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Deming Chen portrait photo

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Design productivity, compilation and acceleration for data analytic applications

Deep Neural Networks (DNNs) are computation intensive. Without efficient hardware implementations of DNNs, many promising AI applications will not be practically realizable. In this talk, we will analyze several challenges facing the AI community for mapping DNNs to hardware accelerators. Especially, we will evaluate FPGA's potential role in accelerating DNNs for both the cloud and edge devices. Although FPGAs can provide desirable customized hardware solutions, they are difficult to program and optimize. We will present a series of effective design techniques for implementing DNNs on FPGAs with high performance and energy efficiency. These include automated hardware/software co-design, the use of configurable DNN IPs, resource allocation across DNN layers, smart pipeline scheduling, Winograd and FFT techniques and DNN reduction and re-training. We showcase several design solutions including Long-term Recurrent Convolution Network (LRCN) for video captioning, Inception module (GoogleNet) for face recognition, as well as Long Short-Term Memory (LSTM) for sound recognition. We will also present some of our recent work on developing new DNN models and data structures for achieving higher accuracy for several interesting applications such as crowd counting, genomics and music synthesis.

Biography

Deming Chen obtained his BS in computer science from University of Pittsburgh, in 1995, MS and PhD in computer science from University of California in 2001 and 2005 respectively. He joined University of Illinois at Urbana-Champaign (UIUC) in 2005 and worked as professor till 2015. He is a technical committee member for a series of top conferences and symposia on EDA, FPGA, low-power design and VLSI systems design. He is an associated editor for several leading IEEE and ACM journals. He received the NSF CAREER Award in 2008, the ACM SIGDA Outstanding New Faculty Award in 2010 and IBM Faculty Award in 2014 and 2015. He also received seven Best Paper Awards and the First Place Winner Award of DAC International Hardware Contest on IoT in 2017. He is included in the List of Teachers Ranked as Excellent in 2008 and 2017. He was involved in two startup companies previously, which were both acquired. In 2016, he co-founded a new startup, Inspirit IoT, Inc., for design and synthesis for machine learning applications targeting the IoT industry. He is the Donald Biggar Willett Faculty Scholar of College of Engineering of UIUC.

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