

TRR404: FRIDAY GET-TOGETHER

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“Emerging Non-Volatile Memory (NVM) Technologies: From Device to Application” (tutorial)

7 November 2025 | 2:00 pm

Onsite Locations

- Dresden: Werner-Hartmann-Bau 205/206
- Aachen/Jülich: new Walter Schottky Haus B101/B102
- Halle/RUB: at your institutions



Online

<https://tu-dresden.zoom-join.com/j/87264138030?pwd=WG41dkN6L0NOaXFaaVRORzM3QmdFQT09>



Abstract

The demand for high-capacity, low-power, cost-effective, and scalable memory solutions is rapidly increasing, due to the demand of modern computing systems and data-centric applications. This has led to the development of various emerging Non-Volatile Memory (NVM) technologies like Resistive Random Access Memory (ReRAM/RRAM), Phase Change Memory (PCM), Magnetoresistive Random Access Memory (MRAM), and Ferroelectric Random Access Memory (FeRAM). The technologies are highly promising contenders for next-generation memory solutions, with a wide range of applications such as automotive, medical, and aerospace industries. Several semiconductor industries, including TSMC, Weebit-Nano, Fujitsu, Infineon, Intel, Everspin, Micron and Crossbar, are investing, both financially and in R&D, to commercialize these technologies.

This tutorial will provide a comprehensive introduction and technical exploration of emerging NVM technologies, covering the complete stack – from device-level principles to application-level use cases. I will first introduce various emerging NVM technologies, including ReRAM, PCM, MRAM, and FeRAM. The introduction includes their operating principles, various flavours of these technologies, and a comparative study with conventional memory technologies (SRAM, DRAM, and Flash). Then I will present several challenges associated with these new technologies. These include reliability challenges like variability, manufacturing defects, limited endurance, etc. Finally, I will present the applications of these emerging memory technologies, such as computing applications, standalone memory, and hardware security.