

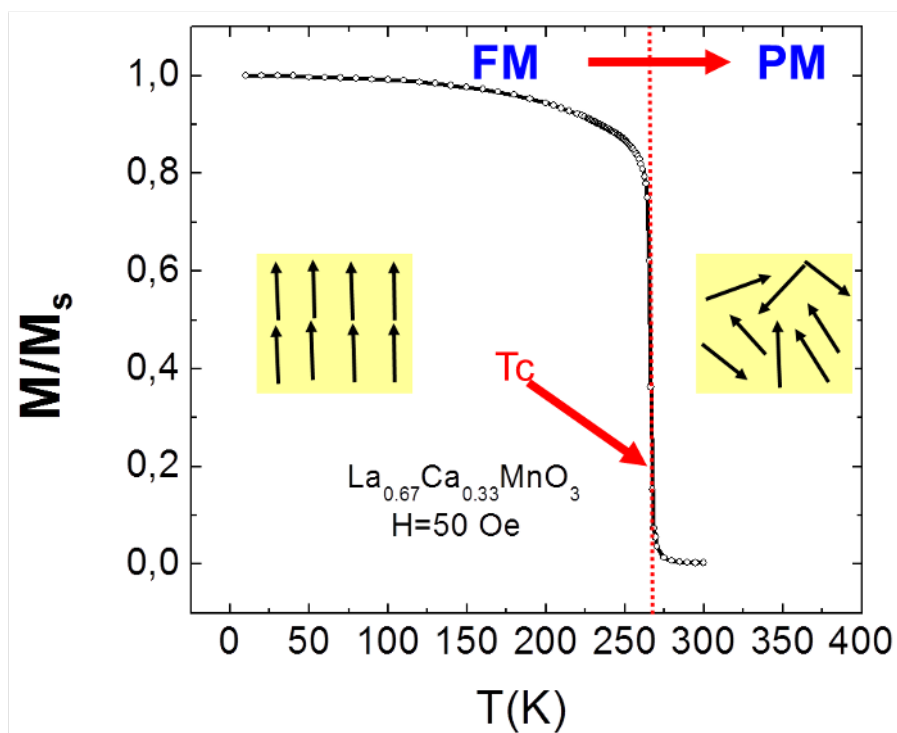
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Chapter 1

Ferromagnetism and the Ising Model

1.1 Ferromagnetism

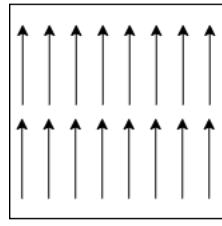


1.2 Ising Model

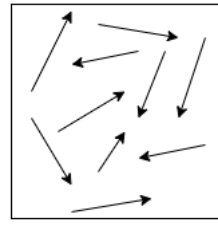
1.2.1 Joint Density of States

1.2.2 Thermodynamics

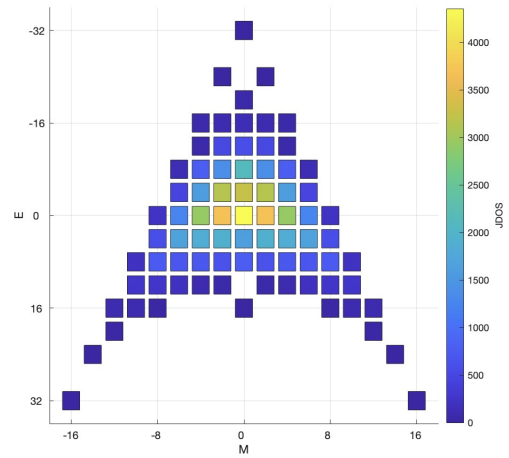
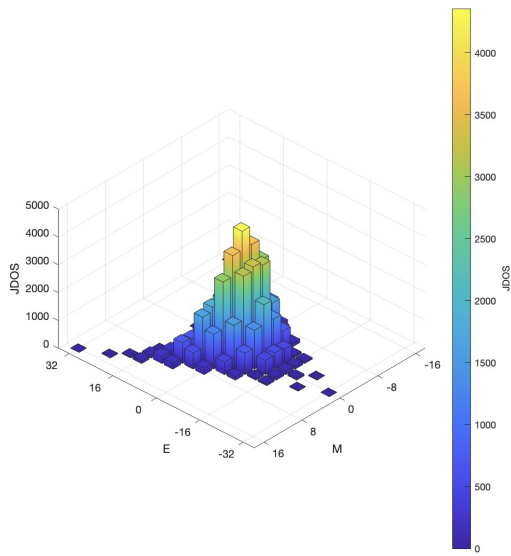
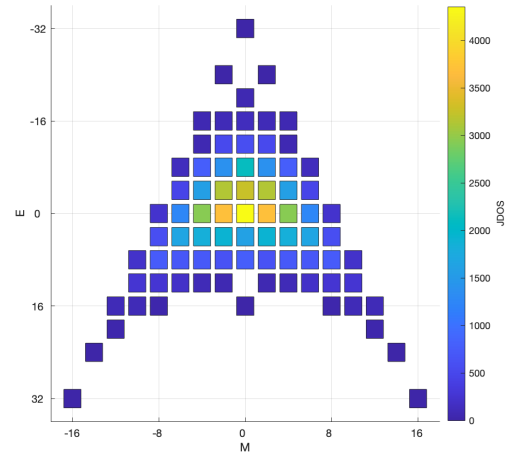
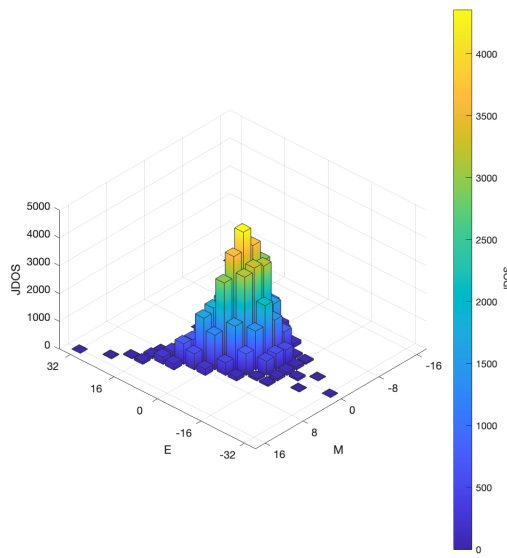
1.2.3 Relevance



Ferromagnetic Phase
 $T < T_c$
 Low Entropy



Paramagnetic Phase
 $T > T_c$
 High Entropy



Chapter 2

Monte Carlo Methods Applied to the Ising Model

2.1 Metropolis

2.1.1 Critical Slowing Down

2.2 Wang-Landau

2.2.1 Algorithm

2.2.2 Variations

2.2.3 Success and Limitations

Chapter 3

Flat Scan Sampling

3.1 Background

3.2 Algorithm

3.3 Implementations

3.3.1 Single Core

3.3.2 MPI

3.4 Validation and Convergence

3.5 Performance

3.5.1 Amdhal's Law and Parallel Scaling

3.6 Comparison with Wang-Landau Sampling

Chapter 4

Thermodynamics and Finite Size Scaling

Chapter 5

Conclusion and Future Work