Computational Physics (physics760)
Exercise 6

Ajay S. Sakthivasan, Dongjin Suh

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1. **Correlator Bias**
   As discussed in the lecture, the algorithm may not explore all spin configurations for large ($\gg J_c$) value of J. The algorithm might settle for one particular spin configuration, either almost all spin-up or almost all spin-down, in which case the correlator will always be close to 1. This means that there is no bias in the Correlator, since we expect for large values of J, the correlation to be close to 1.

2. **Correlator ($r = 0$)**
   If $r = 0$, we are calculating the correlation o each spin site with itself. Since, each spin can either up or down, the product will always be 1. Dividing by the total number of sites, we get $C_0 = 1$.

3. **Correlator as convolution**
   We proceeded to implement the correlator as a convolution. This can be found in the file `corr.py`. For $r = 0$, we obtain the expected value of 1.

4. **Behaviour of C for different N**
   Due to time constraints, we evaluated the behaviour of C at the critical value for the values of $N = 3, 5, 7, 9, 11$, for 1000 sweeps over the entire lattice. The obtained plots, 1, are given below. Note that the x-axis contains the values of r and the y-axis has the values of the r-correlator. We aim to update this to 20000 sweeps and up to a lattice size of 23 for the next submission.

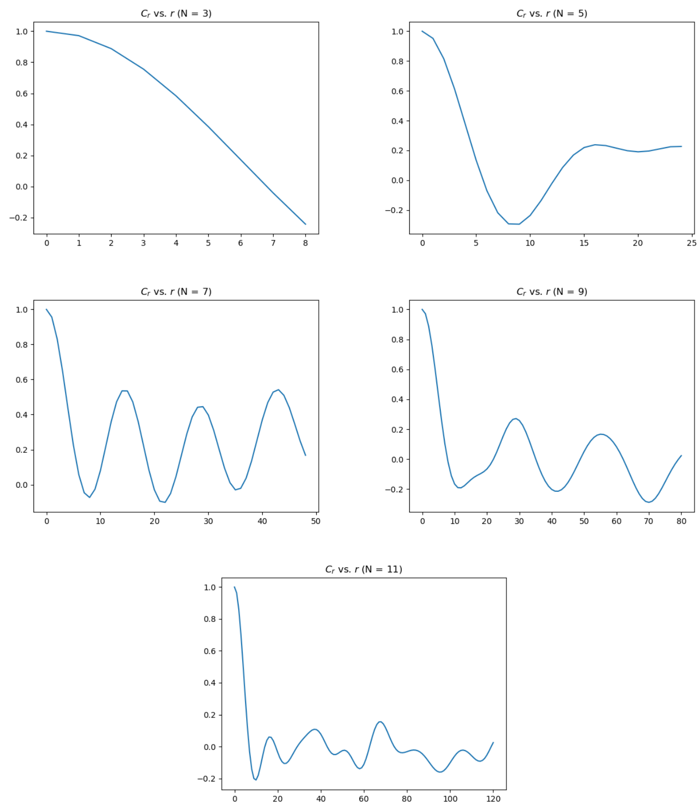

Figure 1: Behaviour of C for different N. x-axis: r-values; y-axis: Correlator