



Seminar Announcement

Venerdì 4 Ottobre 2024, ore 11:00 – 12:30, Aula 160/2

SPINTRONICS FOR MICROWAVE TECHNOLOGY AND PROBABILISTIC COMPUTING !

Prof. Giovanni Finocchio

University of Messina

Abstract — The development of more efficient and high-performance spintronic devices and the efforts to have co-integration of spintronics with CMOS technology is driving the development of hybrid CMOS-spintronic solutions for application where one can take the advantages of both technologies while minimizing their disadvantages. In this talk, I will focus on our recent developments on new potential applications of magnetic tunnel junctions (MTJs) as compact sensors for IoT nodes and computing applications. I will discuss how MTJs can be used to develop compact and more effective accelerometers and physical unclonable functions for security applications. I will also discuss our recent results on spintronic microwave amplifiers which are based on the phenomenon of injection locking. Then, I will focus on probabilistic computing with probabilistic-bits (p-bits) which is emerging as a computational paradigm able to be competitive in solving NP-hard combinatorial problems. I will show how to map hard combinatorial optimization problems (Max-Sat, Max-Cut, Traveling Salesman problem) into probabilistic Ising machine by using the idea of invertible logic gates and more complex energy mapping approaches and how to implement those in spintronic and CMOS technology. We will investigate the potential of advanced annealing schemes comparing simulated annealing, parallel-tempering, and simulated-quantum-annealing and how it will be possible to implement an efficient probabilistic co-processor).

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Bio — Giovanni Finocchio is full professor of Electrical Engineering at the University of Messina. His research interests include spintronics, skyrmions, and unconventional computing (<https://scholar.google.co.uk/citations?user=eKDbn-oAAAAJ&hl=en>). In the last 10 years, he served on many technical program committees of international conferences and organized more than 10 international conferences including program chair of the IEEE NANO 2024 and program co-chair of the 2025 joint InterMag-MMM conference. He is also president of Petaspin association (www.petaspin.com), AdCOM member of the IEEE Magnetism society, chair of the TC-16 on Quantum, neuromorphic and unconventional computing of the IEEE Nanotechnology council and past-chair of the IEEE Magnetism Italy chapter (2019-2022). He is also associate editor of Physical Review Applied (APS).

Per informazioni: Prof. Luca Pierantoni, L.pierantoni@staff.univpm.it