

Automatic phase classification using machine learning

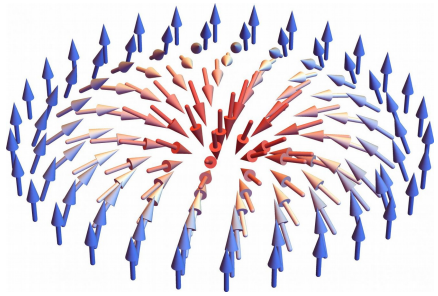
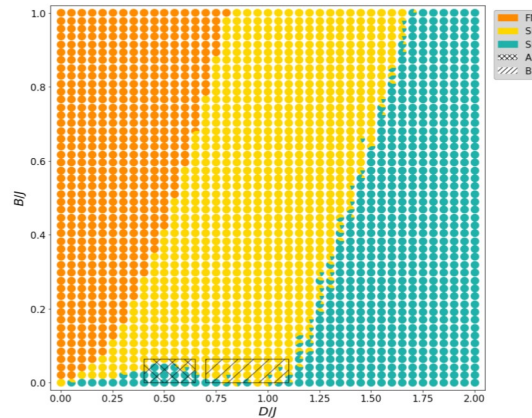
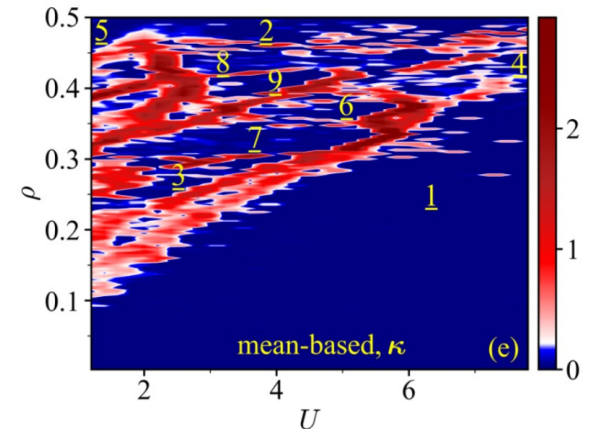


Illustration of magnetic skyrmion



O. Dušek: Phase diagram of Heisenberg model with DMI constructed using SVM



J. Arnold, et al.: PRRResearch (2021): Interpretable and unsupervised phase classification using DNN

Phase classification of complex systems

- can be time consuming and cumbersome
- we often don't know what we are looking for

What would you do?

- study phase diagrams and phase transitions of model systems
- automatize construction of phase diagrams, make ML results interpretable

Machine learning

- supervised phase classification
- unsupervised phase classification

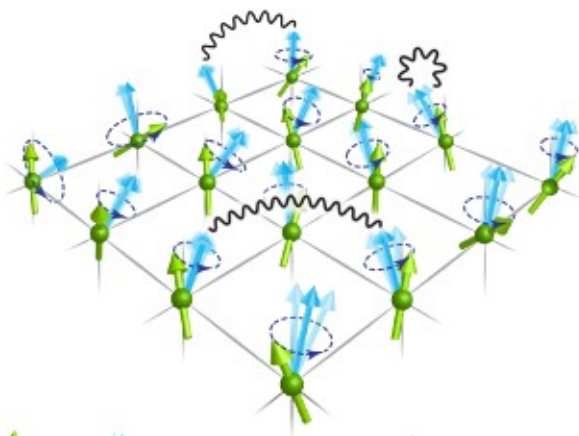
What would you learn

- spin models for spintronics
- or correlated electrons systems
- general machine learning classification techniques

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Machine learning for quantum matter

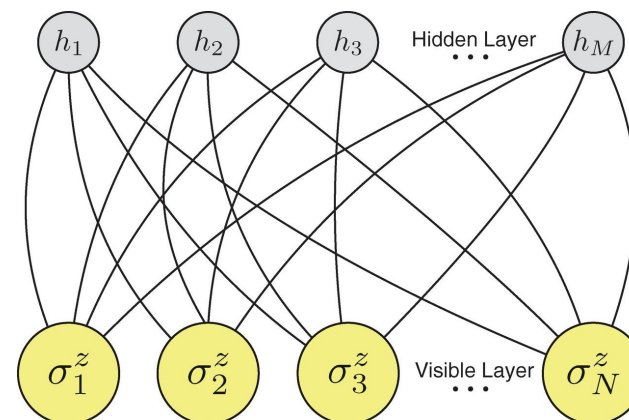


Wave function of a many body system

- is a high dimensional complex object
- approximations are necessary, e.g, variational method for ground state

What would you do?

- research on machine learning methods and their applicability in quantum physics
- application of RBM, CNN or DNN on simple spin systems



Machine learning

- Restricted Boltzmann Machines
- neural network as "trial wavefunction"

What would you learn

- interesting quantum problem
- basics of Quantum Monte Carlo
- machine learning for quantum systems

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