Distributed Machine Learning over Wireless Sensor Networks

(Keynote Abstract)

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Abstract—In Japan, Society 5.0 has been promoted by the government, which highly integrated cyber space and physical space to realize better and sophisticated societies, communities, industry and economy. Toward Society 5.0, ubiquitous and pervasive computing systems based on IoT technologies will play more significant roles. Especially for context/situation- awareness, wireless sensor nodes become tinier and more energy-efficient, and they will be embedded into our living space and environment. As the number of such sensors increases, the amount of information which they sense will also increase for higher level of context recognition and understanding of real-world objects and phenomena. Accordingly, the data analysis is conducted in remote locations (e.g. cloud servers) and the data collection cost might be a primary issue. In addition, data processing cost would not be ignorable as machine learning generally incurs significant workload at the cloud servers. To cope with the issue, in this talk, we introduce a unique approach to train and run neural networks inside wireless sensor networks. We conducted two experiments using real data; one is for anomaly detection of temperature in an over-1,400 square meters lounge space using 50 temperature sensors to confirm the learning capability as well as communication overhead, and another is for activity recognition using an array of thin-, energy-efficient film-type infra-red sensors with micro-processors to demonstrate our concept.

SPEAKER'S BIOGRAPHY

Hirozumi Yamaguchi received the B.E., M.E., and Ph.D. degrees in information and computer science from Osaka University, Osaka, Japan in 1994, 1996 and 1998, respectively. He is currently an associate professor at Osaka University. He has been working in mobile and pervasive computing and networking research areas and has published papers in top-quality journals and conferences. He has served on EAI Mobiquitous 2016 as a TPC co-chair, IEEE PerCom 2019 as a TPC vice co-chair, and many IEEE conferences as technical committee members. He was awarded Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology in 2018.