Call for Contributions to Special Issue on
Machine Intelligence at the Edge

Aim and Scope:

Recent years have seen widespread application of machine learning (ML) to a diverse range of industries and problem domains. By taking advantage of the availability of massive amounts of data and scalable compute resources, ML methods --- including linear models (e.g., SVMs, logistic regression), decision trees (e.g., XGBoost, lightGBM), and deep neural networks (e.g., CNNs and RNNs) --- are able to outperform traditional hand-tuned models on today's large-scale AI tasks. Due to their compute-intensive nature, machine learning systems are typically deployed on clusters of CPUs/GPUs in public or private clouds. However, the success of ML in sensing applications such as object detection and speech recognition has also driven a demand for such technology (both training and inference) in edge settings, for applications such as autonomous vehicles, mobile devices, and embedded/IoT systems. Unfortunately, most existing ML models, hardware, and frameworks are tailored towards a server environment and are ill-equipped for edge computing.

Bringing ML to today's emerging edge applications involves tackling a diverse set of challenges. To give just a few examples: power and energy requirements for mobile, strict latency constraints for autonomous vehicles, security concerns of model/data transmission for IoT, and intermittent operation for embedded sensors. State-of-the-art ML systems in industry today already use custom frameworks, algorithms, and hardware built for a server infrastructure. Addressing the unique challenges of ML at the edge will similarly require specialization, co-design, and integration of domain knowledge for the edge across the computing stack.

Topics of Interest:

This special issue of IEEE Design and Test calls for novel research on machine learning models, hardware architectures, programming tools, and design methodologies for ML at the Edge. Topics of interest include but not limited to:

- Novel ML algorithms co-designed for computing and/or learning at the edge
- Techniques to compress and/or exploit redundancy in existing ML models
- Methodologies to design and test intelligent edge systems, with emphasis on power, latency, and security requirements
- Constraint-aware compilers and tools for mapping ML applications to edge devices
- Efficient hardware architectures for ML algorithms

- Benchmarking ML workloads and/or frameworks on the edge, including accuracy, performance, power and energy etc.
- Comparison studies of different devices (GPUs, ASICs, FPGAs, etc) and architectures (systolic arrays, sparse vs. dense, etc) for the edge
- Hierarchical and distributed approaches to enable edge ML

The special issue particularly welcomes and encourages the submissions from industry or collaborative works between industry and academia for this fast growing area.

Submission Guidelines:
Prospective authors should follow the submission guidelines for IEEE Design & Test. All manuscripts must be submitted electronically to IEEE Manuscript Central at https://mc.manuscriptcentral.com/dandt. Indicate that you are submitting your article to the special issue on Machine Intelligence at the Edge. Submitted manuscripts must not have been previously published or currently submitted for publication elsewhere.

Manuscripts must not exceed 5,000 words, including figures (with each average-size figure counting as 200 words) and a maximum of 12 references (50 for surveys). This amounts to about 4,000 words of text and a maximum of five small to medium figures. Accepted articles will be edited for clarity, structure, conciseness, grammar, passive to active voice, logical organization, readability, and adherence to style. Please see IEEE Design & Test Author Resources for links to Submission Guidelines Basics and Electronic Submission Guidelines and requirements**.**

Schedule:
Manuscript submissions due: Feb. 1, 2019
First round of reviews completed: Apr. 1, 2019
Revised manuscripts due: May 16, 2019
Second round of reviews completed: July 1, 2019
Final manuscripts due: Aug. 1, 2019

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