# Seminar of Jianping WANG

**University of Minnesota, USA**

**Friday 29th May, 2026 – 15:00 PM**

**IJL- Room 2-A013**

## Spintronic Devices and Systems for Memory and Computing and Beyond by New Materials, New Physics and Unconventional Computing Architectures

Many of the technologies we rely on today—including artificial intelligence (AI)—are built on the invention of the transistor, a tiny switch that powers everything from smartphones to supercomputers. Over the years, transistors have become smaller and more powerful, but we're now reaching the limits of how much further they can be improved using traditional methods. To keep advancing, researchers are exploring new ways to build smarter, more efficient technologies. One exciting direction involves spintronics—a field that uses the tiny magnetic properties of electrons to store and process information. These spintronic devices work well with today's computer chip technology and offer new possibilities for energy-efficient computing.

In the first part of my talk, I'll introduce a new concept called Computational Random-Access Memory, or CRAM. Unlike traditional computers, which waste energy constantly moving data between memory and processing units, CRAM can do both tasks in one place. This breakthrough is made possible by spintronic memory devices, and we've recently shown how it works through experiments. CRAM also has the flexibility to adapt to different tasks, making it a great fit for future AI systems.

In the second part, I'll share our latest progress in making spintronic devices even more efficient by using new materials and discovering new physical effects. For example, we've developed a material called $Ni_4W$ that helps spintronic devices switch faster and use less energy. We've also found new ways to control these devices using electric signals, which could lead to even better performance.

Finally, I'll talk about exciting future applications for spintronics, including new types of computing that mimic randomness and uncertainty—similar to how the brain works—and potential uses in medical technologies like brain stimulation and sensing.

Jian-Ping Wang is a Distinguished McKnight University Professor and Robert Hartmann Chair in Electrical and Computer Engineering at the University of Minnesota. Wang is a fellow of National Academy of Inventors, IEEE and APS. Wang is the recipient of 2024 IEEE Achievement Award (Magnetic Society), the highest honor in magnetics. He received the 2019 Technical Excellence Award from Semiconductor Research Corporation (SRC) "Innovations and Discoveries in Nanomagnetics and Novel Materials that Accelerated the Production of Magnetic Random-access Memories". Wang received the Information Storage Industry Consortium (INSIC) Technical Achievement Award 2006 for his pioneering work on the exchange coupled composite magnetic media, which has been used in all Data Centers.

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