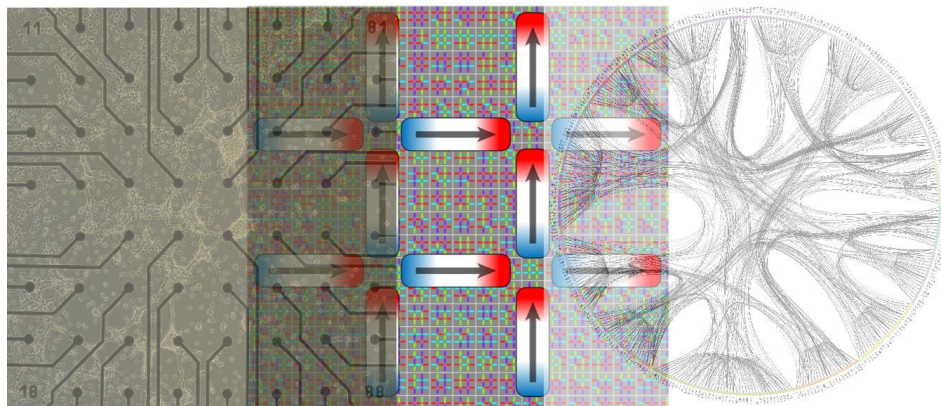


Fra ukonvensjonelle datamaskiner til cyborg

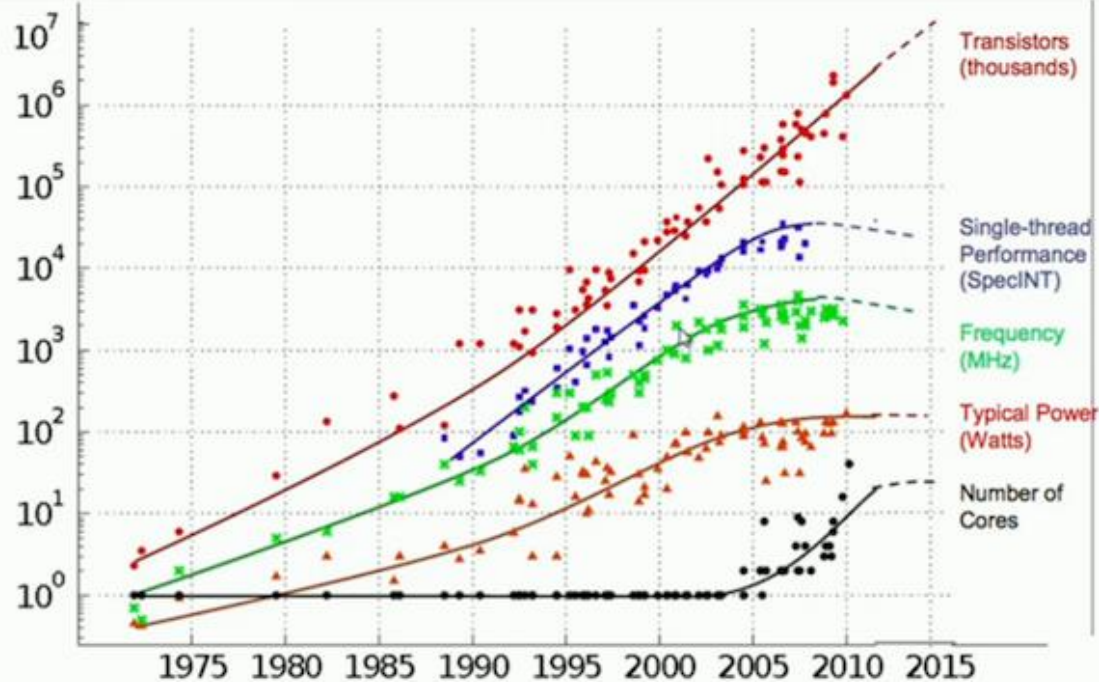
From unconventional computers to cyborg



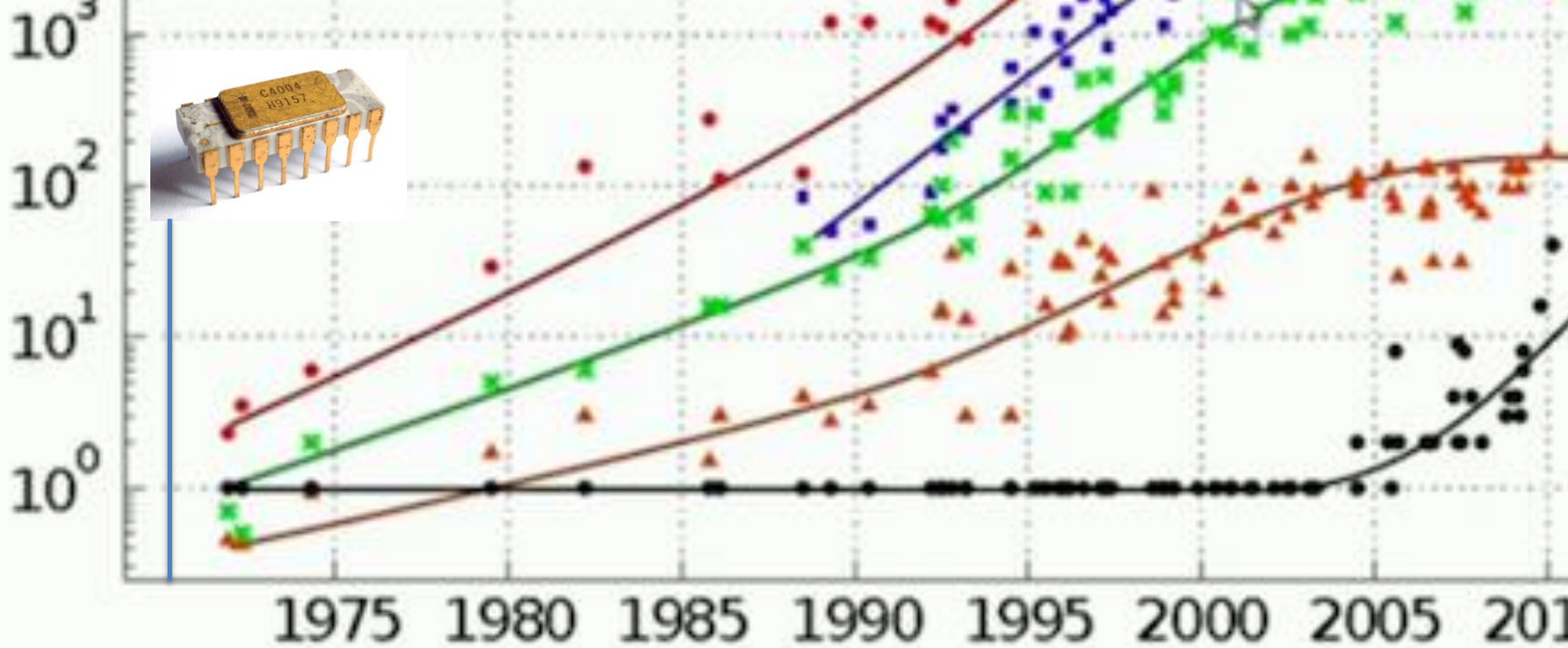
Professor Gunnar Tufte

gunnar.tufte@ntnu.no

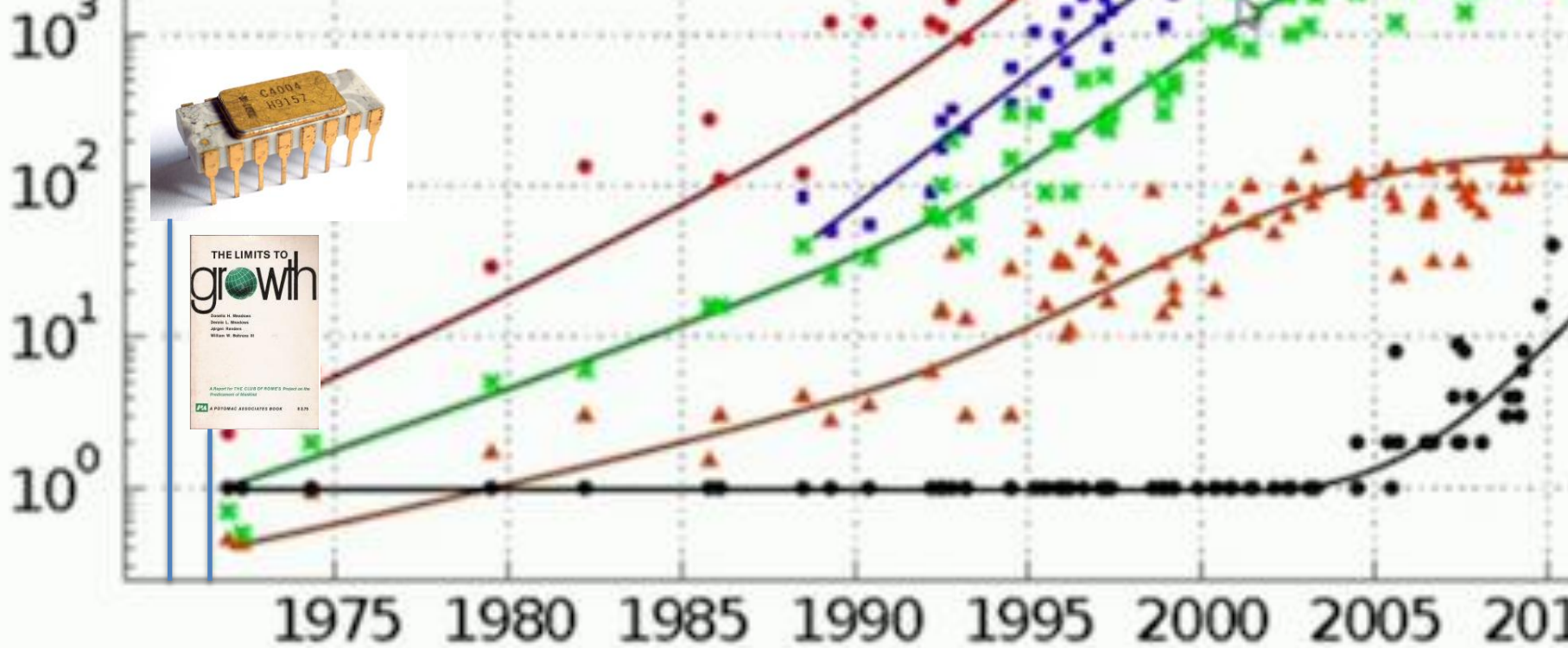
Technology Reaching Limitations



Original data collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond and C. Batten
Dotted line extrapolations by C. Moore



Original data collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Dotted line extrapolations by C. Moore



Original data collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Dotted line extrapolations by C. Moore

Technology Reaching Limitations

Physical

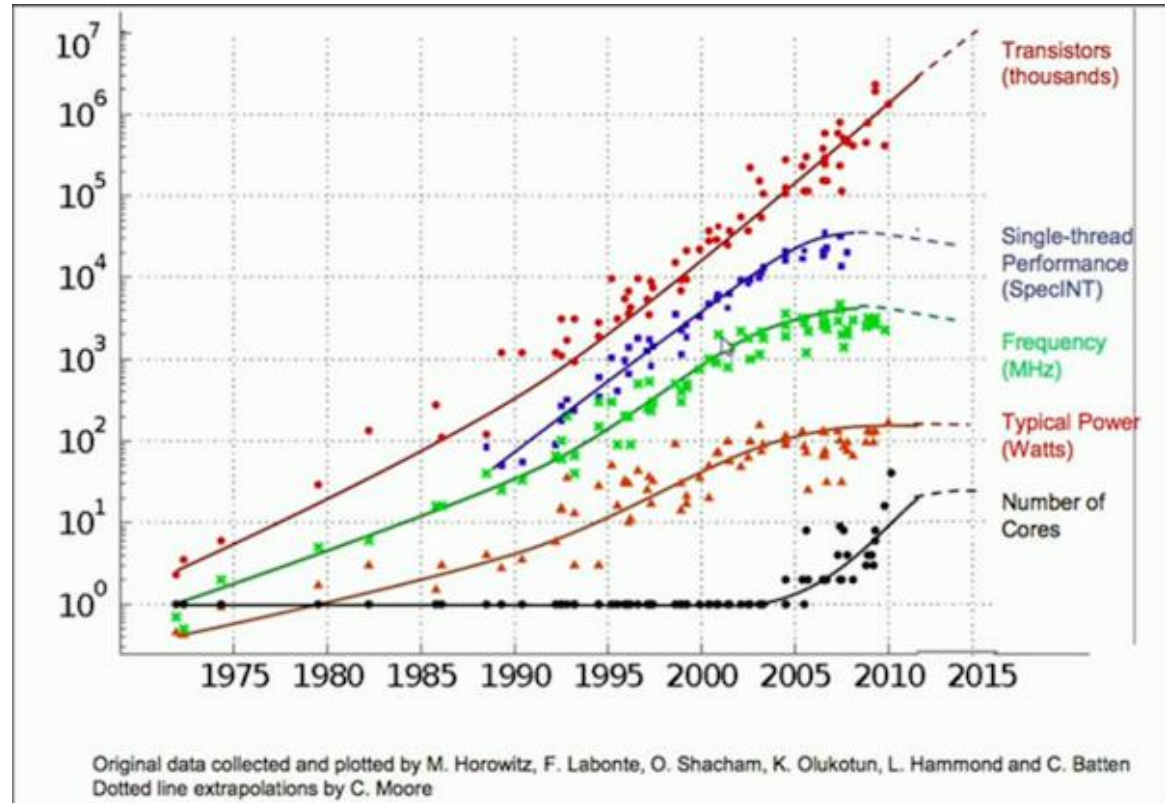
Reaching its limitations
size cost

Energy

Reaching its limitations
W/mm² frequency

Fault tolerant

Reaching its limitations
Every 5000 000 000 must work



Technology Reaching Limitations

Physical

Reaching its limitations
size cost

Energy

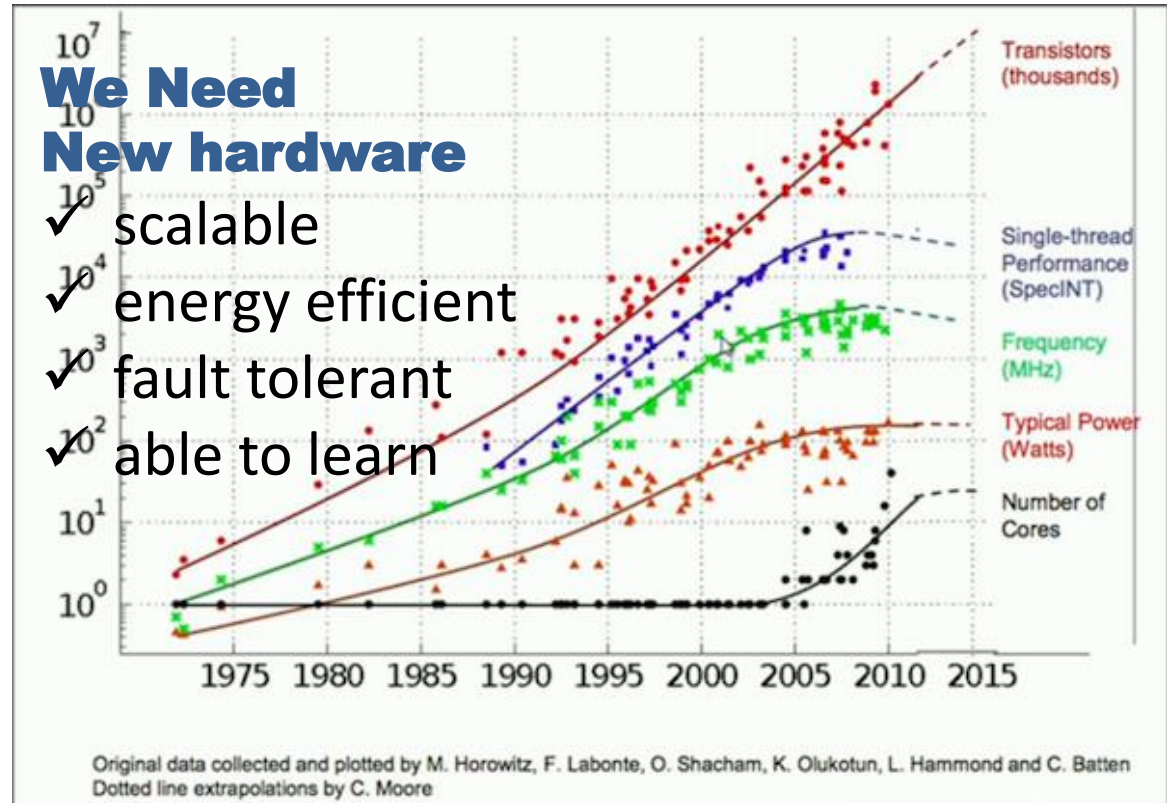
Reaching its limitations
W/mm² frequency

Fault tolerant

Reaching its limitations
Every 5000 000 000 must work

We Need New hardware

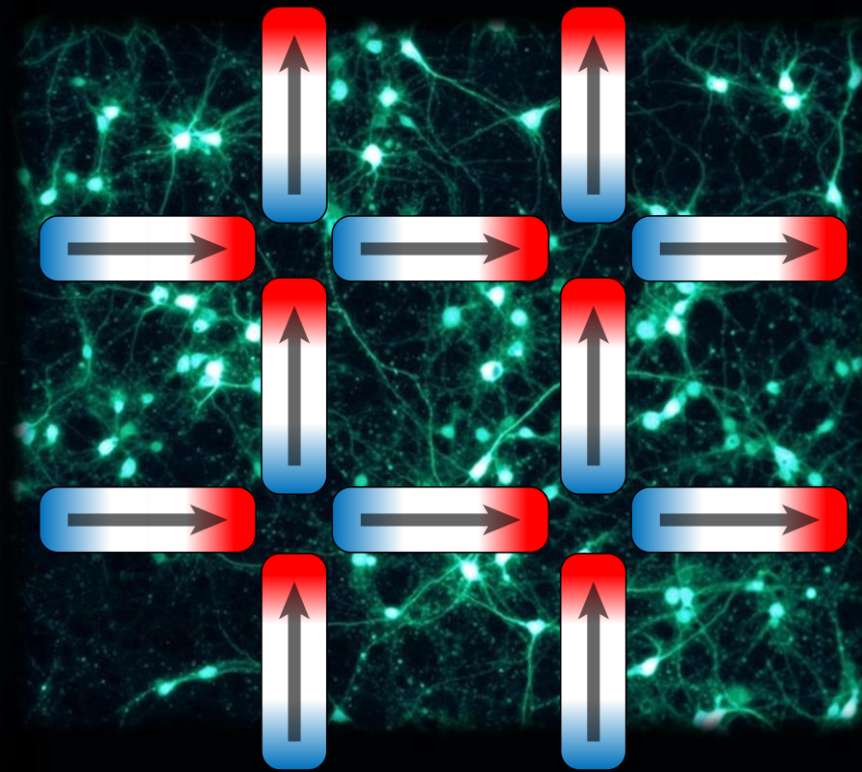
- ✓ scalable
- ✓ energy efficient
- ✓ fault tolerant
- ✓ able to learn



Learn from nature



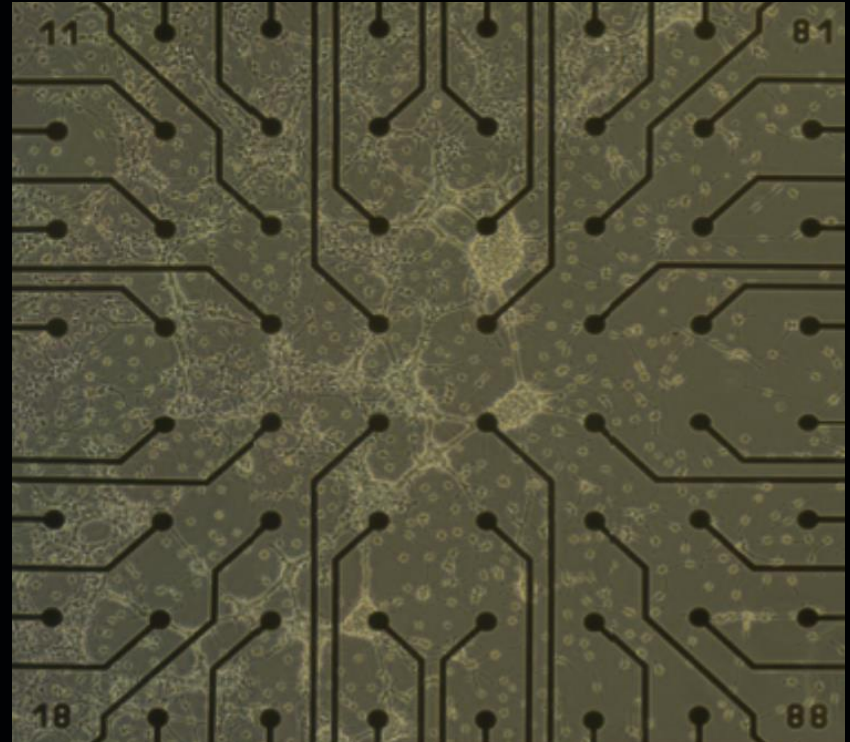
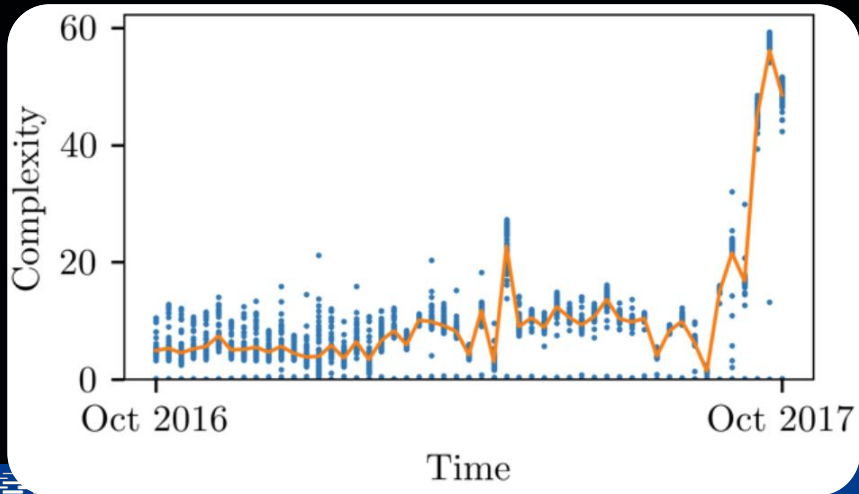
Transfer to nanomagnetic platform



Project idea

Neural Network Cultures

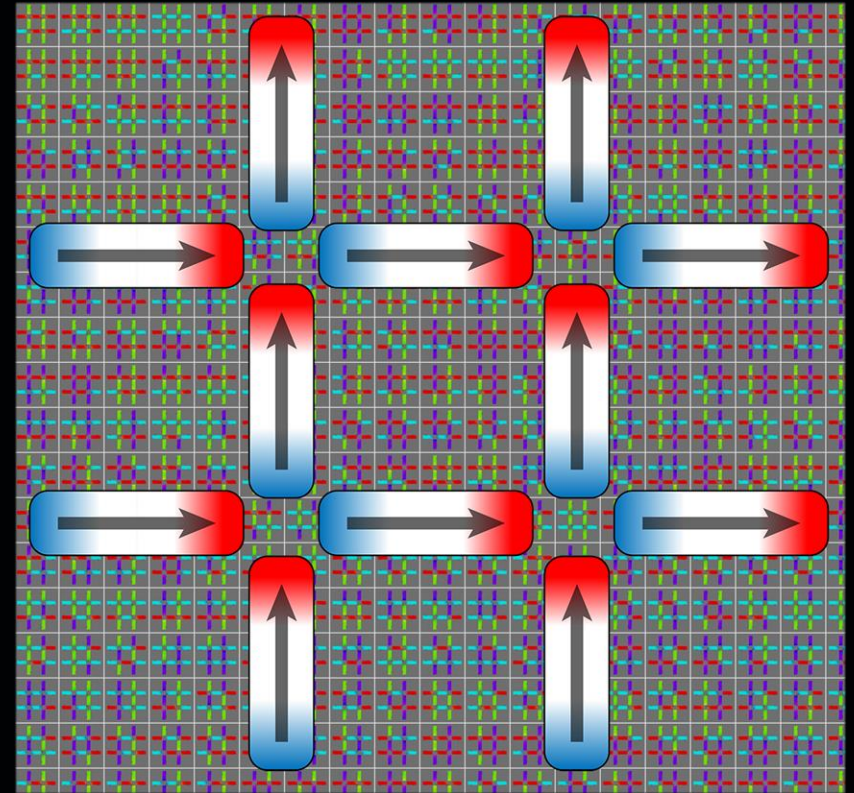
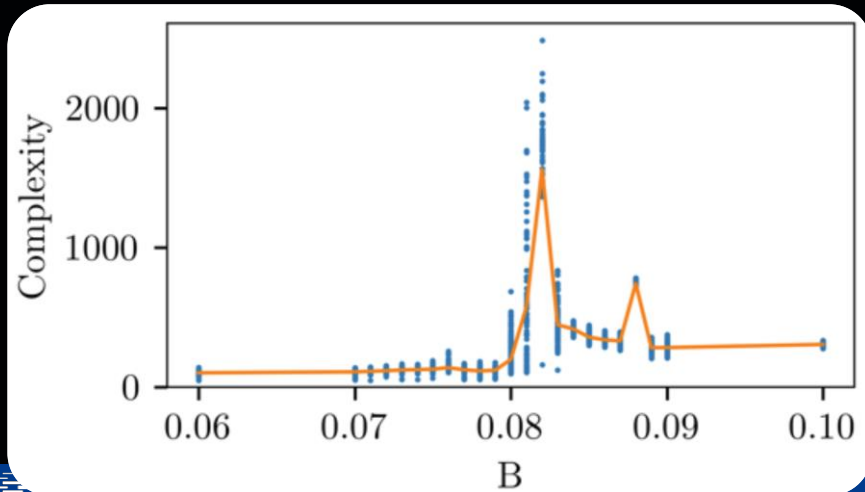
Implementation of neural network cultures and detection of dynamic behaviour



Project idea

Nanomagnet Ensemble

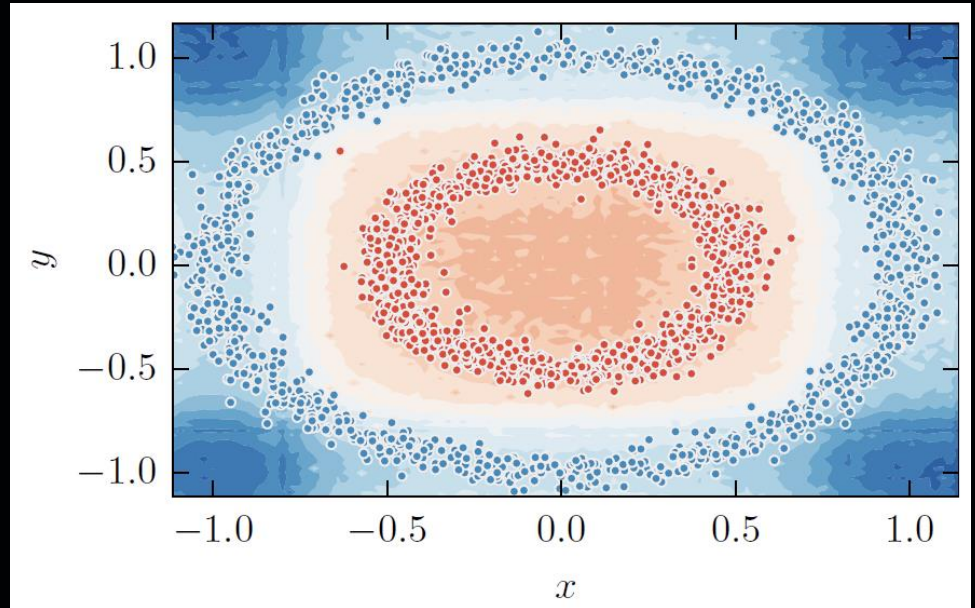
Established micromagnetic model of artificial spin-ice and explored dynamic behaviour



Verification of project idea

Computing Through Self-Organisation

Demonstrated that a very simple chaotic circuit with complex dynamics can solve computational tasks



Toward a Radical breakthrough

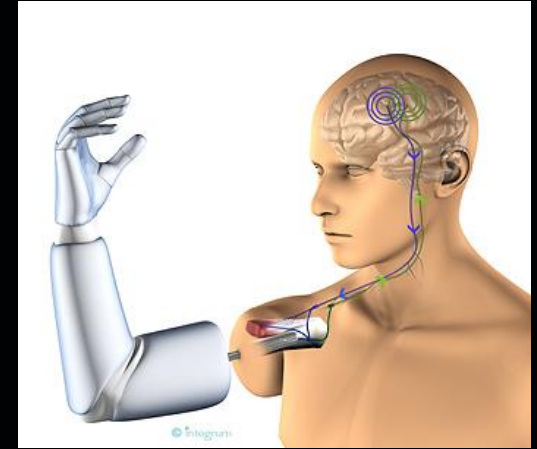
Technology

Scalable energy efficient computers

Machine self-organise architecture

Learning by self-organisation

Self-organisation



Neuro science

Neuro tissue repair and regeneration

Hybrid biological digital systems

Robotics/medical

Self-organisation

