

On-line SPICE-SPIN+X Seminars



Wednesday, 19th May 2021, 15:00 (German Time)

The seminar will be via Zoom ([Meeting ID: 882 0824 8820](#)) and live streamed in the SPICE YouTube Channel.

Karin Everschor-Sitte,

University of Duisburg-Essen



Magnetic skyrmions for unconventional computing and revealing latent information

Novel computational paradigms in combination with proper hardware solutions are required to overcome the limitations of our state-of-the-art computer technology. [1-3] In this talk, I will focus on the potential of topologically stabilized magnetic whirls – so-called skyrmions for reservoir computing. Reservoir computing is a computational scheme that allows to drastically simplify spatial-temporal recognition tasks. We have shown that random skyrmion fabrics provide a suitable physical implementation of the reservoir. [4,5] They allow to classify patterns via their complex resistance responses either by tracing a signal over time or by a single spatially resolved measurement. [6]

In a second part of the talk, I will introduce two recently developed data analysis tools. [7, 8] While often a significant effort is made in enhancing the resolution of an experimental technique to obtain further insight into the sample and its physical properties, an advantageous data analysis has the potential to provide deep insights into given data set.

- [1] J. Grollier, D. Querlioz, K.Y. Camsari, KES, S. Fukami, M.D. Stiles, *Nat. Elect.* 3, 360 (2020)
- [2] E. Vedmedenko, R. Kawakami, D. Sheka, ..., KES, et al., *J. of Phys. D* 53, 453001 (2020)
- [3] G. Finocchio, M. Di Ventra, K.Y. Camsari, KES, P. K. Amiri, Z. Zeng, *JMMM* 521, 167506 (2021)
- [4] D. Prychynenko, M. Sitte, et al, KES, *Phys. Rev. Appl.* 9, 014034 (2018)
- [5] G. Bourianoff, D. Pinna, M. Sitte and KES, *AIP Adv.* 8, 055602 (2018)
- [6] D. Pinna, G. Bourianoff and KES, *Phys. Rev. Appl.* 14, 054020 (2020)
- [7] I. Horenko, D. Rodrigues, T. O’Kane and KES, arXiv:1907.04601
- [8] D. Rodrigues, KES, S. Gerber, I. Horenko, *iScience* 24, 102171 (2021)