Modeling and simulation
LAB 2
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The plot below shows the average cycle length for a one dimensional Cellular Automata. We took our k-value to be equal to two, which means each cell can take two possible states. We named our states 0 and 1, this could for example represent a ground and an excited state. Our r-value equals one, this implies that there are $k^{2r+1} = 2^3 = 8$ possible configurations. Given all this we were able to derive the production rules.

In our first class (CASim) we then derived the cycle length for a specific rule number. Then in our second class (CASimFig) we graphed the first 256 rules and compared their average cycle length for different initial conditions. These initial conditions were randomized with a probability of 0.6 for a value being one. We averaged over N=40 runs with each having different randomized initial conditions.

Then we color coded the rulenumbers according to the list of Wolfram classes per rule. We see that for class one the errorbars are really small which implies that the rulenumbers evolve in (almost) the same manner each time. We observe larger error bars for the other classes but this also largely depends on the rule number. This suggests that for some rule numbers the grid (with width a of 40 cells) progresses similar over time each run and for some it evolves differently depending on the initial conditions. If a run exceeded the maximum runtime (t=200) we assumed the cycle length to equal t_{max}.