

2D Materials for Artificial Intelligence Systems - Eyes, Ears, Nose and Brain?

Max Lemme

AMO, Germany

max.lemme@eld.rwth-aachen.de

Artificial Intelligence (AI) is going to revolutionize all aspects of life, from autonomous vehicles, industrial production and healthcare to environmental monitoring. Conventional computer hardware can deliver the performance required to run specific AI software, but only at the cost of severe energy consumption due to the so called von Neumann-bottleneck – the separation of memory and logic. This is particularly problematic in mobile systems, like vehicles or sensor networks, where the energy supply is limited, while sensor data is processed and analyzed through AI. Two-dimensional (2D) materials offer superior performance for many sensory tasks at the device level, such as photodetection, microphones or gas sensors, and should thus be considered as sensory inputs to AI systems. Several such sensor options that outperform existing technologies will be discussed in the talk. In addition, many applications for future AI will also require energy efficient hardware for data processing, which may come in the form of memristive circuit elements. 2D materials are heavily investigated regarding their memristive behavior, and there are several concepts with different underlying physics. I will discuss one option of molybdenum disulfide memristors that utilizes ion transport in van der Waals gaps to achieve plasticity.