

# Embedded AI and IoT: Transforming Intelligent Systems for Real-Time Adaptation and Decision-Making

**Eralba Spahija, Resilda Rajta, Xhulia Palaj**

University of Shkodra “Luigj Gurakuqi”

Department of Informatics

Sheshi 2 Prilli 24, Shkodër

eralbaspahija@gmail.com

resildarajta@gmail.com

palajxhulia13@gmail.com

**Imelda Zadeja**

University of Shkodra “Luigj Gurakuqi”

Department of Informatics

Sheshi 2 Prilli 24, Shkodër

imelda.zadeja@gmail.com

**Abstract.** *Embedded Artificial Intelligence (EAI) and the Internet of Things (IoT) are two distinct yet complementary technologies that are significantly shaping the future of intelligent systems. EAI enhances IoT devices by enabling autonomous data processing, decision-making, and environmental adaptation. By integrating AI algorithms directly into IoT devices, EAI facilitates real-time data analysis and intelligent decision-making at the edge, thus reducing reliance on cloud connectivity and enhancing latency, privacy, and efficiency. This convergence, commonly known as AIoT, cover the way for the creation of more intelligent, autonomous, and adaptive systems capable of sensing, learning, and responding to dynamic conditions in real-time. The benefits of EAI include real-time processing, cost savings, enhanced privacy and data security, and design flexibility. Nonetheless, the integration of EAI and IoT includes challenges such as ensuring data privacy and security, managing the complexity of large-scale IoT networks, and acquiring the specialized skills and knowledge necessary for designing and deploying these advanced systems. As EAI and IoT continue to evolve, their convergence is expected to have extensive implications across various industries, including healthcare, transportation, agriculture, and energy management. The future of EAI and IoT is one of increasing synergy, driving innovation and transforming the way we interact with the world around us.*

**Keywords.** internet of things (IoT), intelligent systems, real-time processing, AI applications, IoT devices

## References

- Tien, J.M. *Internet of Things, Real-Time Decision Making, and Artificial Intelligence*. *Ann. Data. Sci.* 4, 149–178 (2017). <https://doi.org/10.1007/s40745-017-0112-5>
- Andronie, M.; Lăzăroiu, G.; Iatagan, M.; Uță, C.; Ștefănescu, R.; Cocoșatu, M. *Artificial Intelligence-Based Decision-Making Algorithms, Internet of Things Sensing Networks, and Deep Learning-Assisted Smart Process Management in Cyber-Physical Production Systems*. *Electronics* 2021, 10, 2497. <https://doi.org/10.3390/electronics10202497>
- Tien, J.M. *Convergence to real-time decision making*. *Front. Eng. Manag.* 7, 204–222 (2020). <https://doi.org/10.1007/s42524-019-0040-5>
- Zhang, Z.; Li, J. *A Review of Artificial Intelligence in Embedded Systems*. *Micromachines* 2023, 14, 897. <https://doi.org/10.3390/mi14050897>
- L. Ye et al., "The Challenges and Emerging Technologies for Low-Power Artificial Intelligence IoT Systems," in *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 68, no. 12, pp. 4821-4834, Dec. 2021, doi: 10.1109/TCSI.2021.3095622.