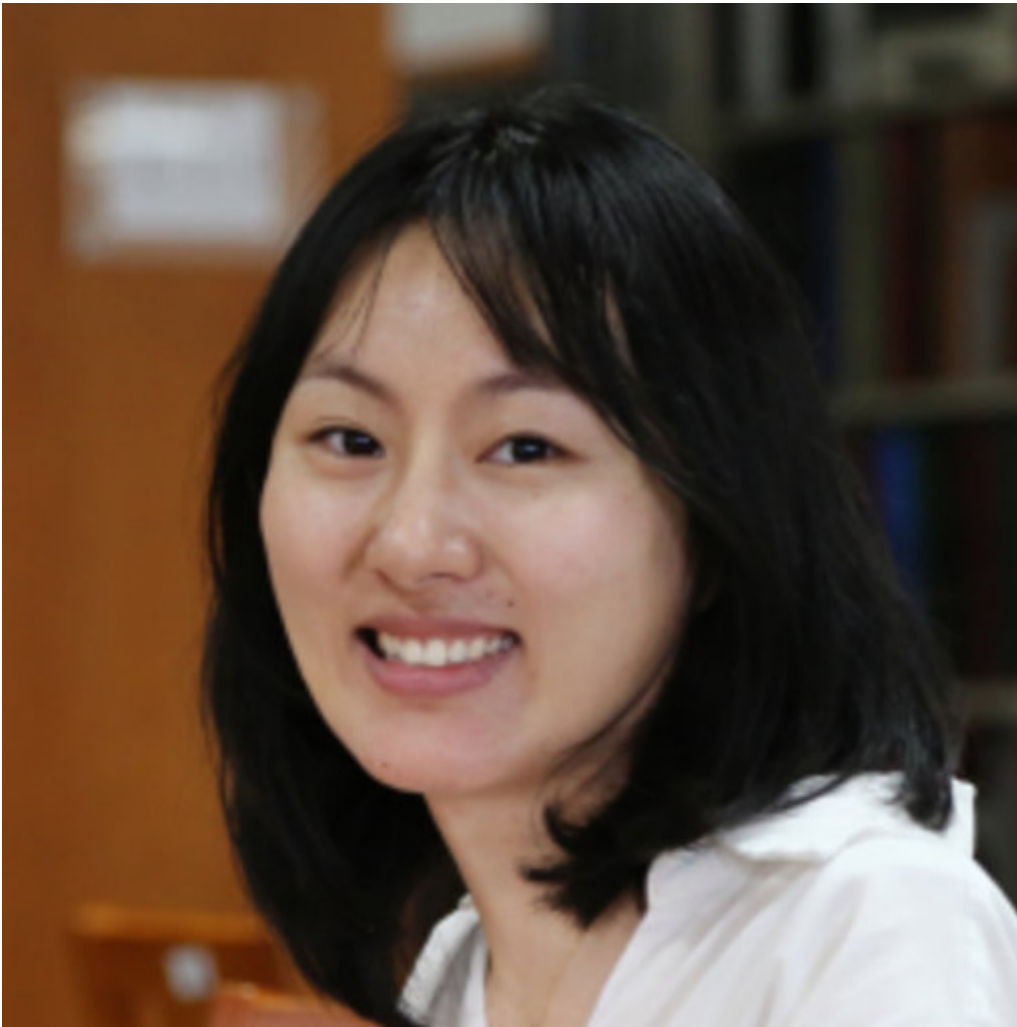


SORS/WomenInBSC: "Sparse linear solver for transistor-level circuit simulation"

Objectives

Abstract:

Sparse linear solvers play a crucial role in transistor-level circuit simulation, especially for large-scale post-layout circuit simulation when considering parasitic effects. Along with the fast development of semiconductor, integrated circuit sizes are continually expanding, causing sparse linear solvers to consume more time and memory resources. Furthermore, circuit matrices frequently exhibit high sparsity and non-uniform distributions of non-zero elements, compounding the challenge of achieving efficient acceleration. In this talk, I will introduce our recently developed high-performance open-source sparse direct solvers for circuit simulation on CPU, GPU, and distributed heterogeneous clusters, respectively. Several innovative algorithms will be presented, including strategies for harnessing machine learning techniques to address irregular sparsity distribution patterns in circuit matrices for enhanced computational speed, as well as methods that embrace synchronization-free concepts to design GPU and heterogeneous distributed cluster acceleration mechanisms, thereby harnessing the substantial parallel computing capabilities. Moreover, I will also introduce an iterative solver leveraging an efficient spectral graph sparsification algorithm to enable fast power grid simulation. Compared with conventional spectral graph sparsification algorithm, our method demonstrates high efficiency while maintain high accuracy.



Short Bio:

Zhou Jin is an Associate Professor at China University of Petroleum, Beijing. She obtained her Bachelor's degree from Nanjing University in 2010, followed by her Master's and Ph.D. degrees from Waseda University, Japan, in 2012 and 2015, respectively. With expertise in Electronic Design Automation (EDA) for integrated circuits, her research focuses on AI-driven and hardware acceleration techniques for VLSI nonlinear circuit simulation, as well as the hardware-software co-design for linear algebra. She has published over 40 papers in top-tier international conferences and journals such as DAC, SC, PPOPP, TCAD, TODAES, TCAS-II, IPDPS and ASP-DAC, etc. She received the Best Paper Award at SC'23, Honorable Mentioned Paper Award at ISEDA'23, EDA2 Youth Science and Technology Award, Young Elite Scientists Sponsorship Program by BAST and the IEE Japan Kyushu Branch Award, etc. She also actively engages with the academic community by serving as a Technical Program Committee (TPC) member for conferences like DAC, SC, Cluster, ICPP, and as a reviewer for esteemed journals including TCAD, TODAES, TVLSI, and TCAS-II, etc.

Speakers

Speaker: Zhou Jin. Associate Professor in Computer Science, China University of Petroleum-Beijing.

Host: Marc Casas. Leading researcher -Software research and development vehicles for New ARchitectures (SONAR), Computer Sciences, BSC.

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