IJARSCT

ISSN: 2581-9429

International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 1, October 2025

Impact Factor: 7.67

Quantum Chip Networking and Communication

Pawar Radhika Maruti[1], Patu Shradha Gangadhar[2],
Kulkarni Amarja Bhaskar[3], Landge Pooja Pandit[4]
Department of E&TC Engineering[1-4]
BMIT Collage, Solapur, India
University of Solapur, India
landgepooja51@gmail.com

Abstract: *Today's mobile phones depend on towers, satellites, and the internet for communication. They need constant recharges, SIM cards, and network providers. But in the future, communication can become completely different with the help of Quantum Chips. Quantum communication is the process of sending information using quantum states of particles (like photons) instead of traditional electrical signals. These quantum states can represent data in ways that are more secure and faster than normal communication methods. Extremely secure communication (cannot be hacked without detection) Faster and more efficient information transfer, Useful for quantum networks and future internet systems. A Quantum Chip uses the principles of quantum mechanics, such as superposition and entanglement, to process and transfer information. If this chip is used inside a mobile phone, the device can connect directly with another mobile without the need for towers, satellites, or cables. This technology will make mobile communication Highly secure (hack-proof due to quantum properties) Recharge-free communication system Independent of existing network providers. In short, a mobile with a quantum chip will change the way people communicate, bringing the world closer to the era of Quantum Internet. Quantum communication does not require mobile towers, but it does require optical fiber or satellite links to transmit data securely.*

Keywords: Quantum Chip, Quantum Computing, Quantum Network, Quantum Bit (Qubit), Superposition Entanglement, Quantum Coherence, Quantum Communication, Quantum Internet

I. INTRODUCTION

Quantum chip networking is a new and advanced technology that connects quantum chips together so they can share quantum information. It is like the internet for quantum computers a system that allows different quantum devices to talk to each other. A quantum chip is a small electronic chip quantum communication does not always need traditional mobile towers like normal communication systems**.** However, it still needs some medium to transfer data, such as optical fiber cables or quantum satellites[1-21].

In normal communication, data is sent using radio waves through towers and satellites **But** in quantum communication or quantum chip networking, data is sent using photons (light particles), which can travel through fiber optic cables or space (satellite links).

So Without tower: Yes, it is possible. Quantum communication doesn't need towers because it uses light-based communication Without satellite: Possible only for short distances using fiber optic connections. For long-distance communication, a quantum satellite is required to maintain the link. In China launched a quantum satellite named "Micius", which proved that long-distance quantum communication is possible between two countries using entangled photons[22-42].

In the pulsating heart of our digital age, where information flows like an electric river, the dream of seamless connection has long been realized. Yet, beneath this familiar hum, a new whisper is emerging – one not of bits and bytes, but of qubits and quantum entanglement. It's the nascent, breathtaking vision of Quantum Chip Networking and Communication, a frontier poised to redefine not just how we compute, but the very fabric of our interconnected reality.

Imagine a single quantum chip, a marvel of engineering, harnessing the bizarre rules of quantum mechanics to perform calculations impossible for even the most powerful supercomputers. Now, imagine not just one, but many such chips, scattered across a city, a continent, or even the globe, all working in concert. This isn't just a dream; it's the audacious goal of quantum chip networking – to link these islands of quantum power into an ocean of distributed quantum potential[43-63].

The challenge is immense. Unlike the robust electrical signals that course through our classical networks, quantum information is fragile, ephemeral. Qubits, the quantum counterparts of classical bits, exist in states of superposition (being both 0 and 1 simultaneously) and entanglement (being intimately linked, even across vast distances, such that measuring one instantly affects the other). How do you send something so delicate, so intrinsically intertwined, without destroying its very essence?

The answer lies in mastering the art of quantum communication. Optical fibers, already the backbone of our classical internet, become conduits for single photons – the ultimate quantum couriers. These photons can carry quantum information, or, more crucially, they can be used to establish entanglement between distant quantum chips. This isn't just about sending data; it's about sharing a quantum state, creating a shared quantum reality between disparate machines[54-76].

At the heart of this revolution are several key advancements:

Quantum Repeaters: Much like classical repeaters boost a signal, quantum repeaters are vital to extend the range of quantum communication. They aren't simply amplifying the quantum state (which would destroy it), but rather performing sophisticated operations to "purify" and "swap" entanglement between segments, allowing it to span greater distances without succumbing to decoherence.

Quantum Routers/Switches: These devices will direct quantum information and entanglement across a network, much like classical routers direct IP packets. Their design is a monumental task, as they must handle the unique properties of qubits while maintaining their delicate quantum states.

Quantum Transducers: The interface between light (photons) and matter (the qubits within a quantum chip) is critical. Transducers convert quantum information from one medium to another, allowing for seamless integration of photonic communication with solid-state or trapped-ion quantum processors.

The implications of a functional quantum chip network are staggering:

Distributed Quantum Computing: Imagine pooling the processing power of multiple quantum chips, each specializing in different tasks, to tackle problems of unprecedented complexity – from simulating new drug molecules with perfect accuracy to optimizing global logistics for climate change mitigation.

Unbreakable Security (QKD): Quantum Key Distribution (QKD) is already a reality in some point-to-point links. A quantum network would extend this, providing a virtually unhackable communication fabric where any attempt by an eavesdropper to observe the quantum key immediately alters it, alerting the communicating parties.

Enhanced Sensing and Metrology: Entangled networks could lead to distributed quantum sensors with sensitivity far beyond anything achievable today, revolutionizing fields from astronomy to medical diagnostics.

A "Quantum Internet": The ultimate vision is a global quantum internet, where quantum information flows freely, enabling new applications we can barely conceive of today – perhaps even connecting quantum brains.

The journey is far from over. Overcoming the immense challenges of decoherence, error correction, and scaling these delicate systems requires breakthroughs in physics, materials science, and engineering. We're still in the experimental phase, with small-scale networks linking a handful of quantum processors. Yet, the progress is rapid, driven by a global race to unlock the next computational paradigm.

The symphony of entanglement has just begun its overture. As quantum chips increasingly learn to whisper, then speak, across the nascent entangled fabric, we are witnessing the birth of a new era – one where the very bizarreness of the quantum world becomes the foundation for an unimaginably powerful and interconnected future.

II. LITERATURE SURVEY/REVIEW

1960s – Idea Stage: Scientists thought that the strange behavior of tiny particles (like electrons and photons) could be used to make a new kind of computer.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, October 2025
Impact Factor: 7.67

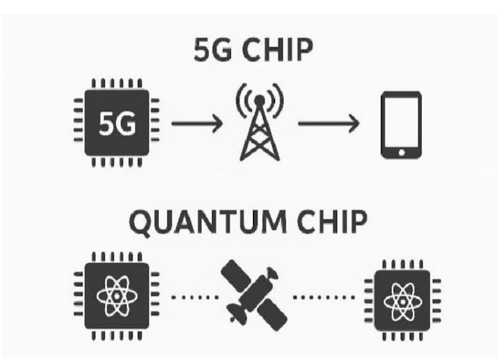
1980s – Concept by Scientists: Richard Feynman explained that a "quantum computer" could solve very hard problems faster than normal computers.
1990s – Small Experiments: Researchers made very small quantum systems with only 2 or 3 quantum bits (called qubits).
2001 – IBM's First Quantum Processor: IBM created a small chip with 7 qubits. It was one of the first working quantum computers.
2011 – D-Wave Company: D-Wave made the first commercial quantum chip (128 qubits). It was used for solving special math problems.
2019 – Google's Sycamore Chip: Google built a chip with 54 qubits and said it did a task faster than any supercomputer. This was called Quantum Supremacy.
2021 – IBM's Eagle Chip: IBM made a 127-qubit chip that was more powerful and stable than before.
2023 – Photonic Quantum Chips:Scientists started making chips that use light (photons) instead of electricity.These chips can work at normal room temperature, so they are easier to use in the future.
2024–2025 – New Progress: Companies like Google, Microsoft, and IBM are building bigger and more stable chips — like Google's Willow, Microsoft's Majorana-1, and IBM's Condor (over 1000 qubits).
Future (2030 and beyond):
Quantum chips may become small, cheap, and powerful enough to fit in laptops, mobiles, and computers. They could make the Quantum Internet possible ultra-fast and hack-proof communication, maybe even without towers or recharge

III. METHODOLOGY

Quantum chip networking is a new technology that uses the principles of quantum mechanics to allow communication without depending on satellites, cell towers, or traditional network cables. At the core of this technology is the quantum chip, which contains qubits instead of regular bits. Qubits are special because they can exist in multiple states at the same time (superposition) and can be connected to other qubits at a distance through entanglement. This means when one qubit changes, its entangled partner changes instantly, allowing information to be shared over long distances very quickly.

The process starts with the initialization of qubits on the quantum chip. These qubits are then entangled in pairs, where one qubit stays with the sender and the other is linked with the receiver's quantum chip. The sender encodes the information onto their qubit, and through the entanglement, the information is transmitted to the receiver's qubit. The receiver then measures their qubit and decodes the original information. Quantum error correction ensures that the data is transmitted reliably without loss.

To build such a system, a quantum chip is required along with components like quantum logic gates to control qubits, entanglement generators to link qubits, detectors to read qubit states, and sometimes cryogenic systems to keep superconducting qubits stable as shown in Figure 1. Photons or other quantum particles act as the carriers of information.



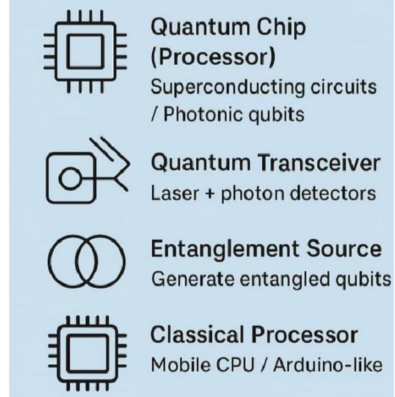


Figure 1: Quantum chip processor

IJARSCT

International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

ISSN: 2581-9429 Volume 5, Issue 1, October 2025 Impact Factor: 7.67

The advantage of quantum chip networking is that it allows instant, secure, and direct communication between devices, without any traditional infrastructure like towers, satellites, or cables. It uses the quantum properties of entanglement and superposition to transmit information efficiently, making it a promising technology for future communication systems, especially in areas where conventional networks are difficult to use.

IV. RESULTS & DISCUSSION

1. Very Fast Data Transmission Quantum entanglement allows information to be shared almost instantly between devices. Communication speed is much higher than traditional networks.
2. High Security-Any attempt to intercept quantum data changes its state, making eavesdropping immediately detectable, Ensures highly secure communication.
3. Reduced Infrastructure Dependence -No need for satellites, cell towers, or long cables. Devices can communicate directly with each other using entangled qubits.
4. Energy Efficiency- Requires less power compared to conventional networks since radio signals and towers are not needed. Requires less power compared to conventional networks since radio signals and towers are not needed.
5. Long-Distance Connectivity-Entangled qubits can maintain connections over very long distances. Potential for global quantum communication without relay systems.
6. Future Applications-Enables secure quantum internet and device-to-device networks. Can support ultra-secure financial transactions, quantum cloud computing, and next-generation communication systems.
7. Reliable Communication-Quantum error correction ensures data is transmitted accurately without loss.

Discussion

Quantum chip networking is an emerging technology that combines quantum mechanics with modern communication systems. It allows devices to communicate using quantum entanglement and superposition, which are properties of quantum particles. In this system, information is encoded in qubits instead of classical bits. Qubits can exist in multiple states at once (superposition) and can be entangled so that the state of one qubit instantly affects the state of its entangled partner, no matter the distance

The key point of quantum chip networking is that it can transmit information without relying on traditional network infrastructure like satellites, cell towers, or cables. This is because the communication happens through entangled qubits, which act as a direct link between devices. Data transmission is therefore extremely fast, secure, and potentially

Another major aspect of this technology is security. Since any attempt to measure or intercept a qubit changes its state, quantum communication is naturally resistant to hacking. This makes it very useful for sensitive applications such as financial transactions, government communication, and secure cloud computing.

Quantum chip networking also promises energy efficiency, as it does not require continuous power for towers or relay systems, and can enable long-distance communication because entanglement does not degrade over distance like traditional signals.

Currently, the technology relies on quantum chips that may use superconducting qubits, photonic qubits, or trapped ions. These chips include quantum logic gates, entanglement generators, and detectors to manage the qubits. Though still experimental, quantum chip networking is considered a major step toward quantum internet and next-generation secure communication systems.

V. CONCLUSION

Quantum chip networking allows direct, fast, secure, and energy-efficient communication between devices without traditional infrastructure, using the unique properties of quantum mechanics. Quantum chip networking uses quantum mechanics to enable fast, secure, and direct communication between devices without satellites, towers, or cables. It offers high-speed data transfer, strong security, energy efficiency, and long-distance connectivity. By using quantum chips with qubits and entanglement, it lays the foundation for a future quantum internet and advanced applications like secure communications and quantum cloud computing. Overall, it represents a major step toward efficient, reliable, and futuristic communication systems.

VI. FUTURE SCOPE

Global Quantum Internet – Enables a worldwide secure and instant communication network.
Ultra-Secure Communication – Protects sensitive data for governments, defense, and financial sectors.

- Direct Device-to-Device Networking – Allows communication without satellites, towers, or cables.
- Quantum Cloud Computing – Connects devices to quantum cloud servers for faster processing.
- Secure Financial Transactions – Supports hacking-resistant banking, blockchain, and online payments.
- Long-Distance Communication – Maintains reliable connections over very large distances.
- Energy-Efficient Networks – Reduces power consumption compared to traditional networks.
- Scientific and Space Applications – Useful for deep-space communication and research networks.

REFERENCES

[1]. Altaf O. Mulani, Arti Vasant Bang, Ganesh B. Birajadar, Amar B. Deshmukh, and Hemlata Makarand Jadhav, (2024). IoT Based Air, Water, and Soil Monitoring System for Pomegranate Farming, *Annals of Agri-Bio Research.* 29 (2): 71-86, 2024.

[2]. Bhawana Parihar, Ajmeera Kiran, Sabitha Valaboju, Syed Zahidur Rashid, and Anita Sofia Liz D R. (2025). Enhancing Data Security in Distributed Systems Using Homomorphic Encryption and Secure Computation Techniques, *ITM Web Conf.,* 76 (2025) 02010. DOI: https://doi.org/10.1051/itmconf/20257602010

[3]. C. Veena, M. Sridevi, K. K. S. Liyakat, B. Saha, S. R. Reddy and N. Shirisha,(2023). HEECCNB: An Efficient IoT-Cloud Architecture for Secure Patient Data Transmission and Accurate Disease Prediction in Healthcare Systems, *2023 Seventh International Conference on Image Information Processing (ICIIP)*, Solan, India, 2023, pp. 407-410, doi: 10.1109/ICIIP61524.2023.10537627. Available at: https://ieeexplore.ieee.org/document/10537627

[4]. D. A. Tamboli, V. A. Sawant, M. H. M. and S. Sathe, (2024). AI-Driven-IoT(AIIoT) Based Decision-Making- KSK Approach in Drones for Climate Change Study, *2024 4th International Conference on Ubiquitous Computing and Intelligent Information Systems (ICUIS)*, Gobichettipalayam, India, 2024, pp. 1735-1744, doi: 10.1109/ICUIS64676.2024.10866450.

[5]. H. T. Shaikh, (2025). Empowering the IoT: The Study on Role of Wireless Charging Technologies, *Journal of Control and Instrumentation Engineering,* vol. 11, no. 2, pp. 29-39, Jul. 2025.

[6]. H. T. Shaikh, (2025b). Pre-Detection Systems Transfiguring Intoxication and Smoking Using Sensor and AI, *Journal of Instrumentation and Innovation Sciences,* vol. 10, no. 2, pp. 19-31, Jul. 2025.

[7]. K. Rajendra Prasad, Santoshachandra Rao Karanam et al. (2024). AI in public-private partnership for IT infrastructure development, *Journal of High Technology Management Research*, Volume 35, Issue 1, May 2024, 100496. https://doi.org/10.1016/j.hitech.2024.100496

[8]. KKS Liyakat. (2023).Detecting Malicious Nodes in IoT Networks Using Machine Learning and Artificial Neural Networks, *2023 International Conference on Emerging Smart Computing and Informatics (ESCI)*, Pune, India, 2023, pp. 1-5, doi:10.1109/ESCI56872.2023.10099544. Available at: https://ieeexplore.ieee.org/document/10099544/

[9]. KKS Liyakat, (2024). Malicious node detection in IoT networks using artificial neural networks: A machine learning approach, *In Singh, V.K., Kumar Sagar, A., Nand, P., Astya, R., & Kaiwartya, O. (Eds.). Intelligent Networks: Techniques, and Applications (1st ed.). CRC Press.* https://doi.org/10.1201/9781003541363

[10]. K. Kasat, N. Shaikh, V. K. Rayabharapu, and M. Nayak. (2023). Implementation and Recognition of Waste Management System with Mobility Solution in Smart Cities using Internet of Things, *2023 Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS)*, Trichy, India, 2023, pp. 1661-1665, doi: 10.1109/ICAISS58487.2023.10250690 . Available at: https://ieeexplore.ieee.org/document/10250690/

IJARSCT

International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

ISSN: 2581-9429

Volume 5, Issue 1, October 2025

Impact Factor: 7.67

[11]. K S K, (2024c). Vehicle Health Monitoring System (VHMS) by Employing IoT and Sensors, *Grenze International Journal of Engineering and Technology,* Vol 10, Issue 2, pp- 5367-5374. Available at: https://thegrenze.com/index.php?display=page&view=journalabstract&absid=3371&id=8

[12]. K S K, (2024e). A Novel Approach on ML based Palmistry, *Grenze International Journal of Engineering and Technology,* Vol 10, Issue 2, pp- 5186-5193. Available at: https://thegrenze.com/index.php?display=page&view=journalabstract&absid=3344&id=8

[13]. K S K, (2024f).IoT based Boiler Health Monitoring for Sugar Industries, *Grenze International Journal of Engineering and Technology,* Vol 10, Issue 2, pp. 5178 -5185. Available at: https://thegrenze.com/index.php?display=page&view=journalabstract&absid=3343&id=8

[14]. Keerthana, R., K, V., Bhagyalakshmi, K., Papinaidu, M., V, V., & Liyakat, K. K. S. (2025). Machine learning based risk assessment for financial management in big data IoT credit. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.5086671

[15]. KKS Liyakat, (2024a). Explainable AI in Healthcare. In: Explainable Artificial Intelligence in healthcare System, editors: *A. Anitha Kamaraj, Debi Prasanna Acharjya.* ISBN: 979-8-89113-598-7. DOI: https://doi.org/10.52305/GOMR8163

[16]. KKS Liyakat, (2024b). Machine Learning (ML)-Based Braille Lippi Characters and Numbers Detection and Announcement System for Blind Children in Learning, *In Gamze Sart (Eds.), Social Reflections of Human-Computer Interaction in Education, Management, and Economics, IGI Global*. https://doi.org/10.4018/979-8-3693-3033-3.ch002

[17]. Kulkarni S G, (2025). Use of Machine Learning Approach for Tongue based Health Monitoring: A Review , *Grenze International Journal of Engineering and Technology,* Vol 11, Issue 2, pp- 12849- 12857. Grenze ID: 01.GIJET.11.2.311_22 Available at: https://thegrenze.com/index.php?display=page&view=journalabstract&absid=6136&id=8

[18]. Kutubuddin, KSK Approach in LOVE Health: AI-Driven- IoT(AIIoT) based Decision Making System in LOVE Health for Loved One, *GRENZE International Journal of Engineering and Technology,* 2025, 11(1), pp. 4628-4635. Grenze ID: 01.GIJET.11.1.371_1

[19]. Liyakat, K.K.S. (2023a). Machine Learning Approach Using Artificial Neural Networks to Detect Malicious Nodes in IoT Networks. *In: Shukla, P.K., Mittal, H., Engelbrecht, A. (eds) Computer Vision and Robotics. CVR 2023. Algorithms for Intelligent Systems. Springer, Singapore*. https://doi.org/10.1007/978-981-99-4577-1_3

[20]. Liyakat K. S. (2024). ChatGPT: An Automated Teacher's Guide to Learning. *In R. Bansal, A. Chakir, A. Hafaz Ngah, F. Rabby, & A. Jain (Eds.)*, *AI Algorithms and ChatGPT for Student Engagement in Online Learning* (pp. 1-20). IGI Global. https://doi.org/10.4018/979-8-3693-4268-8.ch001

[21]. Liyakat. (2024a). Machine Learning Approach Using Artificial Neural Networks to Detect Malicious Nodes in IoT Networks. *In: Udgata, S.K., Sethi, S., Gao, XZ. (eds) Intelligent Systems. ICMIB 2023. Lecture Notes in Networks and Systems, vol 728. Springer, Singapore.* https://doi.org/10.1007/978-981-99-3932-9_12 available at: https://link.springer.com/chapter/10.1007/978-981-99-3932-9_12

[22]. Liyakat, K. K. (2025a). Heart Health Monitoring Using IoT and Machine Learning Methods. In A. Shaik (Ed.), *AI-Powered Advances in Pharmacology* (pp. 257-282). IGI Global. https://doi.org/10.4018/979-8-3693-3212-2.ch010

[23]. Liyakat. (2025c). IoT Technologies for the Intelligent Dairy Industry: A New Challenge. In S. Thandekkattu& N. Vajjhala (Eds.), *Designing Sustainable Internet of Things Solutions for Smart Industries* (pp. 321-350). IGI Global. https://doi.org/10.4018/979-8-3693-5498-8.ch012

[24]. Liyakat. (2025d). AI-Driven-IoT(AIIoT)-Based Decision Making in Kidney Diseases Patient Healthcare Monitoring: KSK Approach for Kidney Monitoring. In L. Özgür Polat & O. Polat (Eds.), *AI-Driven Innovation in Healthcare Data Analytics* (pp. 277-306). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-7277-7.ch009

[25]. Liyakat. (2026). Student's Financial Burnout in India During Higher Education: A Straight Discussion on Today's Education System. In S. Hai-Jew (Ed.), *Financial Survival in Higher Education* (pp. 359-394). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-0407-6.ch013

[26]. M Pradeepa, et al. (2022). Student Health Detection using a Machine Learning Approach and IoT, *2022 IEEE 2nd Mysore sub section International Conference (MysuruCon),* 2022. Available at: https://ieeexplore.ieee.org/document/9972445

[27]. Mahant, M. A. (2025). Machine Learning-Driven Internet of Things (MLIoT)-Based Healthcare Monitoring System. In N. Wickramasinghe (Ed.), *Digitalization and the Transformation of the Healthcare Sector* (pp. 205-236). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-9641-4.ch007

[28]. Mulani AO, Liyakat KKS, Warade NS, et al. (2025). ML-powered Internet of Medical Things Structure for Heart Disease Prediction. *Journal of Pharmacology and Pharmacotherapeutics*. 2025; 0(0). doi:10.1177/0976500X241306184

[29]. N. R. Mulla, (2025). Pipeline Pressure and Flow Rate Monitoring Using IoT Sensors and ML Algorithms to Detect Leakages, *Int. J. Artif. Intell. Mech. Eng*., vol. 1, no. 1, pp. 20–30, Jun. 2025.

[30]. N. R. Mulla, (2025a). Nuclear Energy: Powering the Future or a Risky Relic, *International Journal of Sustainable Energy and Thermoelectric Generator*, vol. 1, no. 1, pp. 52–63, Jun. 2025.

[31]. Nikat Rajak Mulla, (2025b). Sensor-based Aircraft Wings Design Using Airflow Analysis, *International Journal of Image Processing and Smart Sensors,* vol. 1, no. 1, pp. 55-65, Jun. 2025.

[32]. N. R. Mulla, (2025c). A Study on Machine Learning for Metal Processing: A New Future, *International Journal of Machine Design and Technology,* vol. 1, no. 1, pp. 56–69, Jun. 2025.

[33]. Nikat Rajak Mulla, (2025d). Sensor-based Aircraft Wings Design Using Airflow Analysis, *International Journal of Image Processing and Smart Sensors,* vol. 1, no. 1, pp. 55-65, Jun. 2025.

[34]. N. R. Mulla, (2025e). Node MCU and IoT Centered Smart Logistics, *International Journal of Emerging IoT Technologies in Smart Electronics and Communication,* vol. 1, no. 1, pp. 20-36, Jun-2025.

[35]. Nikat Rajak Mulla,(2025f). Air Flow Analysis in Sensor-Based Aircraft Wings Design. *Recent Trends in Fluid Mechanics*. 2025; 12(2): 29– 39p.

[36]. Nikat Rajak Mulla,(2025g). IoT Sensors To Monitor Pipeline Pressure and Flow Rate Combined with Ml-Algorithms to Detect Leakages. *Recent Trends in Fluid Mechanics.* 2025; 12(2): 40–48p.

[37]. Nikat Rajak Mulla, (2025h). Nano-Materials in Vaccine Formation and Chemical Formulae's for Vaccination. *Journal of Nanoscience, NanoEngineering & Applications*. 2025; 15(03).

[38]. Odnala, S., Shanthy, R., Bharathi, B., Pandey, C., Rachapalli, A., & Liyakat, K. K. S. (2025). Artificial Intelligence and Cloud-Enabled E-Vehicle Design with Wireless Sensor Integration. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.5107242

[39]. P. Neeraja, R. G. Kumar, M. S. Kumar, K. K. S. Liyakat and M. S. Vani. (2024), DL-Based Somnolence Detection for Improved Driver Safety and Alertness Monitoring. *2024 IEEE International Conference on Computing, Power and Communication Technologies (IC2PCT)*, Greater Noida, India, 2024, pp. 589-594, doi: 10.1109/IC2PCT60090.2024.10486714. Available at: https://ieeexplore.ieee.org/document/10486714

[40]. Prashant K Magadum (2024). Machine Learning for Predicting Wind Turbine Output Power in Wind Energy Conversion Systems, *Grenze International Journal of Engineering and Technology,* Jan Issue, Vol 10, Issue 1, pp. 2074-2080. Grenze ID: 01.GIJET.10.1.4_1 Available at: https://thegrenze.com/index.php?display=page&view=journalabstract&absid=2514&id=8

[41]. Priya Mangesh Nerkar, Bhagyarekha Ujjwalganesh Dhaware. (2023). Predictive Data Analytics Framework Based on Heart Healthcare System (HHS) Using Machine Learning, *Journal of Advanced Zoology*, 2023, Volume 44, Special Issue -2, Page 3673:3686. Available at: https://jazindia.com/index.php/jaz/article/view/1695

[42]. Priya Nerkar and Sultanabanu, (2024). IoT-Based Skin Health Monitoring System, International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS). 2024, 13(11): 5937-5950. https://doi.org/10.31032/IJBPAS/2024/13.11.8488

[43]. S. B. Khadake, A. B. Chounde, A. A. Suryagan, M. H. M. and M. R. Khadatare, (2024). AI-Driven-IoT(AIIoT) Based Decision Making System for High-Blood Pressure Patient Healthcare Monitoring, *2024 International Conference on Sustainable Communication Networks and Application (ICSCNA)*, Theni, India, 2024, pp. 96-102, doi: 10.1109/ICSCNA63714.2024.10863954.

[44]. S. B. Khadake, P. S. More, R. J. Shinde, K. P. Kondubhairi and S. S. Kamble, (2025). AI-Driven IoT based Decision Making for Hepatitis Diseases Patient's Healthcare Monitoring: KSK Approach for Hepatitis Patient Monitoring, *2025 7th International Conference on Intelligent Sustainable Systems (ICISS)*, India, 2025, pp. 256-263, doi: 10.1109/ICISS63372.2025.11076213.

[45]. S. B. Khadake, K. Galani, K. B. Patil, A. Dhavale and S. D. Sarik, (2025a). AI-Powered-IoT (AIIoT) based Bridge Health Monitoring using Sensor Data for Smart City Management- A KSK Approach, *2025 7th International Conference on Intelligent Sustainable Systems (ICISS)*, India, 2025, pp. 296-305, doi: 10.1109/ICISS63372.2025.11076329.

[46]. S. B. Khadake, B. R. Ingale, D. D. D., S. S. Sudake and M. M. Awatade, (2025b). Kidney Diseases Patient Healthcare Monitoring using AI-Driven-IoT(AIIoT) - An KSK1 Approach, *2025 7th International Conference on Intelligent Sustainable Systems (ICISS)*, India, 2025, pp. 264-272, doi: 10.1109/ICISS63372.2025.11076397.

[47]. Sayyad. (2025a). AI-Powered-IoT (AIIoT)-Based Decision-Making System for BP Patient's Healthcare Monitoring: KSK Approach for BP Patient Healthcare Monitoring. *In S. Aouadni& I. Aouadni (Eds.), Recent Theories and Applications for Multi-Criteria Decision-Making (pp. 205-238). IGI Global.* https://doi.org/10.4018/979-8-3693-6502-1.ch008

[48]. Sayyad (2025b). AI-Powered IoT (AI IoT) for Decision-Making in Smart Agriculture: KSK Approach for Smart Agriculture. In S. Hai-Jew (Ed.), *Enhancing Automated Decision-Making Through AI* (pp. 67-96). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6230-3.ch003

[49]. Sayyad (2025c). KK Approach to Increase Resilience in Internet of Things: A T-Cell Security Concept. In D. Darwish & K. Charan (Eds.), Analyzing Privacy and Security Difficulties in Social Media: New Challenges and Solutions (pp. 87-120). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-9491-5.ch005

[50]. Sayyad, (2025). KK Approach for IoT Security: T-Cell Concept. In Rajeev Kumar, Sheng-Lung Peng, & Ahmed Elngar (Eds.), *Deep Learning Innovations for Securing Critical Infrastructures.* IGI Global Scientific Publishing. DOI: 10.4018/979-8-3373-0563-9.ch022

[51]. Sayyad (2025d). Healthcare Monitoring System Driven by Machine Learning and Internet of Medical Things (MLIoMT). *In V. Kumar, P. Katina, & J. Zhao (Eds.), Convergence of Internet of Medical Things (IoMT) and Generative AI* (pp. 385-416). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6180-1.ch016

[52]. Shinde, S. S., Nerkar, P. M., SLiyakat, S. S., & SLiyakat, V. S. (2025). Machine Learning for Brand Protection: A Review of a Proactive Defense Mechanism. *In M. Khan & M. Amin Ul Haq (Eds.), Avoiding Ad Fraud and Supporting Brand Safety: Programmatic Advertising Solutions* (pp. 175-220). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-7041-4.ch007

[53]. SilpaRaj M, Senthil Kumar R, Jayakumar K, Gopila M, Senthil kumar S. (2025). Scalable Internet of Things Enabled Intelligent Solutions for Proactive Energy Engagement in Smart Grids Predictive Load Balancing and Sustainable Power Distribution, *In S. Kannadhasan et al. (eds.), Proceedings of the International Conference on Sustainability Innovation in Computing and Engineering (ICSICE 24), Advances in Computer Science Research 120,* https://doi.org/10.2991/978-94-6463-718-2_85

[54]. SLiyakat, K. (2024a). AI-Driven IoT (AIIoT) in Healthcare Monitoring. In T. Nguyen & N. Vo (Eds.), *Using Traditional Design Methods to Enhance AI-Driven Decision Making* (pp. 77-101). IGI Global. https://doi.org/10.4018/979-8-3693-0639-0.ch003 available at: https://www.igi-global.com/chapter/ai-driven-iot-aiiot-in-healthcare-monitoring/336693

[55]. SLiyakat, K. (2024b). Modelling and Simulation of Electric Vehicle for Performance Analysis: BEV and HEV Electrical Vehicle Implementation Using Simulink for E-Mobility Ecosystems. *In L. D., N. Nagpal, N. Kassarwani, V. Varthanan G., & P. Siano (Eds.), E-Mobility in Electrical Energy Systems for Sustainability (pp. 295-320). IGI Global.* https://doi.org/10.4018/979-8-3693-2611-4.ch014 Available at: https://www.igi-global.com/gateway/chapter/full-text-pdf/341172

[56]. SLiyakat, S. (2024c). Machine Learning-Based Pomegranate Disease Detection and Treatment. *In M. Zia Ul Haq & I. Ali (Eds.), Revolutionizing Pest Management for Sustainable Agriculture* (pp. 469-498). IGI Global. https://doi.org/10.4018/979-8-3693-3061-6.ch019

[57]. SLiyakat, S. (2024d). Computer-Aided Diagnosis in Ophthalmology: A Technical Review of Deep Learning Applications. In M. Garcia & R. de Almeida (Eds.), *Transformative Approaches to Patient Literacy and Healthcare Innovation* (pp. 112-135). IGI Global. https://doi.org/10.4018/979-8-3693-3661-8.ch006 Available at: https://www.igi-global.com/chapter/computer-aided-diagnosis-in-ophthalmology/342823

[58]. SLiyakat, S. (2024e). IoT Driven by Machine Learning (MLIoT) for the Retail Apparel Sector. *In T. Tarnanidis, E. Papachristou, M. Karypidis, & V. Ismyrlis (Eds.), Driving Green Marketing in Fashion and Retail* (pp. 63-81). IGI Global. https://doi.org/10.4018/979-8-3693-3049-4.ch004

[59]. SLiyakat, S. (2024f). Artificial Intelligence (AI)-Driven IoT (AIIoT)-Based Agriculture Automation. In S. Satapathy & K. Muduli (Eds.), *Advanced Computational Methods for Agri-Business Sustainability* (pp. 72-94). IGI Global. https://doi.org/10.4018/979-8-3693-3583-3.ch005

[60]. SLiyakat, K. (2025). Machine Learning-Powered IoT (MLIoT) for Retail Apparel Industry. In T. Tarnanidis, E. Papachristou, M. Karypidis, & V. Manda (Eds.), *Sustainable Practices in the Fashion and Retail Industry* (pp. 345-372). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-9959-0.ch015

[61]. SLiyakat, K. S. (2025a). Braille-Lippi Numbers and Characters Detection and Announcement System for Blind Children Using KSK Approach: AI-Driven Decision-Making Approach. In T. Murugan, K. P., & A. Abirami (Eds.), Driving Quality Education Through AI and Data Science (pp. 531-556). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8292-9.ch023

[62]. SLiyakat, K. S. (2025b). AI-Driven IoT (AIIoT)-Based Decision-Making System for High BP Patient Healthcare Monitoring: KSK1 Approach for BP Patient Healthcare Monitoring. In T. Mzili, A. Arya, D. Pamucar, & M. Shaheen (Eds.), Optimization, Machine Learning, and Fuzzy Logic: Theory, Algorithms, and Applications (pp. 71-102). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-7352-1.ch003

[63]. SLiyakat, K. S. (2025c). Advancing Towards Sustainable Energy With Hydrogen Solutions: Adaptation and Challenges. In F. Özsungur, M. Chaychi Semsari, & H. Küçük Bayraktar (Eds.), Geopolitical Landscapes of Renewable Energy and Urban Growth (pp. 357-394). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8814-3.ch013

[64]. SLiyakat, K. S. (2025d). AI-Driven-IoT (AIIoT) Decision-Making System for Hepatitis Disease Patient Healthcare Monitoring: KSK1 Approach for Hepatitis Patient Monitoring. In S. Agarwal, D. Lakshmi, & L. Singh (Eds.), *Navigating Innovations and Challenges in Travel Medicine and Digital Health* (pp. 431-450). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8774-0.ch022

[65]. SLiyakat, K. S. (2025e). AI-Driven-IoT (AIIoT)-Based Jawar Leaf Disease Detection: KSK Approach for Jawar Disease Detection. *In U. Bhatti, M. Aamir, Y. Gulzar, & S. Ullah Bazai (Eds.), Modern Intelligent Techniques for Image Processing* (pp. 439-472). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-9045-0.ch019

[66]. SLiyakat, K. S. (2025f). AI-Powered-IoT (AIIoT)-Based Decision-Making System for BP-Patient Healthcare Monitoring: BP-Patient Health Monitoring Using KSK Approach. *In M. Lytras & S. Alajlan (Eds.), Transforming Pharmaceutical Research With Artificial Intelligence* (pp. 189-218). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6270-9.ch007

[67]. SLiyakat, K. S. (2025g). A Study on AI-Driven Internet of Battlefield Things (IoBT)-Based Decision Making: KSK Approach in IoBT. In M. Tariq (Ed.), *Merging Artificial Intelligence With the Internet of Things* (pp. 203-238). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8547-0.ch007

[68]. SLiyakat, K. S. (2025h). KK Approach to Increase Resilience in Internet of Things: A T-Cell Security Concept. In M. Almaiah & S. Salloum (Eds.), *Cryptography, Biometrics, and Anonymity in Cybersecurity Management* (pp. 199-228). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8014-7.ch010

[69]. SLiyakat, K. S. (2025i). KK Approach for IoT Security: T-Cell Concept. In R. Kumar, S. Peng, P. Jain, & A. Elngar (Eds.), *Deep Learning Innovations for Securing Critical Infrastructures* (pp. 369-390). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-0563-9.ch022

[70]. SLiyakat, K. S. (2025j). Hydrogen Energy: Adaptation and Challenges. In J. Mabrouki (Ed.), *Obstacles Facing Hydrogen Green Systems and Green Energy* (pp. 205-236). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8980-5.ch013

[71]. SLiyakat, K. S. (2025k). Roll of Carbon-Based Supercapacitors in Regenerative Breaking for Electrical Vehicles. In M. Mhadhbi (Ed.), *Innovations in Next-Generation Energy Storage Solutions* (pp. 523-572). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-9316-1.ch017

[72]. SLiyakat, S. (2025l). AI-Driven-IoT (AIIoT)-Based Decision Making in Drones for Climate Change: KSK Approach. *In S. Aouadni& I. Aouadni (Eds.), Recent Theories and Applications for Multi-Criteria Decision-Making* (pp. 311-340). IGI Global. https://doi.org/10.4018/979-8-3693-6502-1.ch011

[73]. SLiyakat, S. (2025m). Machine Learning-Driven Internet of Medical Things (ML-IoMT)-Based Healthcare Monitoring System. In B. Soufiene & C. Chakraborty (Eds.), *Responsible AI for Digital Health and Medical Analytics* (pp. 49-86). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6294-5.ch003

[74]. SLiyakat, S. (2025n). Transformation of Agriculture Effectuated by Artificial Intelligence-Driven Internet of Things (AIIoT). In J. Garwi, M. Dzingirai, & R. Masengu (Eds.), *Integrating Agriculture, Green Marketing Strategies, and Artificial Intelligence* (pp. 449-484). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6468-0.ch015

[75]. Upadhyaya, A. N., Surekha, C., Malathi, P., Suresh, G., Suriyan, K., & Liyakat, K. K. S. (2025). Pioneering cognitive computing for transformative healthcare innovations. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.5086894.

[76]. Vaishnavi Ashok Desai, (2025). AI and Sensor Systems Revolutionizing Intoxication and Smoking Pre-Detection. *Journal of Control & Instrumentation*. 2025; 16(3): 15–26p