The 55th Design Automation Conference

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The 55th Design Automation Conference (DAC) was held at the Moscone Center West, San Francisco, CA, USA, on 24–28 June 2018. After 54 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 was filled with new energy! The show fully occupied the three floors of Moscone West, with two floors of exhibits and one floor of research presentations. More than 6000 people attended DAC, which is nearly 30% more than the last year. More than 170 companies exhibited at DAC, about 17% higher than the last year. DAC approved a total of 691 submissions for review, with 47% from North America, 31% from Asia, 20% from Europe, and 2% from South America. Of those, 168 were accepted, resulting in an acceptance rate of 24.3%. Another 85 submissions were accepted as work-in-progress posters.

A new Late Break Results (LBR) category was introduced at the 55th DAC. LBR 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 5-min oral presentation as well as a poster presentation. Accepted abstracts were published on the DAC website. LBR will continue next year, and the accepted extended abstracts will be published in the official DAC proceedings.

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Unique to DAC is the Designer Track and IP Track, which are targeted at practitioners. Hardware designers, software engineers, IP developers, application engineers, and managers present their experiences on effective design flows, methods, tool usage, as well as IP integration and software development practices. The Designer and IP Tracks received 168 submissions and accepted 60 for presentations (35.7%). An interesting tidbit is that a portion of the presentations and attendees are university professors and students!

The 55th DAC featured four inspiring keynotes. Dr. Sarah Cooper, Amazon Web Services' General Manager of Internet of Things (IoT) Analytics and Applications, described her vision of transforming connected devices from individual actors to achieve ambient intelligence, and challenged our design automation community with the task of helping make connected devices to be living products through advancements in embedded artificial intelligence (AI), security, remote management, and end-to-end tools. Dr. Dario Gil, Vice President of AI and IBM Q, gave a comprehensive summary of state-of-the-art computing for AI as well as a roadmap of innovations that would lead us into the decade to come, including approximate computing, analog devices for AI, and quantum computing for AI. He highlighted how these innovations bring forth both challenges and unique opportunities for the design automation community. Dr. David Patterson, the 2018 Turing Award recipient, took us on an exciting tour of computer architecture history in the past 55 years and shared his insights on current architecture challenges due to the ending of Dennard Scaling and Moore's Law as well as his insights on security. He predicted the

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coming of a golden age calling for agile hardware development and new computer-aided design enabling development techniques to make small teams productive via abstraction and reuse. Dr. Maja Matarić, Chan Soon-Shiong Professor of Computer Science, Neuroscience, and Pediatrics at the University of Southern California, described exciting research into modeling and steering social dynamics and long-term adaptation and learning for socially assistive robotics (SAR). She also demonstrated the short-, middle-, and long-term commercial applications of SAR, as well as the frontiers of SAR research.

Besides the 50 sessions related to core EDA and IP topic areas, the 55th DAC featured the following:

- 23 sessions in design (from heterogeneous SoCs, architectures, and circuits to emerging technologies)
- 12 (six system, six auto) sessions in embedded software and systems and auto (from IoT, cyber-physical systems, and embedded memory to autonomous driving)
- 16 sessions in security/privacy (from secure processor design, IC reverse engineering, and hands-on IoT hacking to blockchain for security), including presentations by winners of the Hack@DAC contest and hands-on IoT hacking demos in DAC pavilion
- five sessions in IoT (from embedded machine learning, IoT security, and runtime support to industrial IoT architectures).

AI/machine learning was the newly featured topic area at the 55th DAC. There were keynotes, invited talks, tutorials, and research paper presentations (close to 20 sessions altogether) on innovative hardware, software and system designs of neural network accelerators, as well as the application of AI/machine learning techniques to advancing EDA. Also related to AI/machine learning, DAC held its first System Design Contest (SDC). The SDC featured lower energy and high-performance embedded system implementation of neural network-based object detection in video clips taken from drones. The data sets were provided by DJI, and graphics processing unit and FPGA hardware 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 hardware category and received cash prizes sponsored by Nvidia and Xilinx.

Given the resurgent interests in design automation nationally and internationally, the 55th DAC organized a panel consisting of international experts discussing the similarities, differences, challenges, and solutions in research funding from a regional and global perspective. These panelists shared their insights on the long-term impact of the respective funding strategies. Mr. Andreas Olofsson, a program manager in the Microsystems Technology Office at DARPA, delivered a short keynote on DARPA's two EDA research programs, i.e., the Intelligent Design of Electronic Assets program and the Posh Open Source Hardware program. He specifically detailed the effort in building a universal hardware compiler and provided an analysis of the potential impact that could have on the current semiconductor ecosystem.

Hack@DAC, a first-of-its-kind competition, took place at the 55th DAC. Competitors participating Hack@DAC acted as security engineers hunting for bugs in an open-source SoC that was jointly developed by Intel engineers and the Hack@DAC organizers for this contest. A record-breaking 55 teams from academia and industry participated in the competition. The top three teams received cash awards provided by the sponsors, including Crossing and NYU.

The two floors of the 55th DAC's exhibit housed more than 170 companies with 31 first-time exhibitors. Besides individual companies' exhibits, DAC brought attendees to several new areas/activities.

- Design Infrastructure Alley was for professionals who manage the hardware and software products and services required by design teams. This area included a dedicated Design-on-Cloud Pavilion featuring presentations from the Design Infrastructure Alley exhibitors and invited companies.
- Smart Systems Square was a centralized exhibit pavilion where engineers were able to interact with developers, network and platform providers, and verification experts for AI and machine learning applications. It also showcased live demos of the winning entries from the System Design Contest.

The 55th DAC again showed that DAC is the premier event for top-notch researchers to present their cutting-edge discoveries, the platform for leading field engineers to share their experiences in using EDA tools to tame the ever-growing circuit and system design monsters, and the largest trade

show devoted to exhibition of EDA tools, embedded software, IP cores, and other related products and services. This unique combination lubricates the pipelines for research to become products and for real-world problems to stimulate research. DAC has been and will continue to be the must-attend event for the design and design automation community.

The 56th DAC will be held in Las Vegas, NV, USA, on 2–6 June 2019. Visit dac.com for more details. ■

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