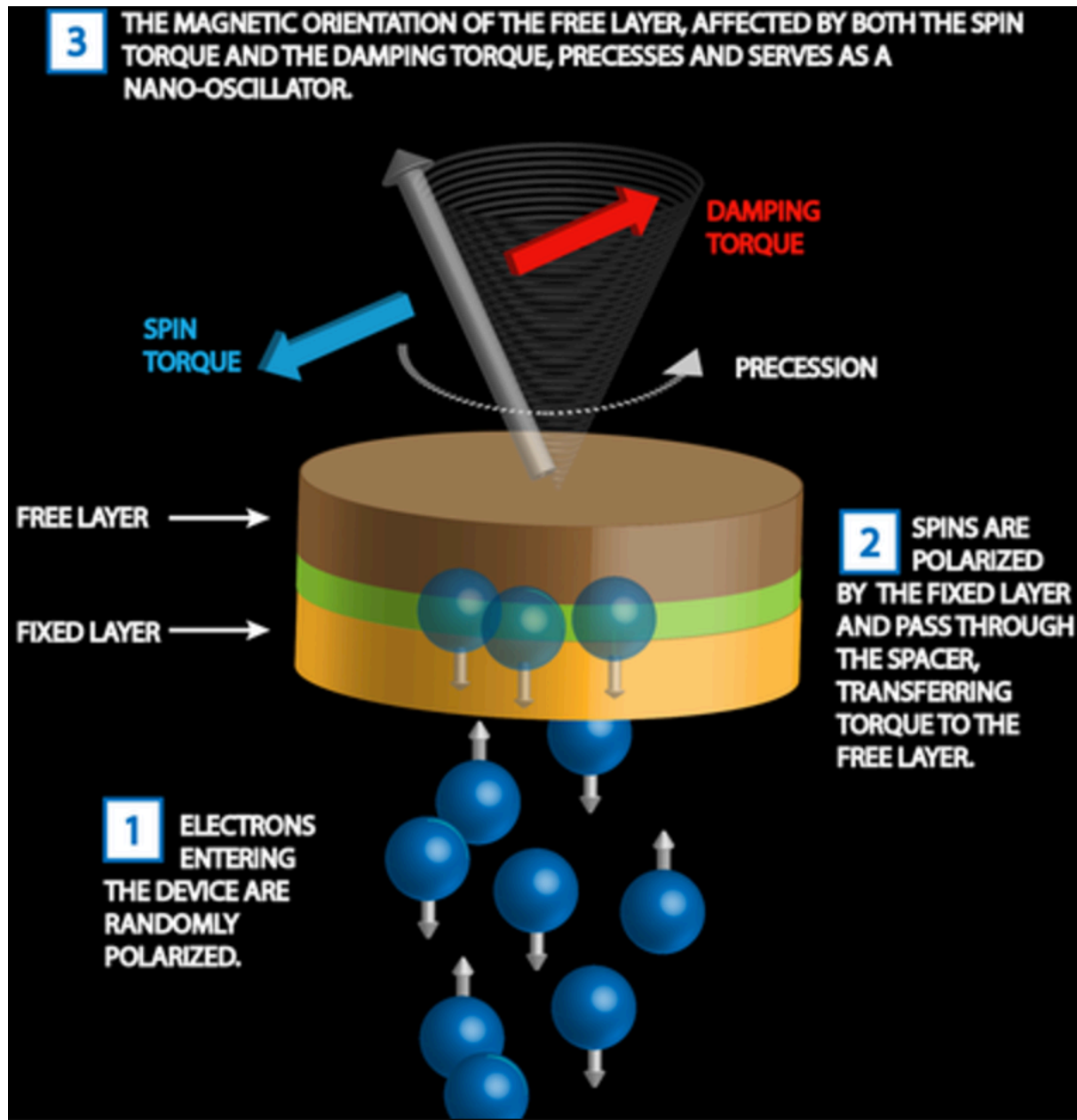


Spin-based nano-oscillators for neuromorphic computing

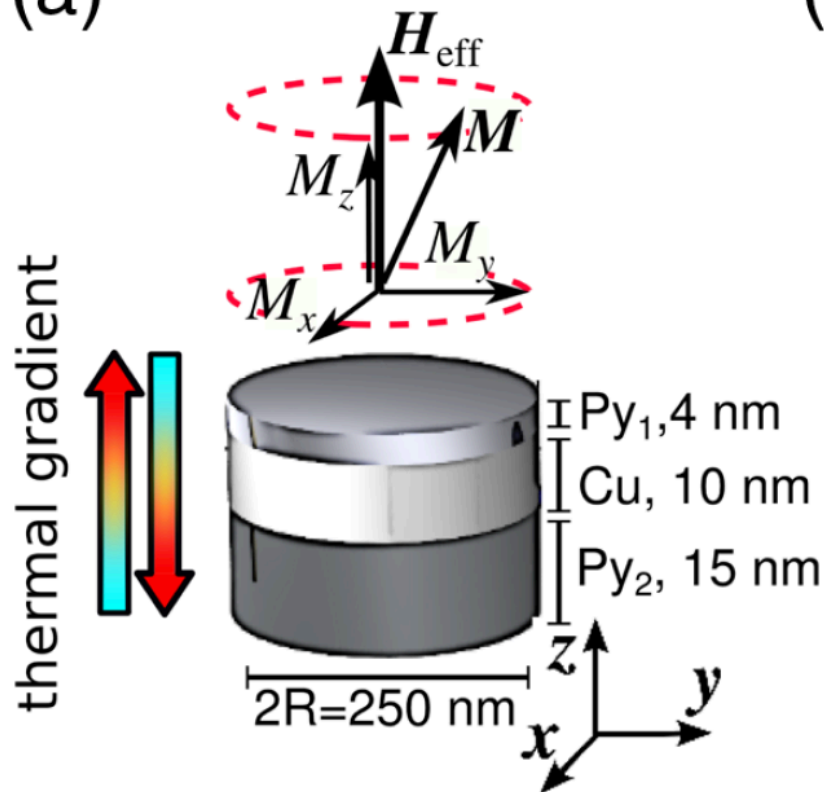
VR strong research environment, 2017-2022
Johan Åkerman (KTH, GU), Dag Hanstorp (GU)
Anna Delin (KTH) , Ana Rusu (KTH)

What is a spin-based nano oscillator?

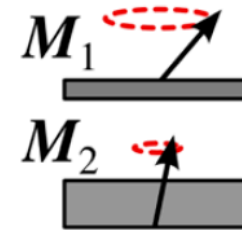


Spincaloritronic diode

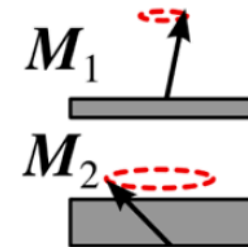
(a)



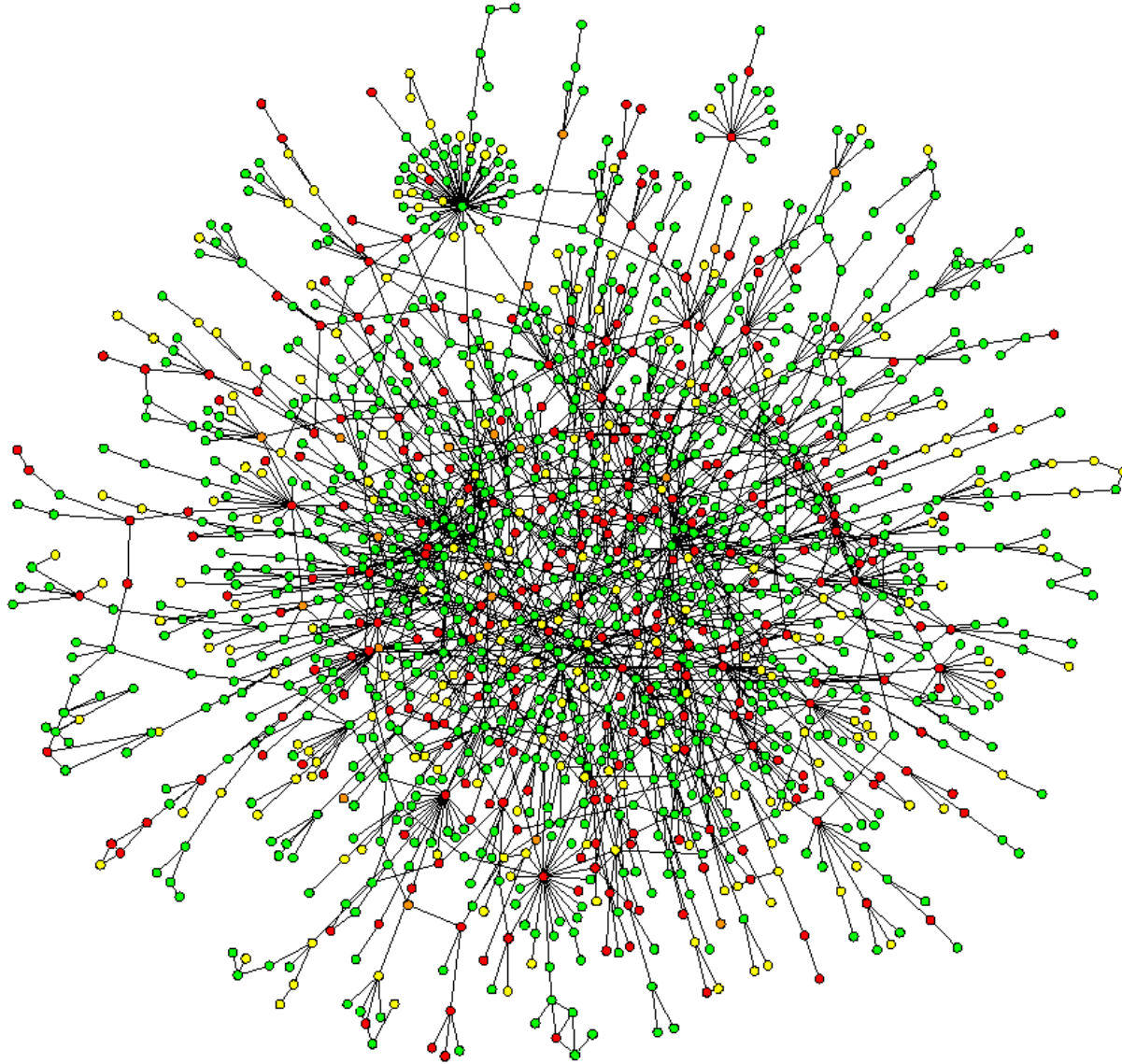
(b) in-phase precession:
s modes



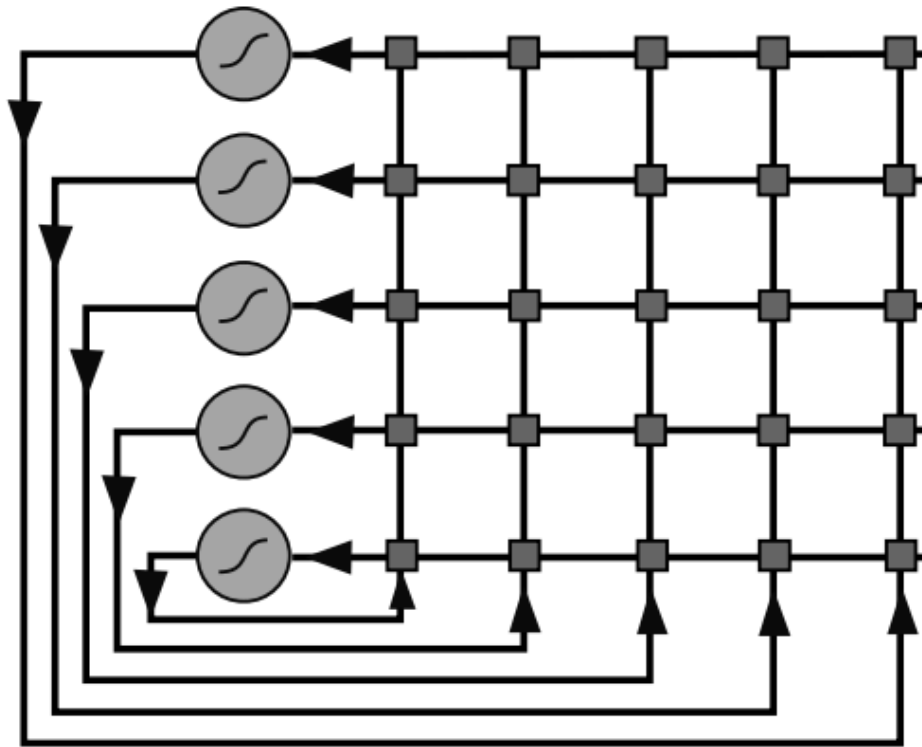
anti-phase precession:
a modes



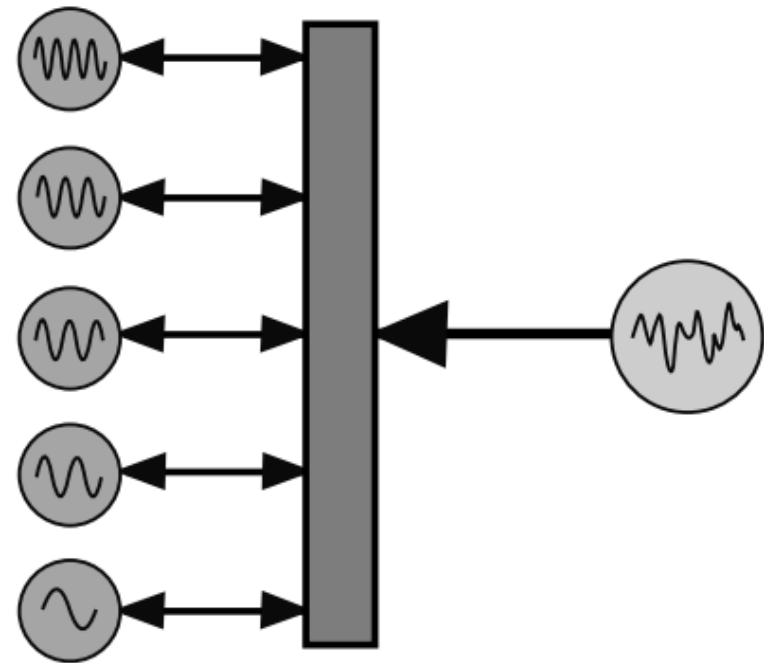
Network of interacting oscillators



Neurocomputer architectures

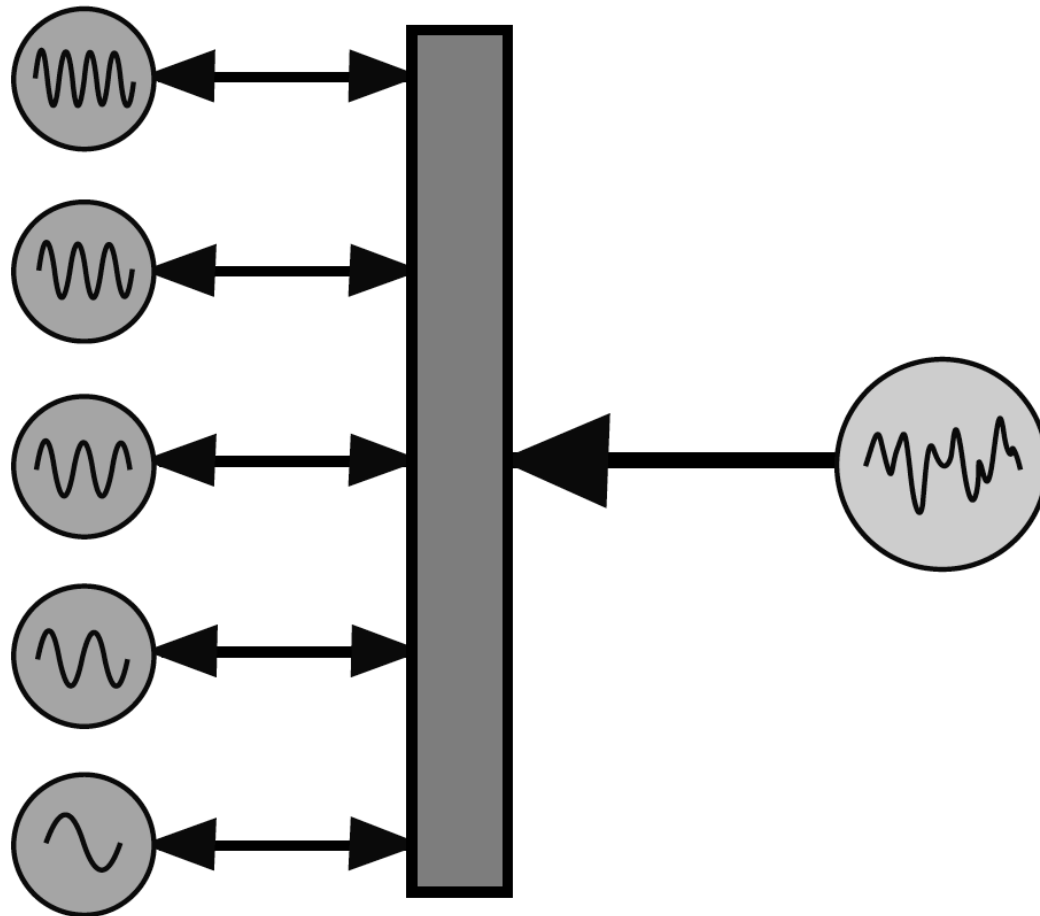


Conventional Neurocomputer

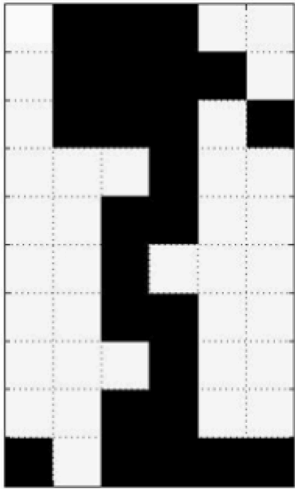


Oscillatory Neurocomputer

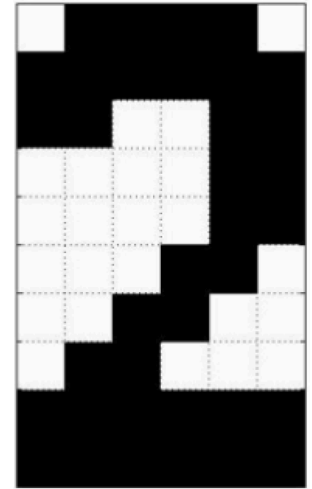
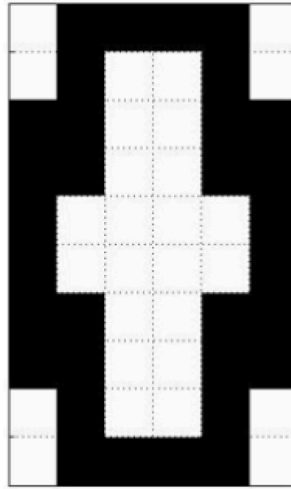
Coupled-oscillator associative memory array



Pattern recognition using coupled oscillators

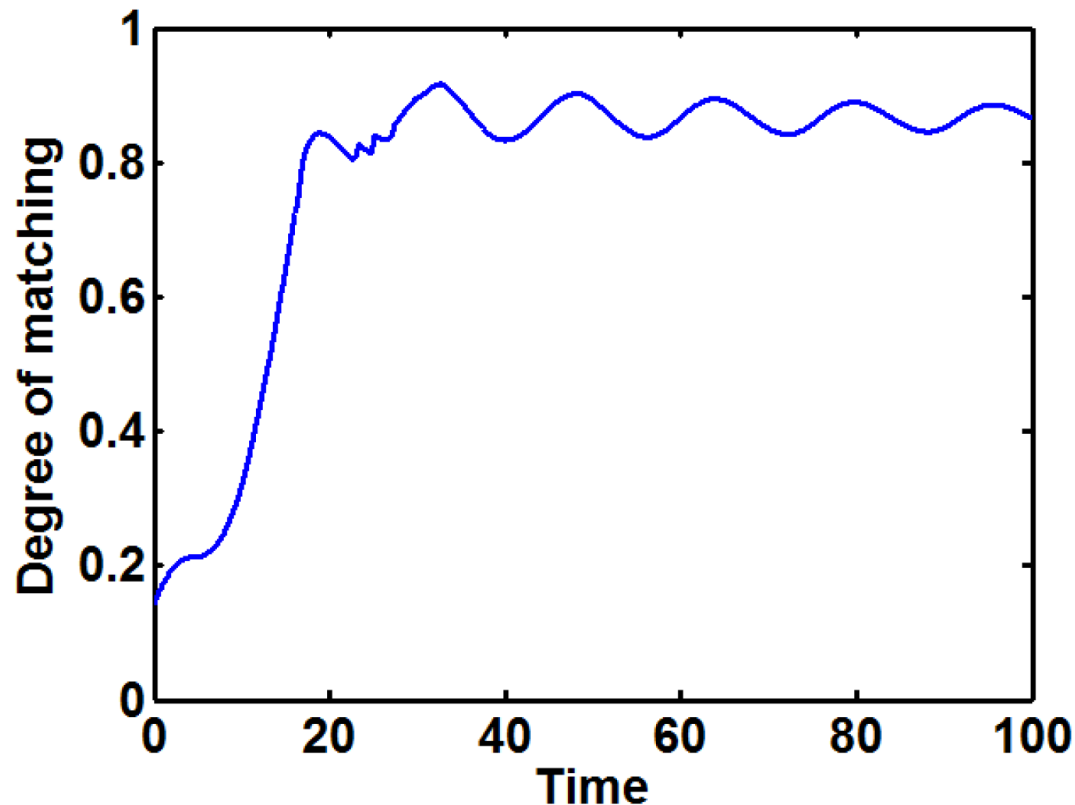


Test pattern



Memorized patterns

Pattern recognition using coupled oscillators



Test pattern matches best to the “1”

What we will do

- Explore (with simulations) synchronization of spin-based nano-oscillators using multiscale modeling (from DFT to macro-spin).
- Suggest optimal materials for spin-based nano-oscillators, e.g., low-damping materials.
- Investigate the effect of noise on synchronisation.