



Revolutionizing Industries: The Transformative Role of Advanced Computing and Systems

Inam Ullah^{1,*}

¹Department of Computer Engineering, Gachon University, Seongnam 13120, Republic of Korea

Dear Researchers,

I am pleased to introduce a new Transactions focusing on the rapidly evolving field of Advanced Computing and Systems. This journal is intended to serve as a platform for cutting-edge research and technological advancements that have the potential to reshape industries through state-of-the-art computing methodologies. The goal is to foster interdisciplinary collaboration among researchers, practitioners, and industry leaders, facilitating the advancement of computing systems and exploring their impact on real-world applications. Through this publication, I aim to contribute to the academic discourse and help drive innovation in this critical domain.

1 Emerging Significance

During the past decade, there have been extraordinary progressions in advanced computing, mainly driven by the exponential growth in processing power, memory size, and connectivity [1, 2]. In particular, advances in network infrastructure—including high-altitude platform networks supporting massive IoT deployments—have further expanded the reach and scale of advanced computing systems [3].



Submitted: 02 November 2024

Accepted: 19 November 2024

Published: 21 November 2024

Vol. 1, No. 1, 2025.

10.62762/TACS.2024.123352

*Corresponding author:

✉ Inam Ullah

inam@gachon.ac.kr

The arrival of multi-core processors, specialized hardware such as Graphics Processing Units (GPUs), and the widespread growth of cloud computing infrastructure have enabled systems to accomplish more complex tasks and process large datasets [4]. With the development of computational capacity, our competence to resolve real-world problems has also enhanced productivity and accuracy. Technologies such as artificial intelligence (AI), machine learning (ML), edge computing, and quantum computing have become essential to the upcoming generation of computational systems, giving incomparable potential across varied businesses [5, 6]. These developments indicate the beginning of a new era in which the limits of computational competencies are continually extended.

Artificial intelligence and machine learning represent some of the most revolutionary advancements in contemporary computing, with rapidly maturing tools and frameworks accelerating their adoption across research and industry [8]. AI systems, especially those utilizing deep learning algorithms, can analyze extensive datasets, identify patterns, and make decisions with exceptional accuracy—capabilities that have proven particularly valuable in domains such as multi-source sensor data fusion, where ML and AI methods enable more reliable pattern recognition and situational awareness [7]. Industries,

Citation

Ullah, I. (2024). Revolutionizing Industries: The Transformative Role of Advanced Computing and Systems. *ICCK Transactions on Advanced Computing and Systems*, 1(1), 1–4.



© 2024 by the Author. Published by Institute of Central Computation and Knowledge. This is an open access article under the CC BY license (<https://creativecommons.org/licenses/by/4.0/>).

including healthcare, finance, and manufacturing, are currently reaping the advantages of these innovations. AI-driven systems in healthcare are enhancing diagnostics, personalizing treatment plans, and optimizing hospital workflows [9]. AI-driven medical imaging systems can identify diseases like cancer at earlier stages than conventional techniques. Nevertheless, the deployment of AI in high-stakes domains such as healthcare also demands rigorous attention to algorithmic bias and fairness, particularly in reinforcement learning-based clinical applications [10]. In finance, artificial intelligence enhances risk assessments and fraud identification; similarly, AI-driven anomaly detection methods have been applied to IoT environments to identify intrusion and security threats in real time [12]. In manufacturing, AI-driven predictive maintenance ensures that machinery is serviced prior to failure, thereby reducing downtime and enhancing operational effectiveness [11].

In addition to AI, quantum computing has the potential to deal with these issues that traditional computers are incapable of handling now [13, 14]. Quantum computers use qubits, which can represent multiple states simultaneously, to perform calculations at unprecedented speeds by leveraging the principles of quantum physics. In areas like complicated simulations, material science, and cryptography, this finding is particularly fascinating. For example, quantum computers could meaningfully increase the security and speed of encryption approaches, refining the security of data transmission [15]. Moreover, by mimicking molecular structures and reactions that are computationally demanding for traditional computers, quantum computing has the potential to speed up drug discovery. Quantum computing has many potential uses and is on the verge of revolutionizing industries, even if it is still in the experimental stage.

Another development that is changing the face of advanced computing is edge computing [16–19]. The requirement for rapid and effective data processing is growing along with the number of IoT devices. Large amounts of data are sent to centralized servers for processing in traditional cloud computing models, which may cause latency complications. This is addressed by edge computing, which processes data together on edge servers or the devices themselves, closer to where it is created. This technique cuts down on decision-making time, which is significant for applications like smart cities, real-time analytics, and driverless cars. For example, edge computing

makes it possible to screen energy use and control traffic more rapidly in smart cities, which helps create more sustainable urban surroundings. The necessity for more dispersed, receptive computing systems will grow as the Internet of Things (IoT) spreads, and the aptitude to compute at the edge becomes more vital.

Finally, these advances in computers have important social and ethical implications in addition to their impact across various industries [20]. Data privacy, algorithmic bias, and digital fairness have become major challenges as reliance on AI, quantum computing, and edge systems continues to grow [21–23]. Because algorithmic decisions have the potential to directly affect individual lives, ensuring transparency and accountability is essential when applying AI in sensitive areas such as healthcare and criminal justice. Likewise, there are significant concerns regarding cybersecurity and the protection of sensitive data, especially given the potential of quantum computing to compromise current encryption standards. It is indispensable to address the ethical and societal challenges posed by these transformative technologies. To ensure that the benefits of these technologies are distributed fairly and that they contribute positively to society, it is necessary to develop frameworks that support their responsible, equitable, and secure implementation.

2 Challenges and Ethical Considerations

Advancements in computing systems present considerable potential, yet they also pose substantial challenges, particularly regarding security, privacy, and moral responsibility. The rising dependency on data and networked technologies has made cybersecurity a supreme issue. As computing systems develop, so do the approaches to exploitation and cyberattacks. The protection of personal data and intellectual property is increasingly critical.

Moreover, the rapid advancement of technology presents ethical dilemmas. Artificial intelligence and machine learning systems are increasingly utilized in decision-making capacities, prompting inquiries regarding transparency, accountability, and equity. It is essential to create frameworks that address these issues, ensuring that the benefits of these technologies are accessible, equitable, and sustainable.

This journal seeks to engage in meaningful discourse around these challenges, with the aim of evolving responsible, secure, and inclusive computing systems that endorse social well-being.

3 Content and Directions

To align with the intended mission of this publication, the primary areas of research interest include the following:

- **Emerging Technologies:** Investigating the role of AI, quantum computing, machine learning, cloud computing, and edge computing in advancing computing systems.
- **System Design and Optimization:** Exploring innovative architectures and techniques for optimizing performance, scalability, and efficiency in computing systems.
- **Security and Privacy:** Focusing on advanced methods for securing computing systems and protecting sensitive data in a highly interconnected world.
- **Interdisciplinary Applications:** Encouraging research that integrates computing with other fields such as healthcare, environmental science, and smart cities to address global challenges.
- **Ethical and Societal Impacts:** Addressing the ethical, social, and environmental implications of emerging technologies and their societal impacts.

4 Call for Contributions

Researchers, business leaders, and policymakers are encouraged to submit original research articles, reviews, and editorials that contribute to the advancement of knowledge in the field of advanced computing and systems. A rigorous peer-review process will be implemented to uphold the highest standards of academic integrity and to ensure that the published work has a meaningful impact on the discipline.

5 Commitment to Quality

The editorial board consists of experts committed to preserving the journal's capacity and integrity. Every submission is closely examined to ensure that it meets our requirements for originality, importance, and thoroughness.

6 Vision for the Future

In the future, the aim is to expand the journal's scope to encompass emerging topics, interdisciplinary approaches, and guest-curated special issues. The objective is to foster a dynamic community of

professionals and researchers dedicated to advancing the frontiers of advanced computing and systems.

Data Availability Statement

Not applicable.

Funding

This work was supported without any funding.

Conflicts of Interest

The author is the Editor-in-Chief of *ICCK Transactions on Advanced Computing and Systems*. This Inaugural Editorial was not externally peer reviewed and was accepted directly by the publisher. The Editor-in-Chief was not involved in the handling or decision-making of this manuscript.

Ethical Approval and Consent to Participate

Not applicable.

References

- [1] Zhu, S., Yu, T., Xu, T., Chen, H., Dustdar, S., Gigan, S., ... & Pan, Y. (2023). Intelligent computing: the latest advances, challenges, and future. *Intelligent Computing*, 2, 0006. [CrossRef]
- [2] Gill, S. S., Xu, M., Ottaviani, C., Patros, P., Bahsoon, R., Shaghaghi, A., ... & Uhlig, S. (2022). AI for next generation computing: Emerging trends and future directions. *Internet of Things*, 19, 100514. [CrossRef]
- [3] Ke, M., Gao, Z., Huang, Y., Ding, G., Ng, D. W. K., Wu, Q., & Zhang, J. (2021). An edge computing paradigm for massive IoT connectivity over high-altitude platform networks. *IEEE Wireless Communications*, 28(5), 102-109. [CrossRef]
- [4] Awaysheh, F. M., Alazab, M., Garg, S., Niyato, D., & Verikoukis, C. (2021). Big data resource management & networks: Taxonomy, survey, and future directions. *IEEE Communications Surveys & Tutorials* 23(4), 2098-2130. [CrossRef]
- [5] Sarker, I. H. (2021). Deep learning: a comprehensive overview on techniques, taxonomy, applications and research directions. *SN computer science*, 2(6), 1-20. [CrossRef]
- [6] Sarker, I. H. (2022). AI-based modeling: techniques, applications and research issues towards automation, intelligent and smart systems. *SN computer science*, 3(2), 158. [CrossRef]
- [7] Blasch, E., Pham, T., Chong, C. Y., Koch, W., Leung, H., Braines, D., & Abdelzaher, T. (2021). Machine learning/artificial intelligence for sensor data fusion—opportunities and challenges. *IEEE aerospace and electronic systems magazine*, 36(7), 80-93. [CrossRef]

- [8] Raschka, S., Patterson, J., & Nolet, C. (2020). Machine learning in python: Main developments and technology trends in data science, machine learning, and artificial intelligence. *Information*, 11(4), 193. [CrossRef]
- [9] Kapoor, N., Lacson, R., & Khorasani, R. (2020). Workflow applications of artificial intelligence in radiology and an overview of available tools. *Journal of the American College of Radiology*, 17(11), 1363-1370. [CrossRef]
- [10] Smith, B., Khojandi, A., & Vasudevan, R. (2023). Bias in reinforcement learning: A review in healthcare applications. *ACM Computing Surveys*, 56(2), 1-17. [CrossRef]
- [11] Lee, W. J., Wu, H., Yun, H., Kim, H., Jun, M. B., & Sutherland, J. W. (2019). Predictive maintenance of machine tool systems using artificial intelligence techniques applied to machine condition data. *Procedia Cirp*, 80, 506-511. [CrossRef]
- [12] Xu, H., Sun, Z., Cao, Y., & Bilal, H. (2023). A data-driven approach for intrusion and anomaly detection using automated machine learning for the Internet of Things. *Soft Computing*, 27(19), 14469-14481. [CrossRef]
- [13] Awan, U., Hannola, L., Tandon, A., Goyal, R. K., & Dhir, A. (2022). Quantum computing challenges in the software industry. A fuzzy AHP-based approach. *Information and Software Technology*, 147, 106896. [CrossRef]
- [14] Yang, Z., Zolanvari, M., & Jain, R. (2023). A survey of important issues in quantum computing and communications. *IEEE Communications Surveys & Tutorials*, 25(2), 1059-1094. [CrossRef]
- [15] Bova, F., Goldfarb, A., & Melko, R. G. (2021). Commercial applications of quantum computing. *EPJ quantum technology*, 8(1), 2. [CrossRef]
- [16] Kong, X., Wu, Y., Wang, H., & Xia, F. (2022). Edge computing for internet of everything: A survey. *IEEE Internet of Things Journal*, 9(23), 23472-23485. [CrossRef]
- [17] Carvalho, G., Cabral, B., Pereira, V., & Bernardino, J. (2021). Edge computing: current trends, research challenges and future directions. *Computing*, 103(5), 993-1023. [CrossRef]
- [18] Khan, L. U., Yaqoob, I., Tran, N. H., Kazmi, S. A., Dang, T. N., & Hong, C. S. (2020). Edge-computing-enabled smart cities: A comprehensive survey. *IEEE Internet of Things journal*, 7(10), 10200-10232. [CrossRef]
- [19] Qiu, T., Chi, J., Zhou, X., Ning, Z., Atiquzzaman, M., & Wu, D. O. (2020). Edge computing in industrial internet of things: Architecture, advances and challenges. *IEEE Communications Surveys & Tutorials*, 22(4), 2462-2488. [CrossRef]
- [20] Kling, R. (Ed.). (1996). *Computerization and controversy: Value conflicts and social choices*. Elsevier.
- [21] Mendoza, C., & Herrera, J. (2023). Enhancing Security and Privacy in Advanced Computing Systems: A Comprehensive Analysis. *Journal of Advanced Computing Systems*, 3(12), 1-9. <https://scipublication.com/index.php/JACS/article/view/39>
- [22] Kordzadeh, N., & Ghasemaghahi, M. (2022). Algorithmic bias: review, synthesis, and future research directions. *European Journal of Information Systems*, 31(3), 388-409. [CrossRef]
- [23] Pessach, D., & Shmueli, E. (2022). A review on fairness in machine learning. *ACM Computing Surveys (CSUR)*, 55(3), 1-44. [CrossRef]



Inam Ullah received a B.Sc. degree in Electrical Engineering (Telecommunication) from the Department of Electrical Engineering, University of Science and Technology Bannu (USTB), KPK, Pakistan, in 2016 and a Master's and Ph.D. degree in Information and Communication Engineering from the College of Internet of Things (IoT) Engineering, Hohai University (HHU), Changzhou Campus, 213022, China, in 2018 and 2022, respectively.

He completed his postdoc with Brain Korea 2021 (BK21) at the Chungbuk Information Technology Education and Research Center, Chungbuk National University, Cheongju 28644, S Korea, in March 2023. He is an Assistant Professor at the Department of Computer Engineering, Gachon University, S Korea. His research interests include Robotics, the Internet of Things (IoT), Wireless Sensor Networks (WSNs), Underwater Communication and Localization, Underwater Sensor Networks (USNs), Artificial Intelligence (AI), Big data, Deep learning, etc. He has authored over 130 peer-reviewed articles on various research topics and five books as an editor. He is a TPC member of ACM RACS 2023, Poland, August 2023, and IEEE ICC'24-SAC-10, Denver, CO, USA, 2024, IIoTBDSC 2024, Wuhan, China & Birmingham, UK, ICTIST 2024. He serves as an Associate Editor of ICCK Transactions on Intelligent Systematics, International Journal of Biomedical & Bioinformatics Technology, ICCK Transactions on Data Augmentation, ICCK Transactions on Emerging Topics in Artificial Intelligence, and Guest Editor for various journals such as Computers in Human Behavior, Sensors, Electronics, Journal of Marine Science and Engineering, Frontiers in Sensors, Artificial Intelligence and Applications, etc. Moreover, he serves as an Editorial board member for Computers, Materials & Continua (CMC), World Journal of Artificial Intelligence and Robotics Research, Computing and Artificial Intelligence, Journal of Artificial Intelligence and Robotics, Frontiers in Medical Engineering, Journal of Computer and Creative Technology, and so on. He is the reviewer of many prominent journals, including IEEE Transactions on Industrial Informatics KSII Transactions on Internet & Information Systems, IEEE Transactions on Vehicular Technology, IEEE Transactions on Intelligent Transportation Systems, Transactions on Sustainable Computing, IEEE ACCESS, Sustainable Energy Technologies and Assessments, Future Generation Computer Systems (FGCS), Computers and Electrical Engineering (Elsevier), Internet of Things (IoT) Journal, Digital Communications & Networks (Elsevier), Springer Nature, Wireless Communication & Mobile Computing (WCMC), Alexandria Engineering Journal Sensors, Electronics, Remote Sensing, Applied Sciences, Computational Intelligence and Neurosciences, etc. (Email: inam@gachon.ac.kr)