

## **A versatile spiking neuromorphic system-on-chip based on CMOS/memristor co-design**

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A versatile spiking neuromorphic system-on-chip based on CMOS/memristor co-design Neuromorphic chips promise advancements in computational performance and energy efficiency inspired by the dynamics and architecture of the nervous system. Most of today's systems solely rely on standard complementary metal-oxide-semiconductor (CMOS) technology. An emerging class of devices promises to unleash the full potential of researchers to bring together CMOS and memristors due to practical memristor-based synapses in conjunction with a wide range dynamics, network architectures and experimental environments. Along non-idealities by appropriate circuit/system design. The resulting integration challenges, especially with small prototype dies often used in financially-constrained academic research. Furthermore, memristors combined with CMOS circuits require far-reaching co-design strategies to achieve system level advantages exceeding the expertise of most individual research groups. In this boundary-crossing project, we form an interdisciplinary team of a materials/device expert, an analog CMOS circuit design/neuromorphic system architect, as well as a device-to-system modeling expert to bridge the two fields. Our aim is to create versatile hybrid memristor/CMOS chips and to realize a spiking neuromorphic system that allows us to evaluate the performance of memristor-based synapses in conjunction with a wide range of neuron dynamics, network architectures and experimental environments. Along the way, we expect to advance the memristor portfolio with a novel heterostructure device and discern optimal device parameters in the computing paradigms.

### **Projektbeteiligte**

#### **Dr. Sebastian Billaudelle**

Universität Heidelberg  
Electronic Vision(s) Group  
Kirchhoff-Institut für Physik  
Heidelberg

#### **Prof. Dr. Alwin Daus**

Universität Freiburg  
Technische Fakultät  
Institut für Mikrosystemtechnik - IMTEK  
Sensors Laboratory  
Freiburg im Breisgau

