2023 ACM/IEEE 5th Workshop on Machine Learning for CAD (MLCAD 2023)

Snowbird, Utah, USA 10-13 September 2023



IEEE Catalog Number: ISBN: CFP23V28-POD 979-8-3503-0956-0

Copyright © 2023 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number:	CFP23V28-POD
ISBN (Print-On-Demand):	979-8-3503-0956-0
ISBN (Online):	979-8-3503-0955-3

Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400 Fax: (845) 758-2633 E-mail: curran@proceedings.com Web: www.proceedings.com



Keynote 1:

Analog Synthesis 3.0: AI/ML to Synthesize and Test Analog ICs: Hope or Hype?.....1 Georges Gielen - KU Leuven

Session 1: LLMs and GNNs for EDA

- Chip-Chat: Challenges and Opportunities in Conversational Hardware Design.......2 Jason Blocklove, Siddharth Garg, Ramesh Karri - New York University Hammond Pearce - University of New South Wales
- ChatEDA: A Large Language Model Powered Autonomous Agent for EDA........8 Zhuolun He - The Chinese University of Hong Kong Haoyuan Wu - Shanghai Artificial Intelligent Laboratory Xinyun Zhang, Xufeng Yao, Su Zheng - The Chinese University of Hong Kong Haisheng Zheng - Shanghai Artificial Intelligent Laboratory Bei Yu - The Chinese University of Hong Kong
- Characterize the Ability of GNNs in Attacking Logic Locking......14 Wei Li, Ruben Purdy, Jose Moura, Shawn Blanton - Carnegie Mellon University

Session 2: Early Prediction of Circuit Performance using ML

- ASAP: Accurate Synthesis Analysis and Prediction with Multi-Task Learning.......20 Yikang Ouyang - The Hong Kong University of Science and Technology (Guangzhou) Sicheng Li - Alibaba Group Dongsheng Zuo, Hanwei Fan, Yuzhe Ma - The Hong Kong University of Science and Technology (Guangzhou)
- Using Graph Neural Networks for Timing Estimations of RTL Intermediate Representations......26
 Daniela Sanchez Lopera, Ishwor Subedi, Wolfgang Ecker - Infineon Technologies AG

Prianka Sengupta, Aakash Tyagi - Texas A&M University Yiran Chen - Duke University Jiang Hu - Texas A&M University

Session 3: MLCAD Infrastructure and Industry Application

- Optimizing Constrained Random Verification with ML and Bayesian Estimation......45 Bhuvnesh Kumar, Ganapathy Parthasarathy, Saurav Nanda, Sridhar Rajakumar -Synopsys Inc.

Session 4: ML for Analog Design

- MMM: Machine Learning-Based Macro-Modeling for Linear Analog ICs and ADC/DACs......51 Yishuang Lin, Yaguang Li - Texas A&M University Meghna Madhusudan, Sachin Sapatnekar, Ramesh Harjani - University of Minnesota Jiang Hu - Texas A&M University
- Hybrid Utilization of Subgraph Isomorphism and Relational Graph Convolutional Networks for Analog Functional Grouping Annotation.......57
 Zhengfeng Wu - Drexel University
 Isabel Song - University of Pennsylvania
 Ioannis Savidis - Drexel University
- Differentiable Neural Network Surrogate Models for gm/ID-based Analog IC Sizing Optimization.......63
 Yannick Uhlmann, Till Moldenhauer, Jürgen Scheible - Reutlingen University
- Machine Learning-based Fast Circuit Simulation for Analog Circuit Array.......69 Jaeseung Lee, Sejin Park, Minhyuk Kweon, Seokhyeong Kang - Pohang University of Science and Technology

Keynote 2 ML-augmented Simulation and Co-optimization for Semiconductor Applications and Design Workflows........75 Norman Chang - ANSYS, Inc.

Session 5: International MLCAD Activities

- (Invited) ML-TCAD: Perspectives and Challenges on Accelerating Transistor Modeling using ML......79
 Rodion Novkin, Simon Thomann, Hussam Amrouch - Technical University of Munich

Session 6: ML for Verification

Guangyu Hu, Wei Zhang - The Hong Kong University of Science and Technology Hongce Zhang - The Hong Kong University of Science and Technology (Guangzhou)

Fin Amin, Soumyadeep Chatterjee, Paul Franzon - North Carolina State University

ConVERTS: Contrastively Learning Structurally InVariant Netlist Representations......95 Animesh Basak Chowdhury, Jitendra Bhandari, Luca Collini, Ramesh Karri - New York University Benjamin Tan - University of Calgary Siddharth Garg - New York University

Plenary 2 Machine Learning in EDA: When and How......101 Bei Yu - The Chinese University of Hong Kong

Session 7: ML for Routability

- Routability-Driven Power Distribution Network Synthesis with IR-Drop Budgeting......107 Wonjae Lee, Insu Cho, Gangmin Cho, Youngsoo Shin - Korea Advanced Institute of Science and Technology
- Simultaneous Clock Wire Sizing and Shield Insertion for Minimizing Routing Blockage.......113 Yoonsang Song, Gangmin Cho, Wonjae Lee, Youngsoo Shin - Korea Advanced Institute of Science and Technology

1st MLCAD Contest

The 2023 MLCAD FPGA Macro Placement Benchmark Design Suite and Contest Results.......125

Grigor Gasparyan, Amit Gupta - Advanced Micro Devices (AMD) Andrew B. Kahng – University of California San Diego (UCSD) Meghraj Kalase, Wuxi Li - Advanced Micro Devices (AMD) Bodhisatta Pramanik - University of California San Diego (UCSD) Ismail Bustany - Advanced Micro Devices (AMD)

Keynote 3

Bridging Divides: Unifying AI Architectures from Edge to Cloud......131 *Ivo Bolsens – Advanced Micro Devices (AMD)*