Edge Deep Learning for Smart Energy Applications

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The Internet of Energy (IoE) paradigm is an advancing area of research concerning the fusion of smart technology and energy efficiency [1], combing data collection, processing, and visualization. Smart energy monitoring witnesses technological advancements such as smart metering and IoE networking, allowing the expansion of smart energy networks in a smart house. In this research, we aim to understand energy behavior through big data collection and classification and improve energy efficiency using behavioral economics, deep learning-based recommender systems, and intuitive data visualizations. In specific, a specialized case study is reported on the ODROID XU4 platform [3], and a setup developed at De Montfort University (DMU) at the Energy Lab and AI Lab, it is aimed to build a novel appliance level dataset with contextual ambient environmental data. As a novel advancement in the field, the ODROID performs edge deep learning computations on the collected data, to clean it, summarize it, anonymize it, and classification, it transmits it to a cloud server for further deep processing and storage. Concluding, the proposed work provides aids in exploiting energy-efficiency technologies for improving energy efficiency via an innovative, automated energy efficiency deep learning engine.

Keywords: Edge computing, energy efficiency, artificial intelligence, deep learning, internet of things, internet of energy.

References

[1] C. Xia, W. Li, X. Chang, F. C. Delicato, T. Yang, and A. Y. Zomaya, "Edge-based Energy Management for Smart Homes," in *2018 IEEE 16th Intl Conf on Dependable, Autonomic and Secure Computing, 16th Intl Conf on Pervasive Intelligence and Computing, 4th Intl Conf on Big Data Intelligence and Computing and Cyber Science and Technology Congress(DASC/PiCom/DataCom/CyberSciTech)*, Aug. 2018, pp. 849–856. doi: 10.1109/DASC/PiCom/DataCom/CyberSciTec.2018.00-19.

[2] D. Ürge-Vorsatz, L. F. Cabeza, S. Serrano, C. Barreneche, and K. Petrichenko, "Heating and cooling energy trends and drivers in buildings," *Renewable and Sustainable Energy Reviews*, vol. 41, pp. 85–98, Jan. 2015, doi: 10.1016/j.rser.2014.08.039.

[3] S. L. Fernandes and G. J. Bala, "ODROID XU4 based implementation of decision level fusion approach for matching computer generated sketches," *Journal of Computational Science*, vol. 16, pp. 217–224, Sep. 2016, doi: 10.1016/j.jocs.2016.07.013.