled under COVID-19 and its impact, published by ESN publications on 30th January 2021,ISBN:978-81-947019-41-1,has entered India Book of Records and Asia Book of records, held in January 2021 at Chennai,India
- Received NAARI SAMMAN award from Holistic research center, Hyderabad to commemorate international women’s day on 7th March 2021
- Received Real Super Woman 2020 award from FISA on 13th October 2020 for the achievements in education & Research.
- Received Active participation women award conferred by Computer Society of India-Chennai Chapter, from Chief Justice Sanjay K Mishra on 18/1/2020 held at KIIT University, Bhubaneswar, Orissa
- Dr. Nazeer Ahmed-Best student of the year 1999-2001 award received from
- Dr. APJ. Abdul Kalam Gold Medalist –M.Sc. Computer Science (1999-2001)

Journal Review

- Article reviewer for **Food Science and Applied Biotechnology** from December 2025
- Article reviewer for **Journal of the Nigerian Society of Physical Sciences** from March 2025
- Article reviewer for **CSI ICT Communications** from January 2021
- Article reviewer for **IJAAS Research journal** from January 2020
- Article reviewer for **AJCIS Research journal** from January 2014
- Online reviewer for **Shiksha higher studies** from 2015

Chief Guest: I have been invited to various National and International conferences to act as speaker, moderator and as advisor to share my knowledge and insights on various topics.

Summary:

- An article reviewer for reputed global journals (Springer, Taylor & Francis, CSI, ICT,

etc.)

- An award-winning academic and administrator
- A patent holder with innovative problem-solving capabilities
- A board member in multiple institutions
- A lifetime member of top technical communities such as CSI, IRA, and SDIWC
- An editor whose IoT book initiative aimed for a Guinness World Record
- A post-doctoral researcher in Quantum Computing, a domain shaping the future of technology and entrepreneurship.

Other Activities

- Appointed as AI ambassador representing Nile University of Nigeria in Honoris United Universities
- Appointed as Director of Academic Quality Assurance-Nile University of Nigeria from January 2025
- Appointed as Chairman AI literacy committee, Nile University of Nigeria from March 2025
- Appointed as ODL Module developer for MANCOSA-South Africa from November 2024
- Appointed as Chief Exam Officer for Faculty of Computing from 20/4/2024 to 31/07/2024
- Appointed as Subject Expert in Board of Studies of Subbalakshmi Lakshmi pathy College of Arts & Science, TVR Nagar, Madurai, Tamil Nadu, India from November 2022
- Appointed as Model exam coordinator to conduct exams for higher secondary school students by Computer Society of India-Chennai Chapter from 2022
- Elected Hon.Secretary of Computer Society of India, Chennai Chapter (2020-2022)
- Elected Managing Committee Member-Computer Society of India, Chennai Chapter (2019-2020)
- Ph.D. Doctoral Committee Member from 2022-SRM Engineering Kattankulathur, Bharathidasan University, Bharathiar University.
- Ph.D. Doctoral Committee Member from 2021-St. Peter's University, Chennai
- Appointed as Subject Expert in the Board of Studies of Thirumalai Naicker college of arts and Science, Madurai, Tamilnadu, India from August 2019
- Ph.D. Doctoral Committee Member from 2016-Bharath University, Chennai
- PG Exam Board DG Vaishnav College from 2017
- Entrepreneurship Development Cell President from June 2017
- Science Expo president-Annai Violet Arts and Science College (2014-2016)
- Placement coordinator- Annai Violet Arts and Science College (2016-2017)

- Conducted shows and live chats on Television and Radio (1999-2007)
- JBAS NCC - Trained as a Glider Pilot-(1996-1997)
- FBM-NSS from 1994-1996 & 1998-1999
- School Vice-Captain,1995-1996

Membership

- Membership in Oracle Academy, Nigeria since 2023
- Lifetime Membership IAENG membership number is: 325151.
- Lifetime Membership-Bestow Edutrex International LLP, Registered with NITI Aayog Ministry of Micro, Small and Small enterprises of India,2022
- Lifetime membership -International Association of Engineers,2022
- Lifetime membership-SDIWC,2022
- Lifetime membership (Confirmation No:2021/13/06)-International Research Association, England, UK,2021
- Lifetime membership (I1502977)-Computer Society of India,2015
- Member Technical Program committee-ICIRHT 2017, Pathankot, Punjab,2017

The SDG Goals:

I am happy and privileged to double both a teacher and researcher with various research mindset in setting and achieving the desired SDG outcomes. From the beginning until now, my research is centered and revolving round a secured nature and well-conductive environment for everyone in the world protecting nature and environment, around the globe, through this was also evident in all my various implementations, case studies, patents and publications. A steady publication of 75 articles in peer-reviewed journals, conference papers, and workshops have stood up as a testimony of the work that is carried out so far. This also reflected in all my speaking sessions at various international conferences, workshops and talk shows, where what I learnt and what I am learning is transferred to all in one way or the other.

The projects carried out so far have helped me to achieve the following SDG goals:

SDG 1: Resolutions to stop hunger

SDG 3: Good health and well-being

SDG 4: Quality education

SDG 5: Gender equality

SDG 8: Decent work and economic growth

SDG 9: Industry, innovation and infrastructure

SDG 10: Reduced inequalities

SDG 11: Sustainable cities and economies

SDG 12: Responsible consumption and production

SDG 17: Partnership for the goals

My work extends from teaching to research, research to publications, publications to products and finally translating into world records. Working in different parts of the world with different cultures and boundaries has taught me to be more innovative, with patience in choosing the exact social and environmental related topics to pursue, especially with the research work of my students. As a supervisor, I have always encouraged my students to search and dig deeper into problems that have solutions to societal menace.

NILE UNIVERSITY STUDENTS' RESEARCH WORK / PROJECTS - USING AI: AS A SUPERVISOR

1. Adaptive multimodal LSTM with online learning for evolving IOT Data Streams, published in sciform, 3rd Dec 2025- MDPI
2. Interpretable Ensemble Learning Models for PCOS Risk Prediction, ICMEAS July 5th, 2025
3. Machine Learning in Polycystic Ovary Syndrome (PCOS): A Comprehensive Review of Early Diagnosis, Personalized Treatment, and Predictive Insights, **International Journal of Intelligent Systems and Applications in Engineering (IJISAE)**, Feb 21, 2025
4. American Sign Language translation by Osaze, presented in Thailand University conference and published in Scopus journal, funded by ARIISTA solutions, India
5. Enhancing student learning through a web-based peer tutoring platform: A technological approach to academic support (Stutorpal) by Mayonike FIKI, presented at **5th International Conference on Data Science and Big Data Analysis IDBA**, organized in association with ACM, IEEE computer Society CSI and in collaboration with Namibia University of Science & Technology. It is being hosted by ACM at the **Symbiosis University of Applied Sciences, Indore from 27-28 June 2025**, accepted for publication in Scopus journal, funded by ARIISTA solutions, India

The number (5) publication above is also selected for presentation in Chemistry Conferences in Rome-Italy 2026, where Mayonika Fiki is invited to share his insights.

6. Enhancing DDoS Detection in Software-Defined Networks Using a Hybrid Machine Learning Model by Francis Onojah Bamaiyi, funded by Multimedia University, Malaysia and to be published in SCI journal.

7. Development of an AI Chatbot as a communication tool for campus Navigation (HEJA) by Ayana Small, H.H., Mohammed, E.O. Bassey and J.A. Okereke, funded by Multimedia University, Malaysia to be published in Scopus.
8. Machine Learning in Polycystic Ovary Syndrome (PCOS): A Comprehensive Review of Early Diagnosis, Personalized Treatment, and Predictive Insights by Hauwa Ibrahim Aminu-PhD Scholar, Nile University of Nigeria, accepted for publication in International Journal of Intelligent Systems and Application in engineering (IJISAE) <https://ijisae.org>
9. Interpretable Ensemble Learning Models for PCOS Risk Prediction: Incorporating SHAP and LIME for Model Explainability, by Hauwa Ibrahim Aminu-PhD Scholar, Nile University of Nigeria, accepted for publication in ICMEAS 2025.

ARTIFICIAL INTELLIGENCE FRAME WORK AT NILE UNIVERSITY OF NIGERIA

The Vice Chancellor of Nile University of Nigeria Prof.Dilli Dogo, FNAMEd understood the developing speed of AI in all sectors, hence formed an AI literacy committee and developed modules to educate both staff and students at Nile University with the Future of AI Research: Innovations, Ethics, and Global influence that became the topic of today's inaugural lecture.

PART 4:

CHARTING NEW HORIZONS: NAVIGATING THE FUTURE OF AI RESEARCH: INNOVATIONS, ETHICS, AND GLOBAL INFLUENCE

Training and Capacity Enhancement

AI development requires skilled professionals who can use modern technologies to strategize and innovate. Investing in comprehensive training is essential for equipping people adequately in this evolving industry. A solid workforce is heavily reliant on well-tailored training courses that are grounded in hands-on experience. Such programs should include lectures on deep learning, image processing, real-time visual interpretation, as well as workshops and certification courses. Professionals who possess practical expertise are more able to deal with issues in the field. It is necessary to have sustained collaboration with companies, educational and research institutions to build a comprehensive training framework.[18]

While academic institutions provide the necessary theoretical foundations and research work, industry partners provide access to more current information and trends. Research institutions spark innovation and provide practical learning spaces. Such cooperation enhances curricula to make them more relevant to industry practice. Hands-on experience like job placements, research projects, and internships foster practical experience and assists with career progression. By prioritizing staff development, we aim to create a talented workforce that will further developments in computer vision, address emerging challenges, and drive workforce productivity.

This concentration will boost education and training for the next generation of specialists, allowing them to actively participate in the development of AI and its impact across various fields, ensuring technologies continue succeeding

In the long term, AI myth: humans to be replaced, though it is little worried, one thing what we should know and do is equipping ourselves through learning or upskilling is the only way to stay away from the word “layoff”.

Benefits of AI in Personalized Learning

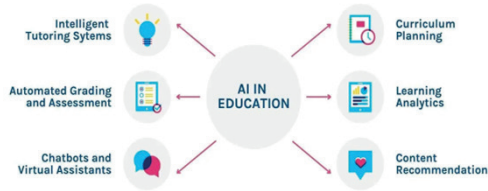


Figure 19: AI in Education (source adapted from [18])

AI in education is the main concern for all the educators, but it is not a burden, we should not go for AI control we should only adapt it and learn to do AI management through individual institutional AI literacy and policies.

ChatGPT: In ChatGPT, as shown in Figure 20 ChatGPT stands for Generative Pre-trained Transformer, below pictures shows us the growth in ChatGPT and the must have GPTs for Academic Researchers.

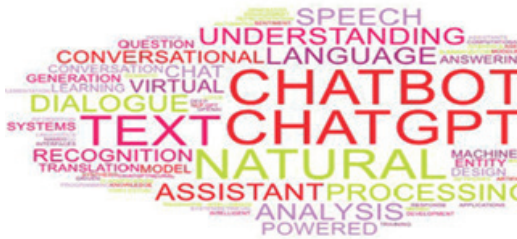


Figure 20: Word Cloud of Chatgpt [(Source: Adapted from [19])

Can a teacher use AI tools to teach? Yes of course, but in a productive way, we don't lose our originality. Same implies to the students but at what % should be decided by the concerned Heads of Institution. As a teacher these adaptive tools are used to deliver a lecture.

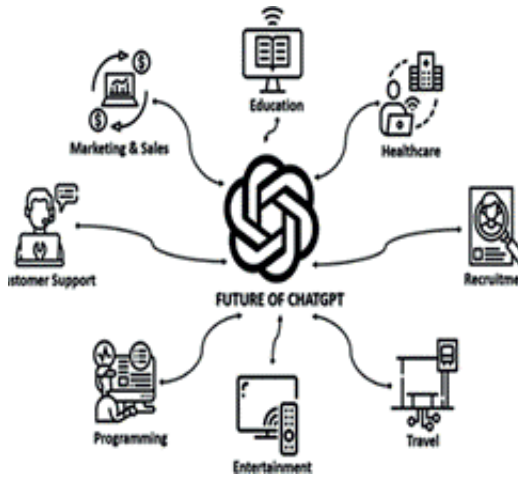


Figure 21: Overview of future applications of ChatGPT in different sectors (Source: Adapted from [19])

The Next focus is on plagiarism, how are we as educators going to handle it, is AI=plagiarism?

AI = PLAGIARISM?
Let's Bust Some Academic Myths.

MYTH 1
Using AI means your work is plagiarized.
Truth: Plagiarism is about copying without credit, not using tools ethically with transparency.

MYTH 2
Journals will reject any work touched by AI.
Truth: Many Journals now allow AI-assisted writing—as long as it's declared and responsibly used.

MYTH 3
AI-generated content always passes AI detection tools.
Truth: Most detection tools aren't fully reliable yet. Focus on originality and clarity, not "tricking the tools."

MYTH 4
You can't use AI for academic writing ethically.
Truth: You absolutely can—if you use it to support, not substitute your thinking.

Figure 23: AI Plagiarism (Source: Adapted from [20])

The different AI tools available to write articles should be controlled, as shown in Figure 23, there should not be AI ban, it should be controlled with the usage of AI. We cannot completely avoid the usage of AI in our research work, but we can derive a limit and scale of measurement for the usage of AI.

SMART AI HOMES

The next phase of AI implementation and quantum computing is on smart homes, this leverages quick automation even at home. But is this necessary? Yes, it is as we speak of energy conservation smart AI homes helps us to achieve this. Entire home control

is monitored and controlled by using your mobile phones. What not, we moved on to automatic cloth protector from rain and the latest hunger detector, when you are hungry you get a beep on your mobile or smart watch. As the data is growing fast, storage space for these data becomes a debating issue, to overcome this issue quantum servers and quantum intelligence are introduced. In my research work currently smart city and smart home implementation occupies a significant value that includes smart homes with automation from doors to solar panel framework.



Figure 24: Zig Bee-Smart Home Tool (Source: Adapted from [21])

Drones Application: Agriculture



Figure 25: Drones in Agriculture (Courtesy – ARIISTA Solutions Namakkal)

To enhance the AI implementation in agriculture and in housing as reflected in Figure 24 and 25, smart homes, smart city projects were explored. As agriculture is the backbone of any country, due to the advancements in the field of AI, the field that produces food also had to accept the various technologies that are required for soil testing to water irrigation, pesticide spraying is successfully carried out using drones. The above pictures show one of our units in India where farmers both men and women are trained in using these drones. Drone usage is rapidly expanding in practically every economic sector, but it is particularly prevalent in the agricultural sector. The agricultural drone market is predicted to increase from a \$1.2 billion (USD) business in 2019 to \$4.8 billion in 2024, according to certain projections [29]. In a few short years, drone use will spread throughout both large and

small farms for anything from scouting to security. As part of a system commonly known as “precision agriculture,” the data collected by drones on farms is frequently utilized to better guide agronomic decisions [30].

Drone use is already a crucial component of extensive precision farming operations in many places. The information gathered by drones surveying fields aids farmers in organizing their planting and treatments to maximize yields. According to some statistics, employing precision farming techniques can boost yields by up to 5% [30], this is a significant improvement in an industry where profit margins are usually thin. This lecture will examine some of the fields in which drone technology is now being applied on farms, discuss some of the new agricultural drone technologies under investigation, and discuss some of the obstacles and procedures involved in implementing widespread drone use in agriculture.

Scouting/Monitoring Plant Health

As shown in Figure 26, a significant contribution of my research work is to monitor plant health as part of smart agriculture. Plant health monitoring is one of the applications of drone imagery that has already been implemented with considerable success. The Normalized Difference Vegetation Index (NDVI), a specialized imaging tool on drones, uses in-depth color data to show the health of plants. This enables farmers to keep an eye on crops as they develop, allowing for prompt resolution of any issues to preserve the plants. This picture demonstrates the Basic operation of NDVI. Crop health is also monitored by drones equipped with “regular” cameras. Although satellite imagery is already widely used by farmers to track crop growth, density, and coloration, it is often more expensive and less efficient than closer drone imaging. Cloud cover and low light levels are less significant when drones are flying near fields. as opposed to using satellite imaging. While drone imaging can produce precise image location down to the millimeter, satellite imaging may only provide meter-level accuracy. This enables the identification and prompt treatment of disease or pest issues as well as the replanting of stand-gap areas after planting.

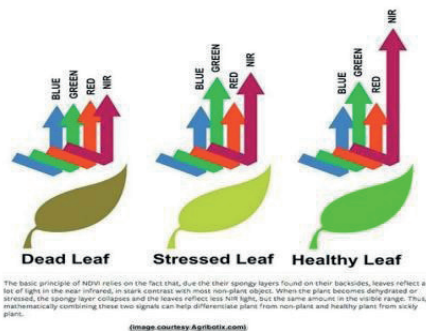


Figure 26: Scouting/Monitoring Plant Health (Courtesy-Crop Tracker)

Monitoring Field and Cattle Health

Additionally, drone field monitoring is being used to keep track on field conditions and soil health. Growers can identify any irregularities in the field by using drones to map the field accurately and provide elevation data. Knowing the field elevation helps identify wet/dry areas and drainage patterns, enabling more effective watering methods. Using improved sensors, some agricultural drone vendors and service providers also provide soil nitrogen level monitoring. This makes it possible to apply fertilizers, precisely getting rid of bad growing areas and enhancing soil health for many years to come.

This is first in class for monitoring cow behavior as displayed below in Figure 27, this helps to improve the Cow health and productivity.



Figure 27: Field and Cattle Health Monitoring (Courtesy-Dairy Farm)

Planting and Seeding

Planting seeds is one of the more recent and less common applications of drones in agriculture. The forestry industry currently uses automated drone seeders the most, but there is a chance that their use will expand in the future [20]. Drone planting allows for the replanting of extremely difficult-to-reach areas without putting workers in danger. With a crew of two operators and ten drones, we can plant 400,000 trees a day much more effectively. This technology will enhance quantitative production, a way to stop hunger.

Spraying Application

In Southeast Asia, the use of drones to apply spray treatments is already common; in India, for example, about 30% of agricultural spraying is done with drones [21]. Steep tea fields at high elevations are among the extremely difficult-to-reach places that drone sprayers can traverse. Workers no longer must use potentially harmful backpack sprayers to traverse fields thanks to drones. To increase productivity and reduce chemical expenses, drone sprayers apply extremely fine sprays that can be directed to locations. Now, laws governing drone sprayers differ greatly between nations. Since more research is required to fully understand the effects of spray drift, they are currently illegal in Canada [22]. Only qualified professionals should be assigned, according to some proposed regulations. Figures 28 and 29 here is one of my ongoing project in India.



Figure 28: Pesticide spraying to paddy fields(Courtesy: ARIISTA Solutions, India)

Drone Pollination

Testing and development are still ongoing for some of the more recent applications of drones in agriculture. Drone technology for pollination is one of the most well-known (and frequently fictionalized) applications. Small drones that can pollinate plants without harming them are being developed by researchers in the Netherlands and Japan [23]. The next stage is to develop pollinating drones that can operate on their own and keep an eye on crop health without constant operator guidance.



Figure 29: Drone Pollination (Courtesy: Drone DJ)

The agricultural sector has already been significantly transformed by drones, and this trend is only expected to increase in the years to come. Even though drones are becoming increasingly helpful to small farmers, there is still a long way to go before they are a standard piece of equipment for all farmers, especially in developing countries. Many nations need to update their drone usage laws, and further study is needed to determine how well drones perform specific tasks like spraying and applying pesticides [24]. Drones can benefit farmers in a variety of ways, but before spending a lot of money on equipment, it's critical to comprehend its features and limitations. An agricultural drone supplier and programming company called Drone Deploy advises beginning small and gradually integrating drone data into your company for the best results. Hence volume of data is going to be generated, to process and store these data we need to have massive storage capacity servers which can be handled only by Quantum servers, thus quantum intelligence incorporates for this fast-growing nature.

UAV – Unmanned Area Vehicle

Exploring Figure 30, it is the advent of reliable drone technology, which has opened up a whole new field of surveillance, deploying UAV or Unmanned Aerial Vehicles as 'eyes in the sky'. Utilized for both military and civilian purposes, UAV surveillance isn't just a matter of watching the movement and/or actions of people from a covert location. It can also include a wealth of uses as diverse as farming, land surveillance, and even studying topics as complex as crowd dynamics.



Figure 30: Using UAVs for Surveillance (Courtesy: Fly sight)

PART 5:

ENVISIONING AI – THE FUTURE 2025 AND BEYOND

Respected Vice Chancellor sir, esteemed colleagues, honored guests and distinguished students, as we witness the end of this lecture - Navigating the Future of AI in Research: Innovations, Ethics, and Global Impact, I want to conclude by bringing before us the vision of AI. AI integrates mostly into 3 places

- Industry automation with robotics
- Finance and Banking
- Healthcare

AI tools for biomedical has started emerging and the next job market will be focused on this. AI will be replaced by OI by 2030. OI is organoid intelligence. Researchers are planning to develop a bio-computer powered by human brain cells. It aims to leverage the extraordinary biological processing power of the brain. AI aims to make computers more brain-like, the research will explore how a 3D brain cell culture can be made more computer like. I is going to integrate biology, euro science with computers, thus opening doors for more experts on this and the job market will clinch towards the need of this new intelligence. A collaborative approach will be set up in building this capacity.

Envisioning AI – The Future 2026 and beyond highlights mainly on the global shift and transformations of AI in every field that carries our daily life. With the advancement and centralizing nature of AI, we need to follow up the societal adaptation and acceptance on this new emerging trend that includes education, research, administration and innovation. As we have started with our new year 2026, AI is going to deep route its foot into higher education that helps in personalized learning, automation in admirative task, accelerating research and curriculum redesign based on AI adaptation.

For Nigerian education sectors NUC has put forth all its efforts to draft a AI policy and stakeholder’s framework and also conducted a workshop where representatives from various universities attended and carried forward the message of transforming every university to come under the drafted AI framework.

Keeping this in mind with the approval of our management, our vice chancellor has taken the leading step of educating all staff and students with AI by launching the AI Literacy LMS through AI literacy committee. Nile University of Nigeria is the first university where all of us will be AI literate. The benefits through this are achievement of :

Adaptive and Personalized Learning: Learning platforms based on AI will change the students learning style that will enable and improve them with understanding, preservation and commitment.

Efficient Administration: Due to the AI integrated automation, paperwork can be reduced both for teaching and non-teaching staff that includes grading systems, enhancing more productive time to lecturers and other staff to focus on career building and transformations.

Research: AI tools specifications will help to access large datasets, acquire LLM's large learning models that support complex analysis solving and will help to generate more research ideas, that will increase the output in research ideas

To achieve this in all sectors new AI usage frameworks and policies should be derived both in national and institutional levels, where it is mostly underway in Nigeria and globally.

This cannot be achieved with hard and fast rules, we need a collaborative call for action, and where the government, industry, institution and the Nigerian citizens should hold out their hands to embrace this new transformation AI which doesn't stand only as AI- Artificial Intelligence it should be embraced as AI-Adapt It.

CONCLUSION AND RECOMMENDATIONS

Mr. Vice Chancellor Sir, Distinguished Ladies and Gentlemen,

Examining the combination of human and machine skills makes it clear that each form of intelligence has distinct benefits and drawbacks. Human intelligence is superior in creativity, moral judgment, and complex decision-making due to its rich cognitive abilities and emotional awareness. However, machine intelligence—more especially, developments in artificial intelligence (AI) has shown itself to be remarkably skilled at deciphering vast amounts of data, seeing trends, and finishing tasks with unprecedented speed and precision. Technologies like machine learning, deep learning, and generative AI have greatly advanced artificial intelligence. Machines can now understand and interact with visual input in ever-more-complex ways thanks to these technologies. These advancements have opened new possibilities in a variety of fields, including medical imaging, autonomous cars, and personalized user experiences. But as we continue to push the boundaries of what artificial intelligence (AI) can do, its significance cannot be emphasized enough.

ACI (Application Centric Infrastructure) ensures that technological advancements are accompanied by ethical and human monitoring while enabling the successful resolution of complex issues by fusing the strengths of human and machine intelligence. As drone technology is growing rapidly AI with image processing, quantum computing and geo spatial computing should be combined to get better results in the new AI era. Image processing techniques emerged gigantically with various imaging techniques from simple camera image capture to drones capturing image.

My research and practical projects at Nile University of Nigeria show our commitment to advancing the theoretical and applied aspects of AI and quantum computing. We intend to invest in talent development, develop innovative curricula, and encourage interdisciplinary collaboration to establish AI and quantum computing as the cornerstones of future technological advancement.

In conclusion, Artificial Intelligence has already transformed the way we live, work, and reason reshaping industries, redefining productivity, and augmenting human decision-making across nearly every sector of society. Yet, as powerful as classical AI has become, it is increasingly constrained by the physical and computational limits of classical computing. Quantum Computing, by contrast, does not merely accelerate computation; it redefines the very foundations upon which intelligence can be built. Its integration with AI therefore marks not just an incremental advance, but the dawn of a fundamentally new era of intelligence.

Throughout this lecture, I have traced the evolution of machine intelligence from symbolic reasoning, through machine learning and deep learning, into the emerging domains of Quantum Artificial Intelligence and the future vision of Quantum Intelligence. This progression illustrates a consistent pattern in the history of computing: each generation of intelligence arises to overcome the limitations of the previous one. Quantum Intelligence represents the next logical step in this evolution an intelligence capable of reasoning, learning, optimizing, and simulating complex systems at scales that are unattainable by classical machines.

My own scholarly journey reflects this broader evolution. From the digital preservation of ancient palm-leaf manuscripts, through algorithmic models for industrial safety and intelligent automation, to recent work in Quantum Image Processing and quantum-enabled agricultural intelligence, my research has consistently sought to apply advanced computation to human-centered and societal challenges. This journey affirms a central principle: technology achieves its highest value when it serves humanity, preserving knowledge, enhancing safety, improving food security, and enabling sustainable development.

As we look to the future, Quantum Intelligence challenges us not only technically, but philosophically and ethically. While quantum-enhanced machines may surpass human capabilities in computation, optimization, and simulation, they do not replace human wisdom, creativity, empathy, or moral judgment. The future, therefore, does not lie in competition between humans and machines, but in collaboration where human insight guides quantum-powered intelligence toward responsible, inclusive, and transformative outcomes.

In this emerging era, universities such as Nile University of Nigeria have a critical role to play as incubators of talent, engines of research innovation, and custodians of ethical responsibility. By investing in quantum education, interdisciplinary research, and global collaboration, we can position ourselves not merely as consumers of future technologies, but as contributors and leaders in shaping them.

Ultimately, the convergence of Artificial Intelligence and Quantum Computing invites us to rethink intelligence itself, for the way it is defined, it is created, and how it should be used. Quantum Intelligence is not merely a technological destination; it is an intellectual journey one that calls upon us to align scientific ambition with human values. It is my hope that this lecture contributes, in its own modest way, to that journey.

Thank you, Mr. Vice Chancellor Sir, and thank you all for your kind attention.

RECOMMENDATIONS

Mr. Vice Chancellor, Sir, to drive technological progress in artificial intelligence and quantum computing, the following recommendations are made:

1. Encourage the Development of Conscientious AI
 - Encourage interdisciplinary collaboration among legislators, computer scientists, business executives, and ethicists.
 - Promote transparent and truthful research practices to boost confidence and reproducibility.
 - Promote financing for fundamental research in areas such as human-AI collaboration, explainable AI (XAI), and energy-efficient models.

2. Strengthening Ethical Frameworks
 - Establish global ethical guidelines to guide the development and use of AI.
 - Incorporate ethics education on AI into academic and professional programs.
 - Use bias detection methods and fairness audits before implementing AI systems.
 - You can ensure user data privacy and consent by enacting stronger legislation and choosing better AI design choices.

3. Enhance Global Collaboration and Equity
 - Promote international cooperation for the sharing of research, datasets, and knowledge.
 - Create inclusive AI ecosystems that support underserved and developing regions.
 - Ensure access to AI resources and education in resource-constrained environments.
 - Support AI-for-good initiatives that tackle global concerns like education, health, and climate change.

4. Foster Human Capacity and AI Literacy
 - Incorporate AI education into all academic levels, from primary to advance. The workforce can become more skilled with the support of reskilling and lifelong learning programs.
 - Support public education campaigns aimed at debunking AI myths and fostering trust.

5. Establish Sturdy Policy and Regulatory Frameworks
 - Implement national AI policies in accordance with international standards.
 - Create governance bodies for AI to oversee compliance, safety, and ethical use.
 - Regularly update legal frameworks to reflect the challenges and advancements in AI. • Monitor the impact of AI on society and adjust regulations to mitigate negative effects.

6. Encourage the Sustainable and Safe Application of AI
 - Promote green AI methods to reduce energy consumption and carbon emissions.
 - Take note of AI design that prioritizes human well-being and accessibility.
 - Establish trustworthy testing settings to evaluate AI systems before they are used in real-world scenarios.

We can make sure that the development of artificial intelligence and quantum computing not only encourages technological innovation but also significantly advances society and improves international communities through implementing these suggestions into practice.

In summary, I humbly request that what we have heard today, in this 6th inaugural lecture should be part and parcel of us, as we all move out of this conference hall. It should be a call for everyone, a call for our institution/industry and a call for the nation, for us to embrace the changes through AI transformations.

Thank you all for listening, May God bless you richly, may GOD bless my country - India, the Federal Republic of Nigeria and Nile University of Nigeria at large.

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BRIEF PROFILE OF THE INAUGURAL LECTURER

1. Introduction

Professor A. Prema Kirubakaran, an accomplished scholar, administrator, researcher, and thought leader, stands as one of the most distinguished figures in contemporary higher education across the globe. With over two decades of academic, research, and administrative experience, she has significantly influenced the fields of Computer Science, Artificial Intelligence, Quantum Computing, Data Science, Internet of Things (IoT), and Academic Quality Assurance. As the Deputy Vice Chancellor (Central Administration) at Nile University of Nigeria and a respected global academic voice, she brings to her inaugural lecture a wealth of experience marked by groundbreaking innovations, research excellence, international engagements, and transformative educational leadership.

Her portfolio spans professorial leadership, cutting-edge research, curriculum development, quality assurance reforms, global collaborations, mentorship of doctoral scholars, and contributions to emerging technologies. She is widely recognized for her exceptional productivity, having authored over 120+ research publications, 12 books, multiple patents across India and the UK, conference keynotes worldwide, and impactful community and professional engagements. This inaugural lecture profile captures her illustrious journey—from her formative beginnings to becoming an influential academic shaping the future of higher education and technological innovation.

2. Early Life and Background

Professor Prema Kirubakaran's early life laid the foundation for her intellectual curiosity, resilience, and commitment to service. Born into a family that valued education and personal discipline, she developed a strong passion for learning from an early age. Her formative years were marked by diligent academic pursuit, early exposure to diverse cultures, and encouragement to explore knowledge beyond conventional boundaries. These foundations shaped her worldview, nurturing an interest in global development, educational equity, and the transformative power of higher education. Over time, these interests matured into a lifelong pursuit of academic excellence and leadership rooted in integrity, vision, and service to humanity. Her early education at Fatima Basheer Matriculation Higher Secondary School, Chennai, where she excelled academically, laid a strong foundation for her future pursuits, where she won the young scientist award at the age of 13.

Her formative years were marked not only by academic excellence but also by active participation in leadership and extracurricular activities. She trained as an NCC Glider

Pilot, participated in NSS activities, and developed strong communication skills traits that would later strengthen her career as a lecturer, administrator, and global speaker.

This combination of academic brilliance, discipline, and early leadership experiences helped shape her identity as a resilient scholar driven by curiosity, purpose, and service.

3. Educational Journey

Professor Kirubakaran's academic journey reflects a lifelong commitment to excellence. She holds a Bachelor's and Master's degree in Computer Science with outstanding performance, completing both with distinction. She further earned an M.Phil. (Highly Commended) and a Ph.D. (Highly Commended) in Computer Science from Karpagam University in 2015.

Her passion for advanced research led her to complete a Post-Doctoral Fellowship (PDF) in Quantum Image Processing with a grant of 5 million at Lincoln University, Malaysia, where she specialized in emerging technologies and defended her thesis in 2023. Alongside her formal degrees, she obtained additional professional certifications including:

- TEFL Diploma with specialization in English Grammar (2009)
- Advanced Diploma in Java Programming (2001)
- Praveen Hindi Certification (1999)
-

Her academic formation reflects both depth and versatility qualities that underpin her success as a global researcher and educator.

4. Academic Career and Professional Growth

Professor Kirubakaran's professional journey spans more than 23 years, with progressive responsibilities in India, Libya, and Nigeria. She began her career in 2001 as a Senior Lecturer at JBAS College for Women, Chennai, before joining Misurata University, Libya, as a lecturer in 2009.

Her leadership trajectory advanced rapidly when she became Head of Department at Annai Violet Arts and Science College (2013–2018). She later served as Associate Professor at VELS University (2018–2023) before joining Nile University of Nigeria in 2023.

Her administrative roles at Nile University include:

- Deputy Vice Chancellor (Central Administration) (2024–date)
- Professor & Head, Dept. of Information Technology and Information Systems
- Director, Academic Quality Assurance
- Chairman, AI Literacy Committee

Across these roles, she has introduced reforms in academic governance, quality assurance, AI strategy, curriculum design, and research capacity-building, making her one of the most influential administrators in the region.

5. Research Focus and Scholarly Contributions

Professor Kirubakaran is an accomplished researcher with an extensive portfolio spanning AI, Machine Learning, Quantum Computing, IoT, Image Processing, Cybersecurity, Data Analytics, and Digital Education. She has supervised multiple Ph.D. and M.Phil. scholars and currently mentors several Undergraduate, postgraduate and Doctoral and Post - Doctoral researchers across the globe.

Her research output includes:

- 120+ peer-reviewed publications (Scopus, Web of Science, SCI, and international journals)
- Chapters in top Springer book series, including LAIS, ISEM, EAISICC, SCI, and SIST
- Conference papers presented across India, Nigeria, Malaysia, and global platforms

Her work is widely cited, with impactful contributions to:

- Quantum image processing
- Heart-disease prediction models
- Solar photovoltaic optimization
- IoT-based smart agriculture
- Machine learning for cybersecurity and DDoS detection

Her research excellence has attracted multiple grants, including industry-funded quantum computing and IoT projects. As, her contribution to research continues, she is acting as editor and reviewer for various research journals that includes

- Food Science and Applied Biotechnology from November 2025
- Journal of the Nigerian Society of Physical Sciences from March 2025
- CSI ICT Communications from January 2021
- Springer and SCI journals from 2021
- IJAAS Research journal from January 2020
- AJCIS Research journal from January 2014
- Online reviewer for Shiksha higher studies from 2015

Prof. Prema also holds membership from various boards

- Membership in Oracle Academy, Nigeria since 2023

- Lifetime Membership IAENG; membership number is: 325151.
- Lifetime Membership-Bestow Edutrex International LLP, Registered with NITI Aayog Ministry of Micro, Small and Small enterprises of India,2022
- Lifetime membership - International Association of Engineers, 2022
- Lifetime membership-SDIWC,2022
- Lifetime membership (Confirmation No:2021/13/06)-International Research Association, England, UK,2021
- Lifetime membership (I1502977) - Computer Society of India,2015
- Member Technical Program committee - ICIRHT 2017, Pathankot, Punjab,2017

6. Teaching Philosophy and Pedagogical Innovations

Professor Kirubakaran’s teaching philosophy is rooted in innovation, inclusivity, and real-world relevance. She believes in equipping learners with 21st-century competencies through a blend of theoretical depth and hands-on application. She integrates digital tools, AI-enhanced learning, experiential pedagogy, and problem-based methods to improve engagement and performance.

She has taught undergraduate, postgraduate, and doctoral levels for over two decades and is widely admired for her mentorship, academic clarity, and commitment to student development. Her courses often incorporate research-based assignments, industry collaboration, and emerging technologies to prepare students for global competitiveness.

Through her teaching, she has impacted on thousands of students, many of whom occupy prominent positions in academia, industry, and public service. Her legacy as an educator is defined not only by knowledge imparted but also by lives transformed.

7. Leadership Roles, Administrative Service, and Community Impact

Professor Kirubakaran has held several high-level administrative and leadership roles across institutions. At Nile University, she leads key academic governance structures, chairs committees on AI literacy and academic quality, and oversees institutional reforms.

Her community impact includes:

- Leadership roles with the Computer Society of India
- Reviewer ship for international journals
- Service on doctoral committees in India and Nigeria
- Keynote addresses at international conferences
- Advocacy for women in STEM and digital education
- Student Executive Secretary at University Level
- Assistant School Pupil Leader-Higher Secondary
- Class Leader from Grade 1 to Grade 10

Her work has strengthened academic quality, expanded research visibility, and contributed significantly to institutional transformation. Her impact extends beyond the university into broader society, where she is actively involved in community development projects, professional associations, and advocacy for educational reform. Her service exemplifies commitment to national and international development with social responsibility.

8. National and International Engagements

Professor Kirubakaran is a globally engaged academic who collaborates with universities and professional bodies across India, Nigeria, Malaysia, South Africa, Saudi Arabia, UK and USA. She has delivered keynote speeches at international conferences, served on scientific committees, participated in global workshops, and contributed to cross-border research initiatives.

Her international engagements include collaborations with:

- Lincoln University, Malaysia
- Springer academic networks
- Nigerian Women in IT (NIWIIT)
- African Edutech Conference
- King Saud University (funded project)

These engagements highlight her global presence and her role in shaping AI, education, and digital transformation discourse worldwide.

9. Awards, Recognitions, and Fellowships

Professor Kirubakaran is a multi-award-winning academic whose recognitions reflect excellence in teaching, research, innovation, leadership, and professional service. Her awards include:

- Vidya Ratna Award (2025)
- Jyestha Award (2024)
- Most Innovative Educationist Award (2023)
- Remarkable Award for Education & Research (2023)
- International Educational Ambassador (2022)
- Award for Excellence in Research (2022)
- Faculty Excellence Award (2021)
- International Researcher Award (2021)-UK
- Naari Samman Award(2021)
- Real Super Woman 2020 award(2020)
- Active participation women award(2020)
- Dr. Nazeer Ahmed-Best outgoing student award(2001)-Received from Dr. APJ Abdul Kalam, Renowned ISRO Scientist and Former President of India

- Gold Medalist-M.Sc Computer Science(2001)
- Young Scientist Award for innovation in IoT named “Sound-Triggered Radio Automation System” at an age of 13

She has also contributed to record-breaking projects, including editorial leadership for the Guinness World Record attempt for the thickest book. Her patents in India and the UK further demonstrate her innovation-driven career.

10. Vision, Legacy, and Future Directions

Professor Prema Kirubakaran’s vision is to advance higher education through innovation, research excellence, digital transformation, and global partnerships. She envisions academic institutions that leverage AI, Quantum Computing, data science, quality assurance, best practices, and emerging technologies to solve national and global problems.

Her legacy is defined by:

- Transformative academic leadership
- Groundbreaking research contributions
- Strong mentorship of future scholars
- Global influence in STEM and digital education
- Institutional reforms that strengthen academic quality and governance

As she delivers her inaugural lecture, she stands not only as a distinguished scholar but as a symbol of dedication, resilience, and visionary leadership continuing to inspire students, academics, and institutions across the world.

11. Personal Life

Prof. Prema Kirubakaran is married to Engr. Kirubakaran and they are both blessed with two children. The first child is a daughter; Miss K. P. Arundhati, she’s pursuing Medicine in India and the younger son Master K. P. Pranavan, a high school scholar in Nigeria.

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Thanking GOD:

I begin this moment of profound reflection and gratitude by giving thanks to the Almighty, whose grace, guidance, and unceasing strength have sustained me throughout every stage of my academic, personal, and professional journey. It is with a deep sense of humility and appreciation that I stand to deliver this inaugural lecture an achievement made possible by the blessings, support, and encouragement of many individuals who have played significant roles in my life.

Thanking my Parents:

To my beloved parents, Father Late Arumugam and mother, Late Mallika Arumugam, whose sacrifices, values, and unconditional love laid the foundation upon which my life has been built, I offer my deepest and heartfelt appreciation. My parents instilled in me the discipline, determination, and moral grounding that continue to shape my path today. Their unwavering belief in the transformative power of education, combined with the example of their own resilience, nurtured in me the courage to dream, to pursue, and to achieve. Every step I take in the academic world carries with it the imprint of their prayers, guidance, and constant encouragement. Their influence remains the strength behind my achievements and the compass that guides my decisions.

To my Husband and Children:

They always say behind every man's success, there is a woman but, in my instance, I would proudly say in every woman's success there is a man, standing strong as her backbone. On a deep personal level, I reserve a special place of gratitude for my dearest husband, my sweetheart, Mr. Kirubakaran, whose love, understanding, and unwavering support have been instrumental to my journey. His encouragement during moments of challenge, his patience during long hours of research and administrative responsibilities, and his constant belief in my potential have been my anchor. His partnership has made every milestones meaningful, and his presence adds immeasurable joy to every achievement. Today, I'm here because of his support and understanding. The support from the bottom of his heart, pure and vivid has made me to rise to this height and that encourages me to the level of my achievement and would still build many more women like me.

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To my Siblings and Close Family:

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Special Gratitude to the Vice Chancellor: Prof. Dilli Dogo, FNAMeD

I wish to express my profound and heartfelt gratitude to our esteemed Vice Chancellor, Prof. Dilli Dogo, FNAMeD, for the remarkable honor of entrusting me with the responsibility of serving as Deputy Vice Chancellor. His unwavering support, gracious guidance, and constant encouragement have been instrumental in strengthening my confidence and enhancing my capacity to serve the University with dedication. I am deeply thankful for his exemplary leadership, which continues to inspire excellence, humility, and commitment to all who work with him. His readiness to offer direction, his patience in providing clarity, and his consistent willingness to support me through my daily responsibilities have made my journey truly meaningful. His open-door approach and readiness to offer advice have instilled in me a strong sense of purpose and commitment. I deeply appreciate the trust he has placed in me to contribute meaningfully to our institution's goals. The constant encouragement I receive from him fuels my dedication to excellence. His wisdom and experience have been integral to my growth both as an individual and as a leader. Working under his guidance has been an inspiring experience, one that I cherish immensely. I look forward with optimism to continuing this collaborative and productive relationship. I remain sincerely appreciative of the trust he has placed in me and for the many opportunities he has provided for my growth. His mentorship has shaped my professional path in profound ways, and I am honored to work under his visionary leadership. My heartfelt thanks go to him for believing in my potential, for guiding me with wisdom, and for standing as a pillar of strength throughout this journey. Prof. Dilli Dogo's influence has been both transformative and uplifting, and I pray for continued wisdom, strength, and success for him as he leads our institution to greater heights. His term is also etched into Nile's history as Golden Era.

Tribute to Management, Staff and Esteemed Colleagues of Nile University of Nigeria

I sincerely appreciate the Management- Dr. Jonathan Louw-Chairman, Board of Trustee, HRH Chancellor, Pro-Chancellor- Mr. John Vermaaten, Chief Operating Officer- Mr. Jonathan Okharedia, Chief Finance Officer- Mr. Lateef Kareem, Chief Marketing Officer- Mr. Gerald Osugo. I am equally grateful to the Deputy Vice Chancellor Academics Prof. Saleh Abdullahi, the Acting Registrar Dr. Ekanem, the Deans, Directors, Heads of Departments, Members of Senate, and the broader university administration. Their collaboration, guidance, and shared commitment to academic excellence have enriched my

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Faculty of Computing is the place where I was groomed and encouraged to stretch my wings under my former Dean- Prof. Moussa Mahamat Boukar and HOD of Computer Science Prof. Agwu Nnanna. I also take this opportunity to thank my current Dean- Prof. Joshua Abah and special thanks to HOD of Software Engineering Associate Prof. Anka Salihu Ibrahim and his wife Dr. Asmau Usman who are always there for me both officially and personally. Associate Prof. Suleiman Muhammad, the current HOD of Computer Science and Associate Prof. Nurudeen Ibrahim -HOD of Cyber Security, Associate Professor Bilikisu for their unwavering support as a team. I wish to acknowledge my colleagues in the Faculty of Computing, whose intellectual camaraderie and professional synergy have made our shared work fulfilling and impactful. Whether through collaborative projects, curriculum design, committee activities, or daily academic engagements, their support and encouragement have been invaluable.

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AQAC Members and AI Literacy Committee Members

To the members of the Academic Quality Assurance Directorate and the AI Literacy Committee, thank you for your dedication, teamwork, and the passion you bring to advancing institutional quality and digital transformation. Working alongside such dynamic and committed professionals has played an essential role in shaping the initiatives we have accomplished together.

Professional Organizations and NGOs

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whenever needed. Your friendship means a lot, and I am grateful to have such reliable and caring people in my life. Thank you for being there every step of the way. I wish I can mention everyone's name, all the way from India to Kuwait, Saudi Arabia, Libya, Nigeria and my friends from Nile University of Nigeria.

Heartfelt Thanks to All Units at Nile University of Nigeria

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Finally, I express my sincere appreciation to the organizing committee's Chair Prof. Christopher Nkiko and his team members, distinguished guests, colleagues, students, and everyone present at this inaugural lecture. Your presence is a testament to your support and belief in the value of scholarship, innovation, and lifelong learning. This occasion is made more meaningful because you are here to share it with me. I am deeply honored by your attendance and engagement.

As I deliver this inaugural lecture, I stand on the shoulders of all who have supported, nurtured, and inspired me. I acknowledge your contributions with gratitude and humility. May this lecture serve as a reflection of your influence and a testament to the collective strength of family, mentors, colleagues, and community.

Thank you all for being part of my beautiful journey, I owe this to the Almighty GOD and pray to him to bless me to still contribute positively to more lives as I journey ahead.

