

# SEMICON® EUROPA

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## Future of Computing

### Tailored Intelligence: The Art of Customized Processors for AI Acceleration

H. Amrouch  
Prof. Dr.-Ing.  
Technical University of Munich (TUM), Computer  
Engineering, Munich, Germany

Technical  
University  
of Munich



#### Body

In the rapidly evolving field of artificial intelligence (AI), the drive for processor customization to substantially enhance efficiency is more critical than ever. In this talk, we will explore the pivotal role of tailoring the underlying RISC-V CPU architecture to meet the specific demands of AI algorithms. We will highlight how brain-inspired hyperdimensional computing presents a compelling alternative to deep learning, thanks to its remarkable capacity to learn from minimal and noisy data. Lastly, we will illustrate how in-memory computing and cryogenic computing open new avenues for dramatically enhancing the speed and efficiency of AI computations.

#### Biography

**Hussam Amrouch** is a professor heading the Chair of AI Processor Design at the Technical University of Munich (TUM). He is, additionally, heading the Brain-inspired Computing at the Munich Institute of Robotics and Machine Intelligence. Further, he is the head of the Semiconductor Test and Reliability at the University of Stuttgart. He received his Ph.D. degree with the distinction (summa cum laude) from KIT, Germany in 2015. He has more than 260 publications (including over 110 articles in many top journals like Nature Communications) in multidisciplinary research areas covering semiconductor device physics, circuit design and computer architecture. His research interest is transistor compact modeling, in-memory computing with a special focus on reliability, and cryogenic circuits for quantum computing.

References

## Topic Coming Soon

R. Verberk  
Director Semicon & Quantum  
<https://www.tno.nl>, High Tech Industry- Semicon  
& Quantum, Delft, Netherlands



## Body

Coming Soon

## Biography

Coming Soon

References

## **Superconducting Quantum Computing: Building on Decades of Semiconductor Innovation for Transformative Computational Power**

S. Kulkarni  
CEO  
Rigetti Computing, Berkeley, United States of  
America



### **Body**

Superconducting quantum computing is one of the leading modalities of quantum computing, a fundamentally different approach to processing information. Quantum computing has the potential to transform how many industries address their most challenging problems. Discover the current state of quantum computing and how Rigetti is leading the way to enable hands-on access to quantum hardware to continue to push the boundaries of what's possible with this revolutionary technology.

### **Biography**

Dr. Kulkarni has served as President and Chief Executive Officer at Rigetti since December 2022. Dr. Kulkarni is a seasoned public company CEO with thirty-plus years of experience in the semiconductor industry and a track record of success in scaling and commercializing cutting-edge technologies. Prior to joining Rigetti, Dr. Kulkarni was President, CEO, and member of the Board of CyberOptics Corporation, a developer and manufacturer of high precision sensors and inspection systems for the semiconductor and electronics industry. He held these roles from 2014 until CyberOptics was acquired by Nordson Corporation in November 2022. Prior to CyberOptics, Dr. Kulkarni was CEO of Prism Computational Sciences, a developer of software tools for scientific and commercial applications in the semiconductor industry. Earlier in his career, he held additional leadership positions, including Chief Technology Officer and Senior Vice President of OEM/Emerging business, global commercial business, R&D and manufacturing at Imation, a global scalable storage and data security company. Dr. Kulkarni began his career in research and management positions with 3M Corporation and IBM. He received his B.S. in chemical engineering from the Indian Institute of Technology, Mumbai, and later obtained a M.S. and Ph.D. in chemical engineering from MIT. Dr. Kulkarni currently serves on the Board of KeyTronic Corporation, a publicly traded electronics manufacturing services company, as well as Chairman of the Board for Prism Computational Sciences.

References

## Energy-Efficient AI Using Stochastic Magnetic Tunnel Junctions

N. Alder  
Research Assistant  
Hasso Plattner Institute, Potsdam, Germany



### Body

(Pseudo)random sampling is a costly and widely used method in AI algorithms. We introduce an energy-efficient algorithm for uniform Float16 sampling, utilizing a room-temperature stochastic magnetic tunnel junction device to generate truly random floating-point numbers. By avoiding expensive symbolic computation and mapping physical phenomena directly to the statistical properties of the floating-point format and uniform distribution, our approach achieves a higher level of energy efficiency.

### Biography

Nicolas Alder is a PhD student at the Hasso Plattner Institute, specializing in energy-efficient artificial intelligence. With a strong academic foundation in Data Engineering and Computer Science, Nicolas has been involved in cutting-edge research at the intersection of AI, hardware, and sustainability. He serves as a Research Assistant at the AI and Sustainability Chair and is a part of the MIT-HPI Joint Research Program. Nicolas has also gained industry experience through roles at Volkswagen, the Hasso Plattner Foundation, and BearingPoint, focusing on AI and data science.

References