

Title: Tutorial: Introduction to Monte Carlo Methods

Date: Jun 19, 2017 02:00 PM

URL: <http://pirsa.org/17060065>

Abstract:

TUTORIAL MONTE CARLO

TODAY : • WRITE A PROGRAM TO SIMULATE
THE 40×40 ISING MODEL, USING METROPOLIS

• plot $|M|$ vs β

SKETCH :

```
main()
```

```
{
```

```
    initlatt();
```

```
    for (it=0; it<100000; it++) {
```

```
        k = N * random();
```

```
        deltaE = ...
```

```
        if (random() <  $\exp(-\text{BETA} \cdot \text{deltaE})$ ) { spin(k) = -spin(k); }
```

```
    }
```

```
}
```

```

k = N * random();
deltaE = .....
if (random() < exp(-BETA * deltaE)) { spin[k] = -spin[k]; }

```

```

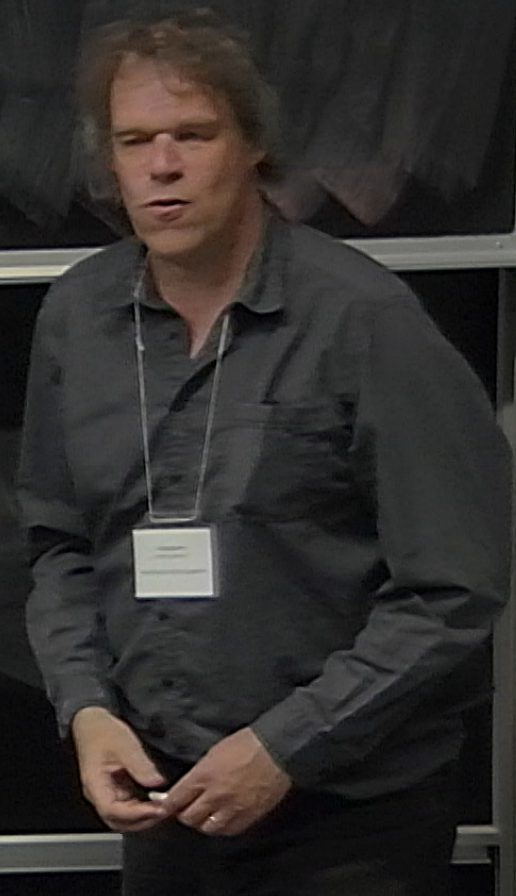
} showSpins();
}

```

```

{
for (i=0; i<N; i++) {
if (i%L==0) printf("\n");
if (spin[i]==1) printf("+");
else printf("-");
}
}
}

```



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• plot $|M|$ vs β

[TOMORROW:

• OPTIONALLY, THE WULFF ALGORITHM

• $\chi = \frac{\beta}{N} (\langle M^2 \rangle - \langle M \rangle^2)$ vs β FOR $L=20, 30, 40, 50, 60, 80, 100$

• DATA COLLAPSE (FINITE-SIZE SCALING $\Rightarrow \gamma, \nu$)]

TODAY: • WRITE A PROGRAM TO SIMULATE
 THE 40×40 ISING MODEL, USING METROPOLIS
 FOR $M \in [0.3 \dots 0.5]$
 • plot $|M|$ vs β

[TOMORROW:

- OPTIONALLY, THE WULFF ALGORITHM
- $\chi = \frac{\beta}{N} (\langle M^2 \rangle - M^2)$ vs β FOR $L = 20, 30, 40, 50, 60, 80, 100$
- DATA COLLAPSE (FINITE-SIZE SCALING $\Rightarrow \gamma, \nu$)

WARNING: FOR $(i-1) \bmod N$, USE $(i-1+N) \% N$

- <https://julialang.org/downloads/>
- `Pkg.add("IJulia")`
- Open notebook sent by Stephanie