Conference Reports

The 56th Design Automation Conference

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The 56th Design Automation Conference (DAC) was held at the Las Vegas Convention Center on June 3–6, 2019. After 55 years, DAC continues to be the premier conference for design and design automation *from chips to systems*, where attendees *learn today and create tomorrow*.

This year's DAC captured the fun and vibrant spirit of Las Vegas, with an extensive and varied set of research and designer track sessions, keynotes, panels, and tutorials, along with an exhibits floor that spanned the design automation ecosystem. Over 5,000 people attended DAC in Las Vegas. DAC approved a total of 815 submissions for review (up 18% from 2018), with 40% from North America, 37% from Asia, 20% from Europe, 2% from the Middle East, and 1% from South America. Among them, 202 were accepted, resulting in an acceptance rate of 25%. Another 76 submissions were accepted as Work-in-Progress (WIP) posters.

Unique to DAC are its Designer Track and IP Track, which specifically target design practitioners. The tracks provide an independent forum where hardware (HW) designers, software (SW) engineers, embedded system and IP developers, application engineers, and managers/executives can present their experiences on what really works in design flows, methods, tool usage, as well as IP integration and SW development practices. The Designer and IP Track received 185 submissions and accepted over 60 for presentations and more than 100 for poster sessions.

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The 56th DAC featured five inspiring keynotes. On Monday, Dr. Galen Hunt, who leads Microsoft's Azure Sphere Team, gave concrete suggestions for ways we can secure the billions of devices around us. On Tuesday, we ventured further afield with Thomas Dolby, who weaved together a story showing how advancing technology and computer interfaces led to a kind of Moore's law of synthesized music and how he continues to look for improvements as part of his role at Johns Hopkins University. He performed *She Blinded Me with Science* and an improvized version of *Hyperactive* as part of his keynote in what I believe is a first for pop songs at DAC. On Wednesday, we had dual keynotes. First, IBM Fellow and professional mad scientist Dr. John Cohn discussed the importance of play and showed how play helped each of his transitions in a career that has ranged from analog design and EDA to his latest role at the Massachusetts Institute of Technology (MIT)-IBM Watson AI Lab. After that, Bas Verkaik of SPIKE shared his and his team's journey from Dutch college students to entrepreneurs designing and producing electric motorcycles, including a round-the-world expedition with a pair of prototype bikes. On Thursday, the final keynote featured MIT's Dr. James Di Carlo, who gave a fascinating and in-depth description of what we currently do and do not know about how human visual intelligence works and the implications of that on future research in artificial intelligence (AI).

The 56th DAC also featured exciting Sky Talks on quantum computing from Dr. Leon Stok of IBM, ethics and AI from Carolyn Herzog, Arm's General Counsel, and memories of the future from Dr. Gurtej Sandhu of Micron Technology.

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In addition, a Vegas-focused Visionary Talk on the future of the gaming industry was given by Dr. Mark Yoseloff of University of Nevada Las Vegas (UNLV). AI and machine learning continued to be the featured topic areas at the 56th DAC. There were keynotes, invited talks, tutorials, and research paper presentations (more than 20 sessions altogether) on innovative HW, SW, and system designs of neural network accelerators as well as the application of AI/machine learning techniques to advancing EDA. This year's best paper awards included work on AI and machine learning from Facebook with the paper "Glow as a Machine Learning Compiler for Heterogeneous HW" and Texas Instruments with the paper "Improving Design Performance Using Machine Learning in Synthesis."

In addition, related to AI and machine learning, DAC reprised its System Design Contest (SDC), which featured lower energy and high-performance embedded system implementation of neural network-based object detection from video clips taken from drones. The data sets were provided by DJI Technology, and the graphics processing unit (GPU) and FPGA HW platforms were provided by Nvidia and Xilinx, respectively. Over 100 teams from both academia and industry participated in the contest. Three winning teams were selected from each HW category and received cash prizes sponsored by Nvidia and Xilinx.

The 56th DAC also included the second edition of our Late Breaking Results (LBR) event, which provides authors an opportunity to announce new findings that were not available during DAC's regular paper submission process. Authors submitted a one-page abstract that was reviewed in a double-blind process. Each accepted LBR submission was given a poster and had its extended abstract published in the official DAC proceedings.

Besides 50+ sessions related to the core topics of EDA, IP, and embedded SW and systems, the 56th DAC featured the following:

- nearly 30 sessions in design (from heterogeneous SoCs, architectures, circuits, to emerging technologies)
- seventeen sessions in security/privacy (from secure tools and design methodologies, securing processors and memory systems, HW/SW codesign, hands-on Internet of Things (IoT) hacking, to encryption), including presentations by winners of the Hack@DAC contest and hands-on IoT hacking demos in the DAC Pavilion
- five sessions in autonomous systems covering automotive, IoT, cyber-physical systems (CPSs), and spiking networks.

Hack@DAC, a one-of-a-kind competition, ran over several days of the 56th DAC. Competitors participating in Hack@DAC acted as security engineers hunting for bugs in an open-source SoC that were jointly developed by Intel engineers and the Hack@DAC organizers for this contest. A record-breaking 31 teams from academia and industry participated in the competition. The top three teams received cash awards provided by the Hack@DAC sponsors.

The 56th DAC's exhibits floor housed more than 150 companies with 18 first-time exhibitors. In addition to the individual companies' exhibits, DAC brought attendees several new areas/activities, such as the following:

- Design Infrastructure Alley is for professionals who manage the HW and SW products and services required by design teams. It houses a dedicated Design-on-Cloud Pavilion, featuring presentations from the Design Infrastructure Alley exhibitors and invited companies.
- Keynotes were presented on the exhibits floor this year, bringing additional excitement to the floor.

The success of the 56th DAC would not have been possible without the dedication of many volunteers, including a year-round effort from the 20+ executive committee members and months of hard work of more than 300 technical program committee (TPC) members from the research, designer, and IP tracks. DAC is also thanks to the loyal supporters including the platinum sponsors (Cadence and Mentor, a Siemens Business) and the silver sponsors (ClioSoft, Methodics, and Synopsys).

The 57th DAC will be held in San Francisco, CA, USA, on July 19–23, 2020, and I hope I will get to talk to many of you in person then. Together, we learn today and create tomorrow. ■

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