Symulacja Monte Carlo Modelu Isinga

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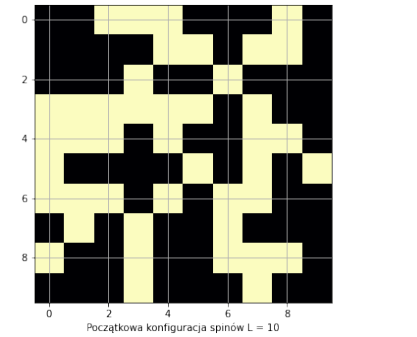
16 czerwca 2023

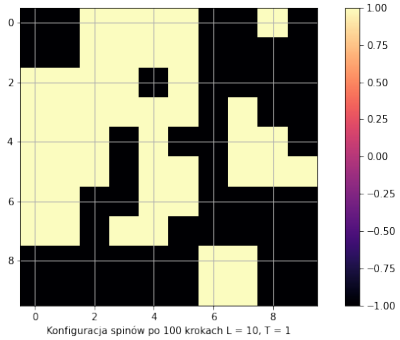
1 Użyte narzędzia.

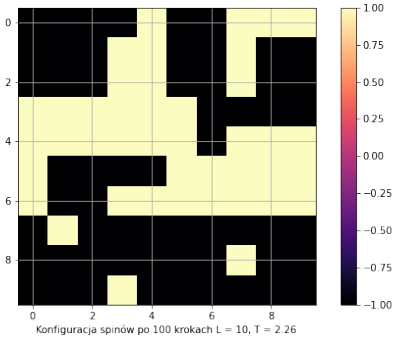
- Program napisany w języku: Python.
- Użyte biblioteki: numpy, scipy, mathplotlib, numba
- Generator liczb pseudolosowych: random.randint
- Rysunki wykonane przy użyciu: mathplotlib
- Wsparcie sztucznej inteligencji: NIE

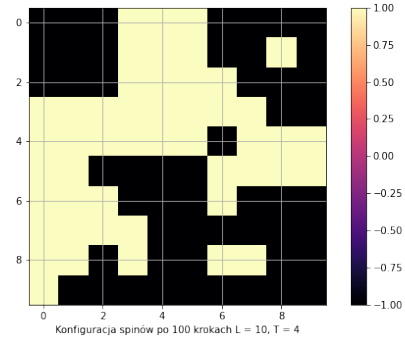
2 Konfigurację spinów po 100 krokach MC dla sieci $L = \{10, 80\}$ dla trzech temperatur: $T_1 = 1$, $T_2 = 2,26$, $T_3 = 4$.

$L = 10$**:**

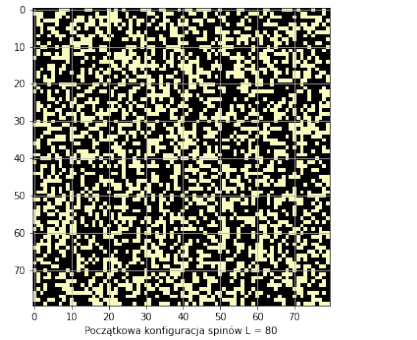


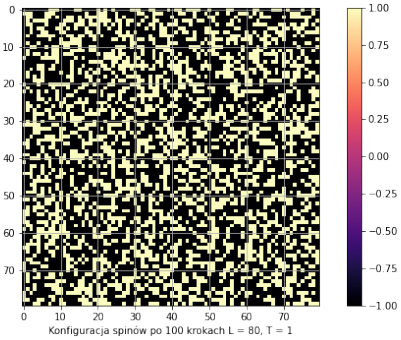


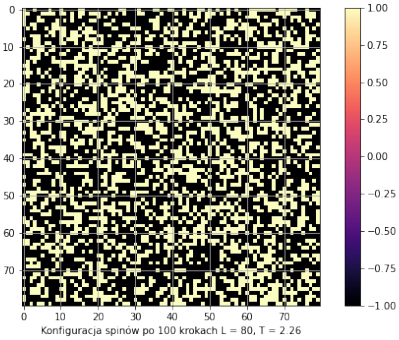


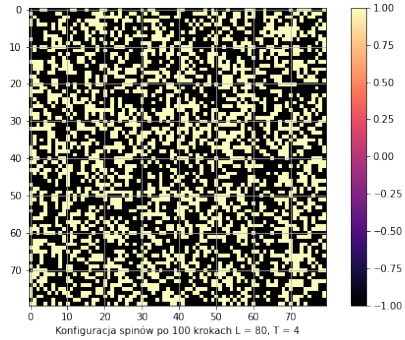


$L = 80$**:**

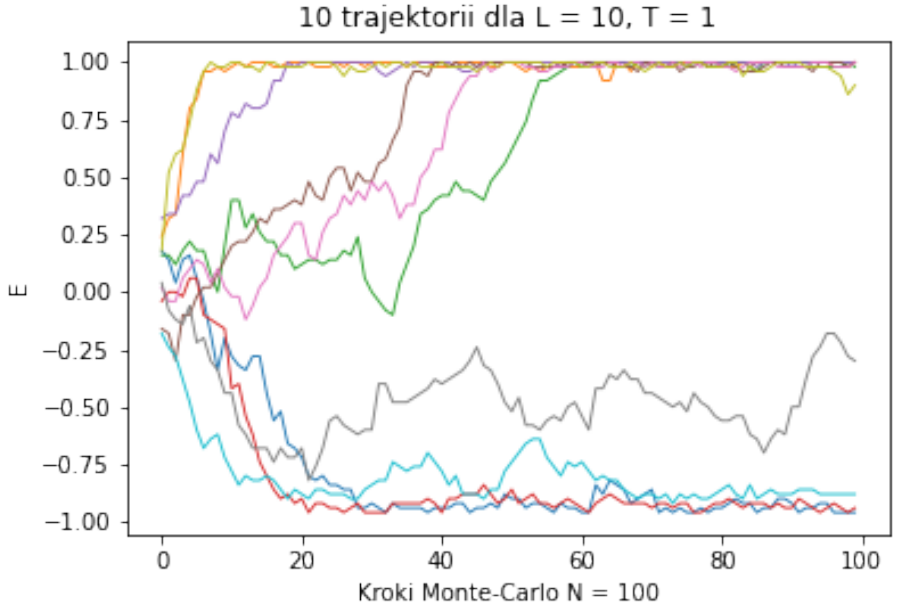


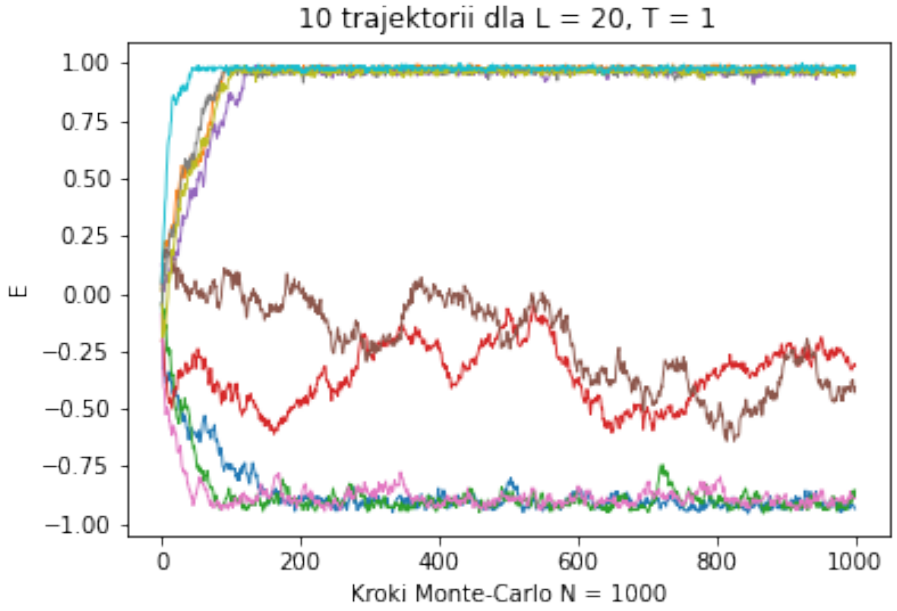


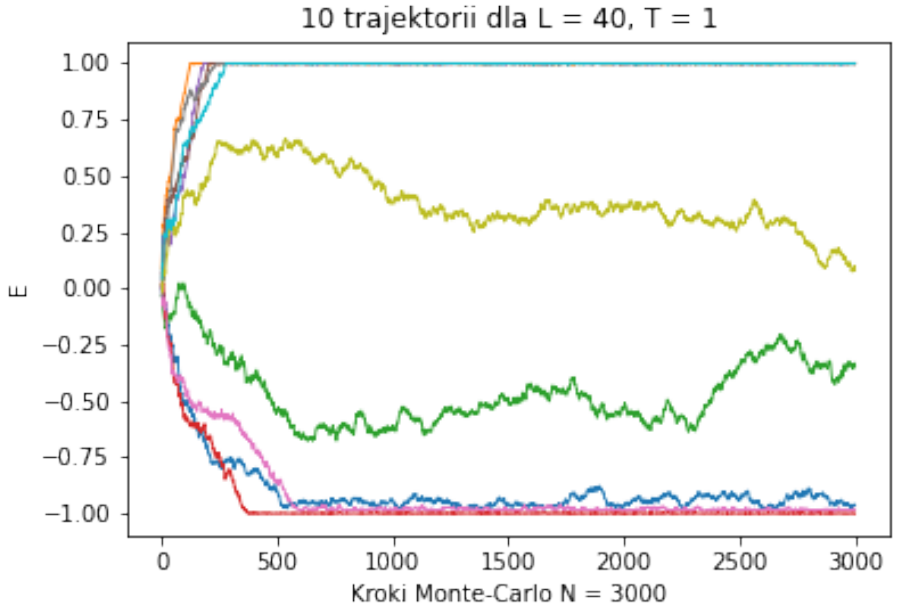


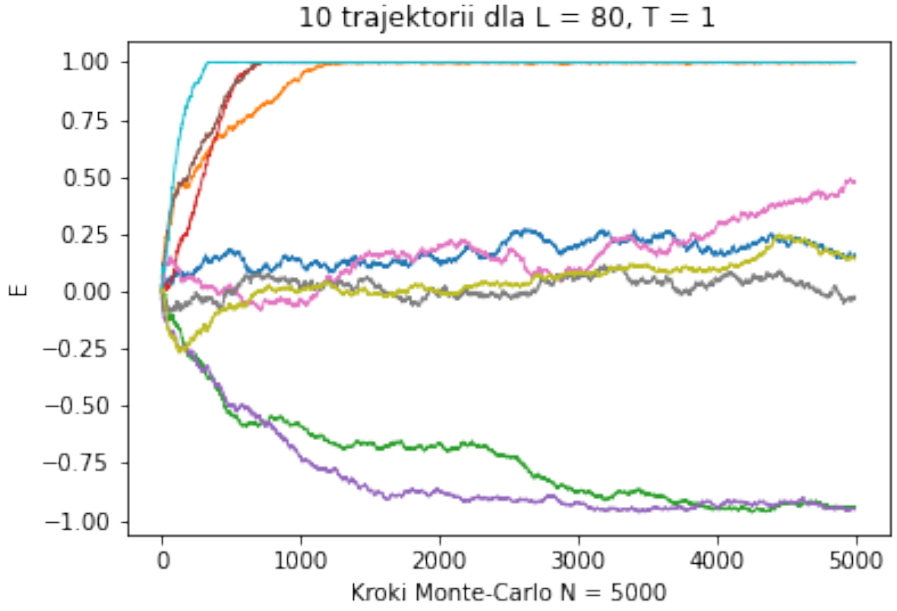


3 Pojedyncze trajektorie dla $L = \{10, 20, 40, 80\}$ dla temperatury $T_1 = 1$



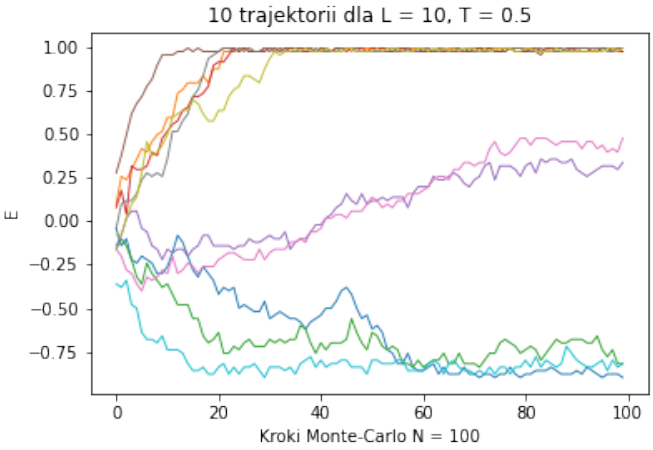


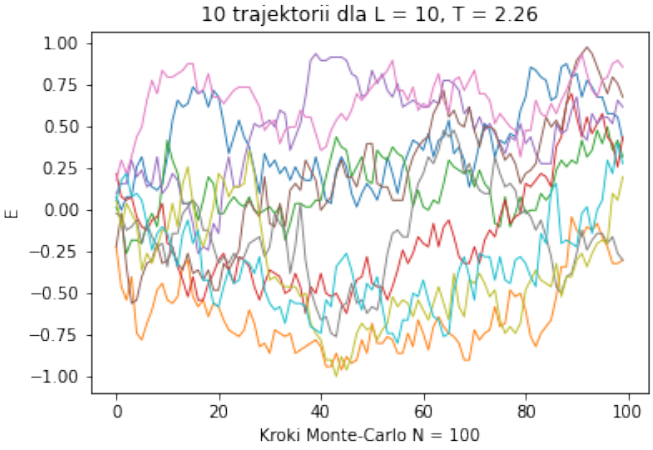

10 trajektorii dla L = 40, T = 1
E
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
500
1000
1500
2000
2500
3000
Kroki Monte-Carlo N = 3000

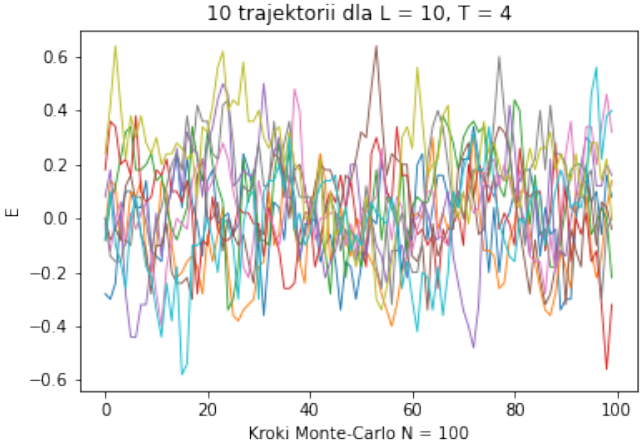

10 trajektorii dla L = 80, T = 1
E
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
1000
2000
3000
4000
5000
Kroki Monte-Carlo N = 5000

4 Pojedyncze trajektorie dla $L = \{10, 20, 40, 80\}$ dla temperatur $T_i = \{0.5, 2,26, 4\}$, gdzie $T_1 < T^*$, $T_2 = T^*$, $T_3 > T^*$.

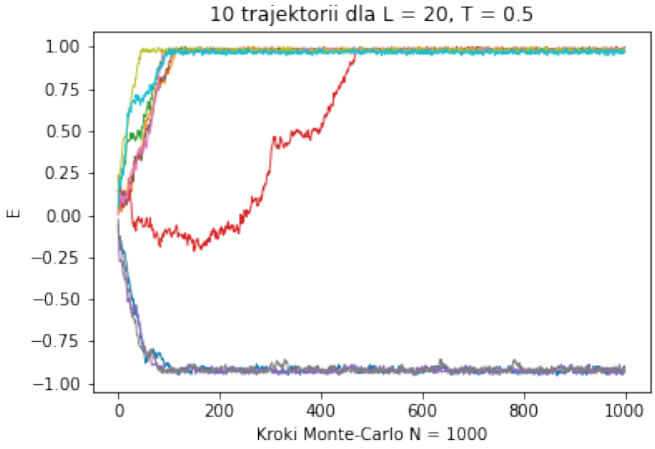
$L = 10$:

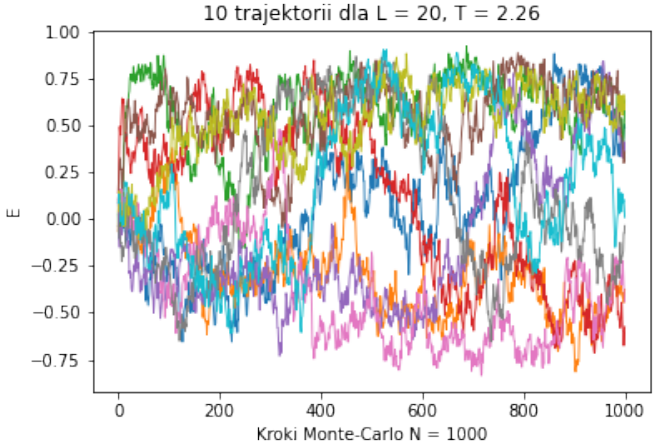


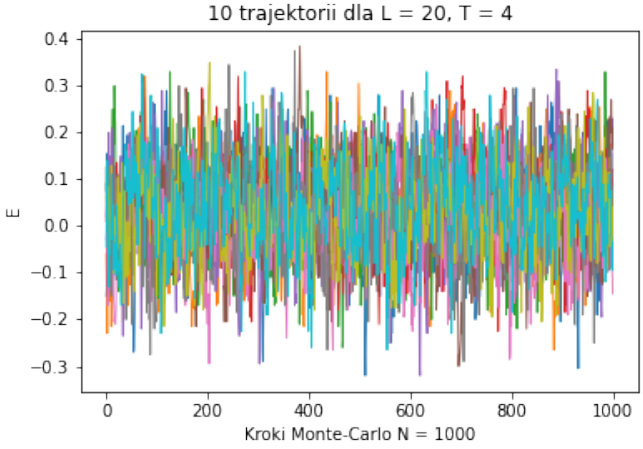




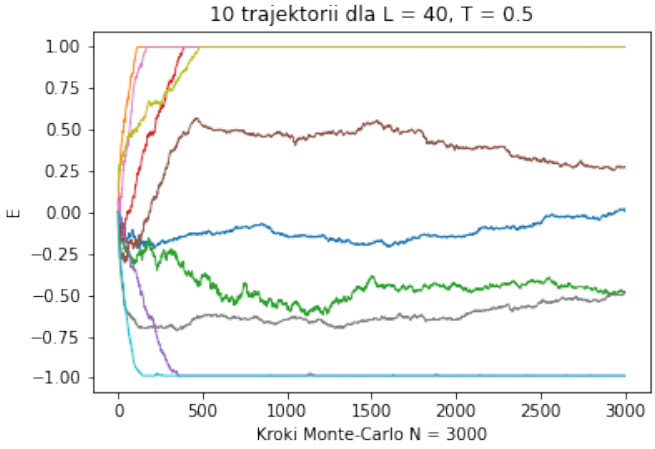
$L = 20$**:**

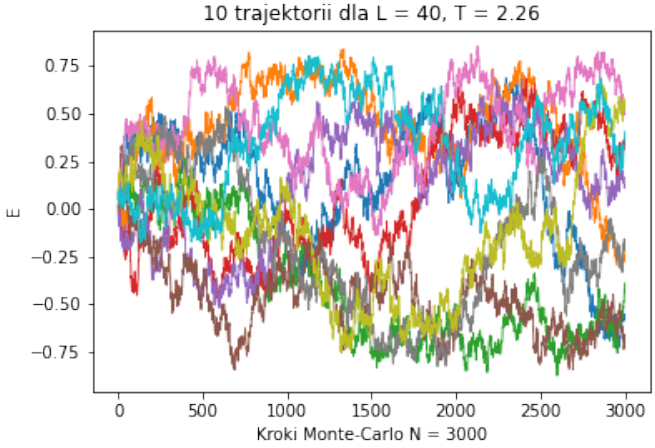

10 trajektorii dla L = 20, T = 0.5
E
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
200
400
600
800
1000
Kroki Monte-Carlo N = 1000

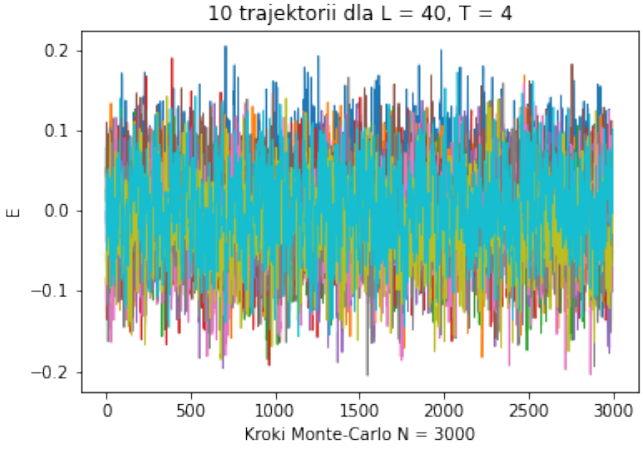

10 trajektorii dla L = 20, T = 2.26
E
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
0
200
400
600
800
1000
Kroki Monte-Carlo N = 1000


10 trajektorii dla L = 20, T = 4
E
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
0
200
400
600
800
1000
Kroki Monte-Carlo N = 1000

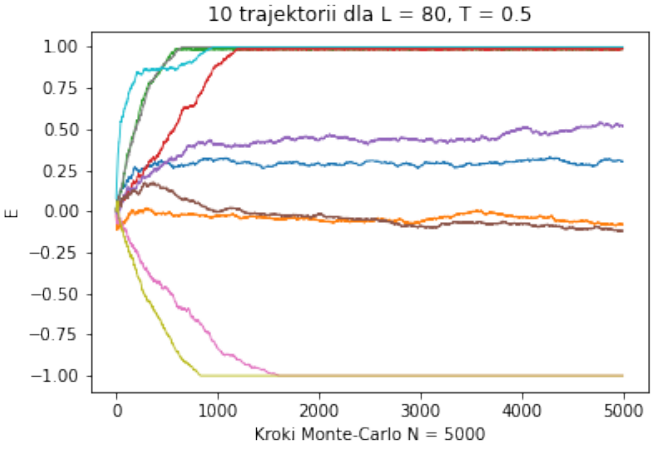
$L = 40$**:**

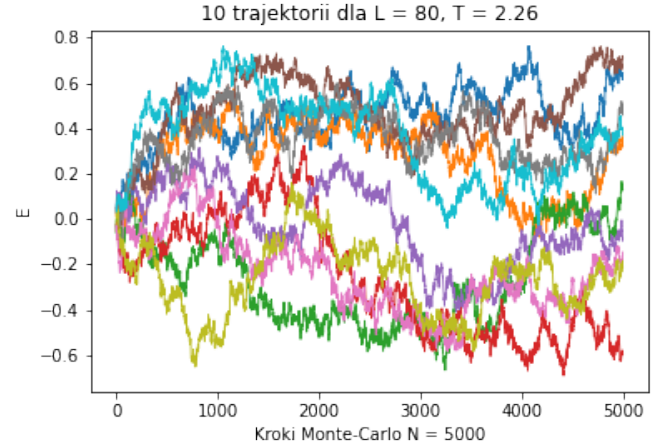

10 trajektorii dla L = 40, T = 0.5
E
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
500
1000
1500
2000
2500
3000
Kroki Monte-Carlo N = 3000

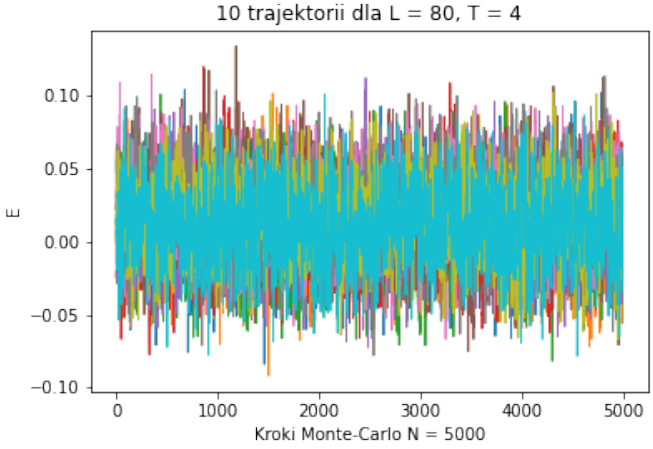

10 trajektorii dla L = 40, T = 2.26
E
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
0
500
1000
1500
2000
2500
3000
Kroki Monte-Carlo N = 3000


10 trajektorii dla L = 40, T = 4
E
0.2
0.1
0.0
−0.1
−0.2
0
500
1000
1500
2000
2500
3000
Kroki Monte-Carlo N = 3000

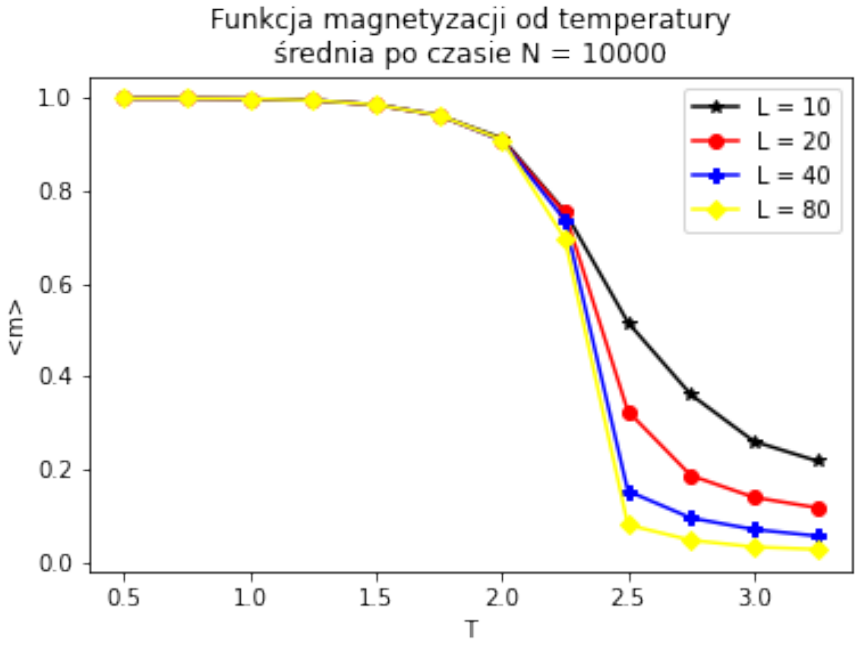
$L = 80$**:**


10 trajektorii dla L = 80, T = 0.5
E
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
1000
2000
3000
4000
5000
Kroki Monte-Carlo N = 5000


10 trajektorii dla L = 80, T = 2.26
E
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
0
1000
2000
3000
4000
5000
Kroki Monte-Carlo N = 5000


10 trajektorii dla L = 80, T = 4
E
0.10
0.05
0.00
−0.05
−0.10
0
1000
2000
3000
4000
5000
Kroki Monte-Carlo N = 5000

5 Magnetyzację jako funkcję temperatury uśredniona po czasie dla zakresu temperatur $T \in (0.5, 3.5)$.



6 Magnetyzację jako funkcję temperatury uśredniona po zespole dla zakresu temperatur $T \in (0.5, 3.5)$.