

# Advanced Monte Carlo: Ising Model

Jacob Calcutt,

Gregorio Ponti,

Physics 480,

Computational Physics,

Spring 2015

Michigan State University

March 18, 2015

# Contents

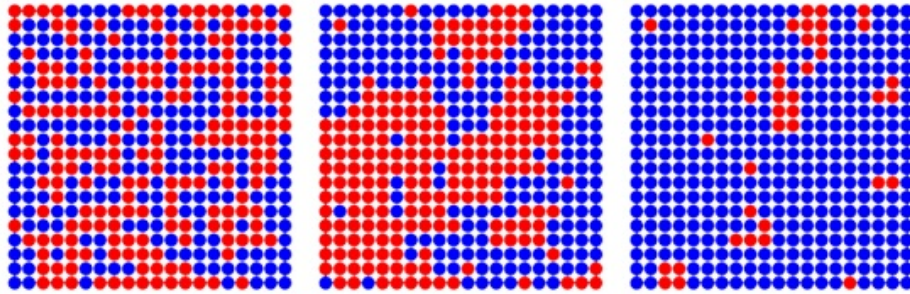
<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	Ising Model . . . . .	3
1.2	Initialization . . . . .	4
1.3	Wolff Algorithm . . . . .	4
1.4	Calculations . . . . .	4
1.4.1	Magnetization . . . . .	4
1.4.2	Magnetic Susceptibility . . . . .	4
1.4.3	Critical Temperature . . . . .	4
1.4.4	Internal Energy . . . . .	4
1.4.5	Heat Capacity . . . . .	4
1.4.6	Critical Exponents . . . . .	4
<b>2</b>	<b>Results</b>	<b>5</b>
2.1	Magnetization . . . . .	5
2.2	Magnetic Susceptibility . . . . .	5
2.3	Critical Temperature . . . . .	5
2.4	Internal Energy . . . . .	5
2.5	Heat Capacity . . . . .	5
2.6	Critical Exponents . . . . .	5
<b>3</b>	<b>References</b>	<b>7</b>

# 1 Introduction

I STICK MA DICK IN THE OWL

## 1.1 Ising Model

Figure 1: Sample of the vis we want



## 1.2 Initialization

## 1.3 Wolff Algorithm

## 1.4 Calculations

### 1.4.1 Magnetization

### 1.4.2 Magnetic Susceptibility

$$\chi = \frac{d(\textit{Magnetization})}{dT} \quad (1.4.1)$$

### 1.4.3 Critical Temperature

### 1.4.4 Internal Energy

$$E = -J \cdot \sum_{\langle i \rangle \langle j \rangle} S_i S_j \quad (1.4.2)$$

### 1.4.5 Heat Capacity

$$C_V = \frac{dE}{dT} \quad (1.4.3)$$

### 1.4.6 Critical Exponents

## 2 Results

### 2.1 Magnetization

### 2.2 Magnetic Susceptibility

### 2.3 Critical Temperature

### 2.4 Internal Energy

### 2.5 Heat Capacity

### 2.6 Critical Exponents



### 3 References

#### References

- [1] Thijssen, J. M. *Computational Physics*. Ch. 8. Cambridge University Press. 1999. Print.