38th IEEE International System-on-Chip Conference

Dubai, UAE

Sept. 29-Oct.1, 2025

Call for Special Session

"AI-Enhanced Semiconductor Manufacturing:
Intelligent Solutions for Next-Generation Fabrication"

As the semiconductor industry rapidly advances toward increasingly complex, high-performance computing platforms, the integration of AI and data-driven technologies throughout the design-to-fabrication pipeline is becoming essential. From chip design and device architecture to nanoscale fabrication, advanced packaging, and heterogeneous integration, today's fabs and design houses must collaborate seamlessly to achieve unprecedented levels of precision, yield, and throughput.

This special session on **AI-Enhanced Semiconductor Manufacturing** brings together insights from both industry and academia to explore how artificial intelligence and machine learning are revolutionizing semiconductor workflows from end to end. Key areas of focus will include chip design optimization, process control, defect detection, metrology, equipment efficiency, and predictive maintenance.

The session will showcase **real-world, scalable AI solutions** capable of processing vast amounts of data from processes, tools, and design to generate actionable insights. These solutions must be adaptable to dynamic fab conditions, support rapid changes in recipes and designs, and ensure reliability, performance, and sustainability at the system level.

Attendees will gain valuable insights into **emerging AI frameworks** that connect data across the entire semiconductor lifecycle—from initial design and simulation to final chip qualification—enabling smarter, faster, and more resilient manufacturing processes.

Key topics include (but are not limited to):

- AI based HW/SW/co-design, benchmarking architectures/inferences.
- AI in Chiplet design.
- Generative AI/LLM based circuit design.
- Cross-layer AI: design-to-manufacturing correlation and learning.
- Digital twins and simulation-driven AI in fab environments.
- Digital twins and simulation-augmented AI for advanced packaging.
- Intelligent metrology and inspection systems (SEM/TEM/AFM/optical).
- Predictive analytics for equipment and process health monitoring.
- Machine learning for real-time process and recipe control.
- AI-driven yield optimization and root-cause analysis.
- Secure and explainable AI in semiconductor manufacturing.
- Large-scale data infrastructure for AI in fabrication environments.
- Smart metrology and inspection using vision and sensor data.
- Data-centric infrastructure for semiconductor AI applications.
- Secure, explainable, and trustworthy AI for mission-critical manufacturing.
- Case studies of AI deployment in production fabs.

Target Audience:

This session is intended for both academic and industry professionals leveraging AI/ML across the semiconductor ecosystem —— experts in chip design, process engineering, metrology, packaging, equipment, and digital transformation —— who are interested in leveraging intelligent systems to address challenges in next-generation semiconductor fabrication.

Submission of Papers:

Limited to six double-column IEEE formatted pages. All submissions will receive double-blind peer review. Accepted papers presented at the conference will be included in the SOCC proceedings and be submitted for inclusion into IEEE Xplore® subject to meeting IEEE Xplore's quality requirements.

For detailed formatting instructions, submission & publication guidelines, refer to www.ieee-socc.org

For specific questions on this special session track submission, please reach Dr. Bappaditya Dey (bappaditya.dey@imec.be), Dr. Joris Vanderschrick (Joris.Vanderschrick@imec.be), Dr. Joyjit Kundu (joyjit.kundu@imec.be), Dr. Kasem Khalil (kmkhalil@olemiss.edu)

Special session submission Deadline: June 30, 2025

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