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Title: Scalable ML Architectures for Real-time Energy-efficient Computing

Abstract:
Technological advancements have led to a proliferation machine learning systems to assist humans in a wide range of tasks. However, we are still far from accurate, reliable, and resource-efficient operations for many of these systems. Despite the strengths of convolutional neural networks (CNNs) for object recognition, these discriminative techniques have several shortcomings that leave them vulnerable to exploitation from adversaries. In addition, the computational cost incurred to train these discriminative models can be quite significant. Discriminative-generative approaches offers a promising avenue for robust perception and action. Such methods combine inference by deep learning with sampling and probabilistic inference models to achieve robust and adaptive understanding. Our focus is now on implementing a scalable, computationally efficient generative inference stage that can achieve real-time results in an energy efficient manner. In this talk, I will present our work on Generative Robust Inference and Perception (GRIP), a discriminative-generative approach for pose estimation that offers high accuracy especially in unstructured and adversarial environments. I will then describe our hardware implementation of this algorithm to obtain real-time performance with high energy-efficiency and its implications for future directions in designing scalable and efficient ML algorithms.

Bio:

R. Iris Bahar received the B.S. and M.S. degrees in computer engineering from the University of Illinois, Urbana-Champaign, and the Ph.D. degree in electrical and computer engineering from the University of Colorado, Boulder. She has been on the faculty at Brown University since 1996 and now holds a dual appointment as Professor of Engineering and Professor of Computer Science. Her research interests have centered on energy-efficient and reliable computing, from the system level to device level. Most recently, this includes the design of robotic systems. She served as the Program Chair and General Chair of the International Conference on Computer-Aided Design (ICCAD) in 2017, 2018 respectively and the General Chair of the International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) in 2019. She is the 2019 recipient of the Marie R. Pistilli Women in Engineering Achievement Award and the Brown University School of Engineering Award for Excellence in Teaching in Engineering. More information out Prof. Bahar can be found at http://cs.brown.edu/people/irisbahar