OSCAR 2023: The Second Workshop on Open-Source Computer Architecture Research

Pradip Bose
IBM Research
Yorktown Heights

Luca Carloni
Department of Computer Science
Columbia University in the City of New York

A workshop co-located with ISCA 2023 --- Orlando, Florida --- June 18, 2023

OSCAR 2023

- OSCAR 2023 is the second edition of a workshop aimed at fostering the community of researchers who are interested in developing and sharing open-source hardware and software for the design of next-generation computer architectures
- Organizers:
  - Pradip Bose (IBM)
  - Luca Carloni (Columbia University)

Why OSCAR?

- The Premise
  - We are in the age of heterogeneous computing. This heterogeneity brings new challenges to hardware designers as well as software programmers
  - Addressing many of these challenges requires collaborative and open-source research
- The Rationale
  - Many innovations are best evaluated in the context of complete system-level implementations, which go beyond traditional simulation methods
  - Most individual research groups do not have the resources to realize such implementations

Why OSCAR?

- The Goal
  - Bring together a community of researchers from academia, industry and government labs who are interested in open-source computer architectures
  - The recent past has seen significant progress in this direction, including contributing open-source hardware components, software tools, as well as integration platforms to simplify the realization of system prototypes with FPGA or ASIC technologies. The number of developers and users of these open-source artifacts has increased substantially
  - It is time to provide a venue that promotes the growth of this community and fosters its efforts!

Today's Program - 1

9:30-10:50: Session I – FPGA-Based Open-Source Innovations

1. **Khyati Kiyawat, Sergiu Mosanu, Mircea Stan and Kevin Skadron**
   Open-Source Processing-in-Memory Architecture Design through FPGA Emulation: A Case Study Modeling Sieve
2. **Allen Boston, Roman Gauchi and Pierre-Emmanuel Gaillardon**
   Programming Management Unit: Open-Source Core for Secure FPGA Bitstream Configuration
3. **Ang Li, Ting-Jung Chang, Fei Gao and David Wentzlaff**
   Open-Source FPGA on Silicon: Case Studies on PRGA, an Open-Source Framework for Building & Programming Custom FPGAs
4. **Javier Campos, Zhen Dong, Javier Duarte, Amir Gholaminejad, Michael Mahoney, Jovan Mitrevski and Nhan Tran**
   End-to-End Codesign of Hessian-Aware Quantized Neural Networks for FPGAs and ASICs
5. **Aman Arora and Lizy John**
   Koios: Open-Source Deep Learning Benchmarks for FPGA Research

11:00-11:20: Coffee Break

Today's Program - 2

11:20-12:40: Session II – Verification, Simulation and Co-Design

1. **Nuzhat Yamin, Dina Hussein and Ganapati Bhat**
   Towards Open Source Platforms for Wearable Health Monitoring
2. **Maximilian Bremer, Nirmalendu Patra, Tan Nguyen, Cy Chan and Dilip Vasudevan**
   Accelerating Open-Source Hardware Simulation Using Optimistic Parallel Discrete Event Simulation
3. **Yingjie Li, Alan Mishchenko and Cunxi Yu**
   Verilog-to-PyG: A Framework for Graph Learning and Argumentation on RTL Designs
4. **Jason Lowe-Power**
   Sustaining Research-Focused Open-Source Hardware Projects

12:40-14:00: Lunch

Today's Program - 3

14:00-15:20: Session III – Compilation & Design-Space Exploration

1. **Yuto Nishida, Sahil Bhatia, Shadaj Laddad, Hasan Genc, Sophia Shao and Alvin Cheung**
   Code Transpilation for Hardware Accelerators
2. **Cheng Tan, Nicolas Bohm Agostini, Ankur Limaye, Serena Curzel, Marco Minutoli, Vito Giovanni Castellana, Joseph Manzano, Ang Li and Antonino Tumeo**
   SO(DA)^2: Software Defined Architectures for Data Analytics
3. **Zhigang Wei, Aman Arora, Ruihao Li and Lizy John**
   ML4Accel: An Open-Source Dataset for ML-Guided Accelerator Design
4. **Giuseppe Maria Sarda, Nimish Shah, Debjyoti Bhattacharjee, Peter Debacker and Marian Verhelst**
   HW-Aware Mapping of Graph Neural Networks on RISC-V GPGPU: A Work-in-Progress

Today's Program - 4

15:20-16:20: Poster Session (with introductory lightning talks and coffee break)

1. **Stefan Huemer, Ahmad Sedigh Baroughi, Hadi Shahriar Shahhoseini and Nima Taherinejad**
   AxE: an ApproXimate-Exact MPSoC Platform
2. **Luca Collini, Joey Ah-Kiow, Christian Pilato, Ramesh Karri and Benjamin Tan**
   Identifying Security Concerns in IP Designs Generated by High-Level Synthesis
3. **Mircea Stan and Kevin Skadron**
   Twenty Years Later - HotSpot at 20
4. **Mattis Hasler**
   RoadRunner: A Modularized Hardware Design Management and EDA Tool Runner
5. **Yao Hsiao, Christopher Fletcher and Caroline Trippel**
   Formal Characterization of Hardware Transmitters
6. **Saranyu Chattopadhyay, Caroline Trippel, Clark Barrett and Subhasish Mitra**
   Generalized QED Pre-silicon Verification beyond Non-Interfering Hardware Accelerators

Today's Program - 5

16:20-17:40: Session IV – Accelerators & Memory Optimization

1. **Kavya Sreedhar, Mark Horowitz and Christopher Torng**
   A Fast Open-Source Extended GCD Accelerator
2. **Jerry Zhao, Seah Kim, Borivoje Nikolić, Krste Asanovic and Yakun Sophia Shao**
   An Open-source Framework for Virtualized and Disaggregated RISC-V Accelerators
3. **Yanwen Xu, Ang Li and Tyler Sorensen**
   Evaluating Shared Memory Heterogeneous Systems Using Traverse-Compute Workloads
4. **Kevin Yunchuan Jiang, Joseph Zuckerman and Luca P. Carloni**
   Pipelining an Open-Source Last-Level Cache

17:40-18:00: All-Hands Discussion and Concluding Remarks

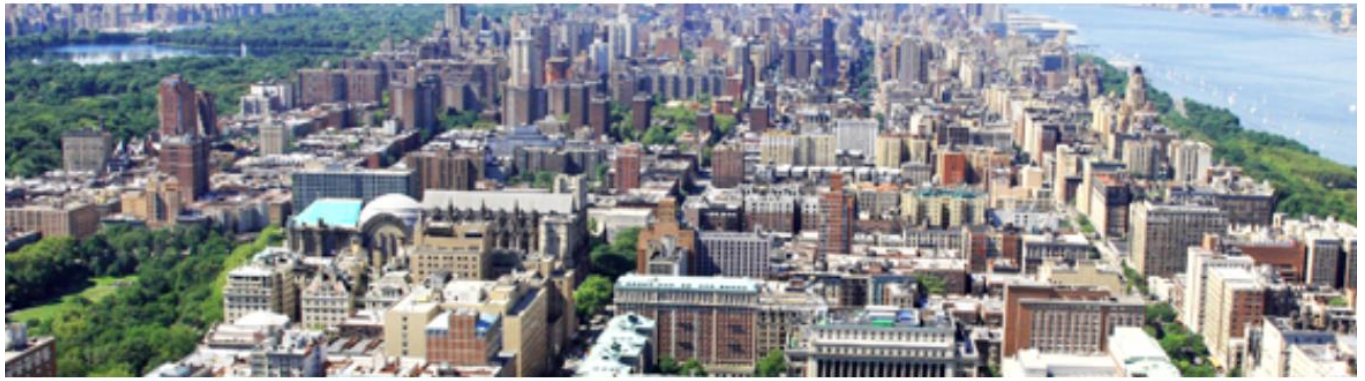
OSCAR 2022 vs. 2023

OSCAR Edition	2022	2023
Submissions	22	25
Accepted Talks	12	17
Accepted Posters	7	6

OSCAR Webpage Archive

Open-Source Computer Architecture Research (OSCAR)

Saturday, June 18, 2022 - New York City (co-located with ISCA 2022)



OSCAR 2022 Workshop - Program

8:30-8:50: Opening Remarks

- **Luca P. Carloni**

PRESENTATION

8:50-9:50: Invited Talk

- **Shashank Nemawarkar**
  Open-Source Silicon Development as an Enabler for Novel Computer Architecture Research (abstract)

PRESENTATION

9:50-10:50: Session I - Architectural Components

1. **Blaise Tine**, Ruobing Han and Hyesoon Kim.
   The Tip of Iceberg in Open-Source Hardware GPU

PRESENTATION Open-Source Release URL

2. **Samuel Riedel**, Matheus Cavalcante, Sergio Mazzola and Luca Benini.
   Efficient Systolic Execution on a Shared-Memory Manycore System

PRESENTATION Open-Source Release URL

Davide Giri (1990-2021)

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

ESP