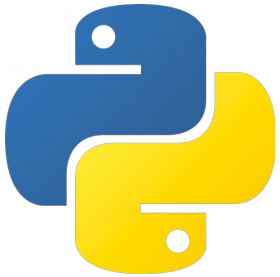
NeuroPhysMath (NPM)
Progress Report

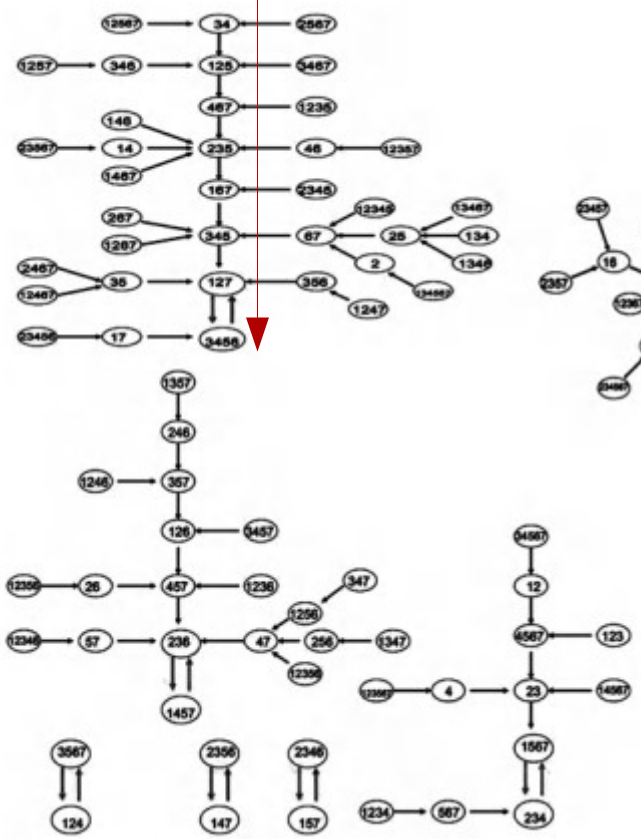
Ali Fele Paranj
Ata Tahouri Torki
Elahe Mollaheydar



First Step

Reproducing the data

First path



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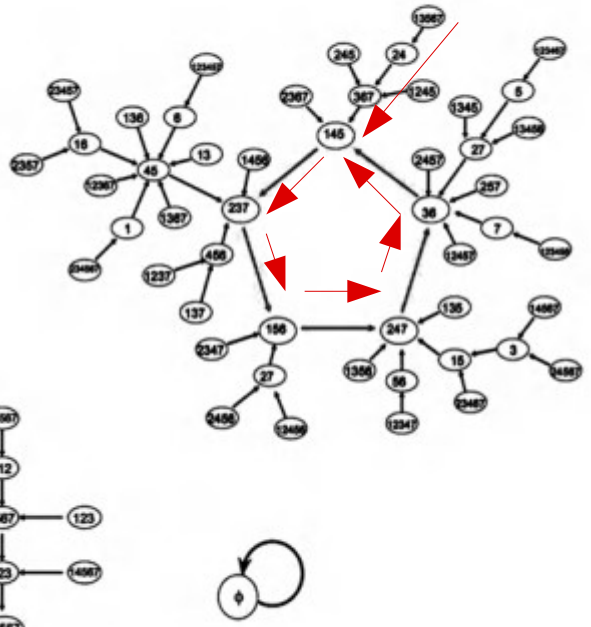

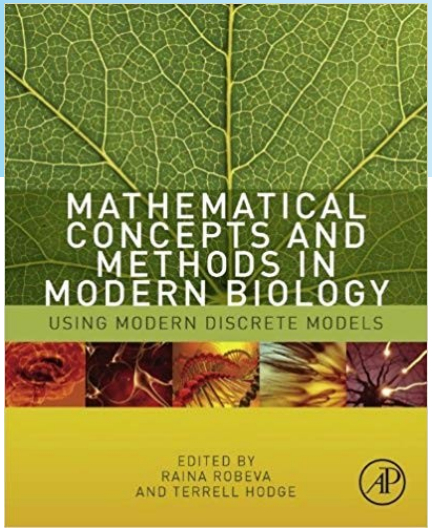


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Out[18]: [[1, 2, 5, 6, 7],
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          [4, 6, 7],
          [2, 3, 5],
          [1, 6, 7],
          [3, 4, 5],
          [1, 2, 7],
          [3, 4, 5, 6],
          [1, 2, 7]]
```

```
Out[21]: [[1, 3, 5, 6, 7],
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          [3, 6],
          [1, 4, 5]]
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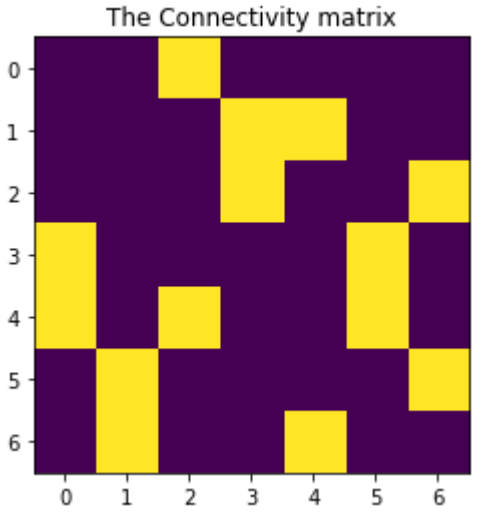
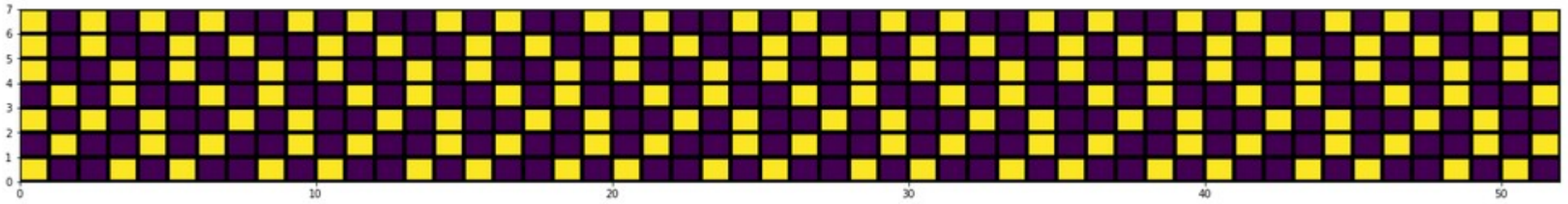
One Step Further

Inventing a new Visualization mode for the neurons activity and Visualizing the Connectivity Matrix

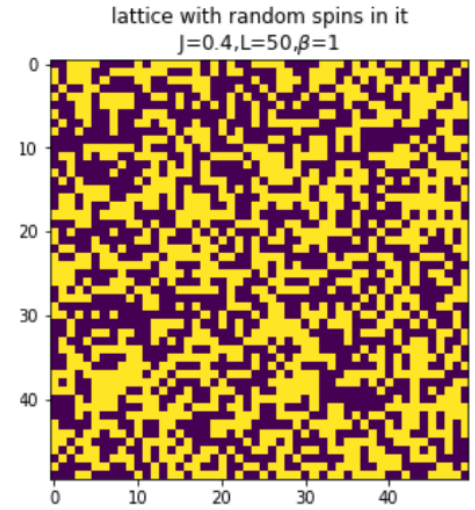


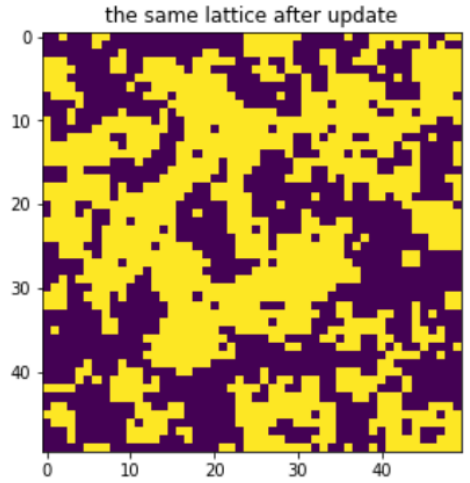
Connectivity Matrix

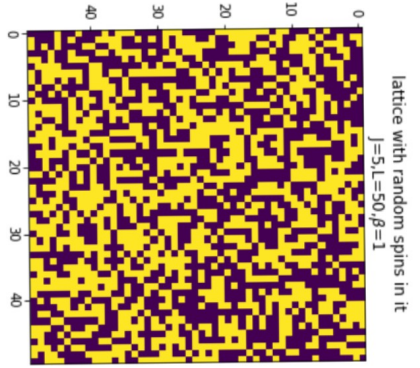
Neurons Activity Trajectory

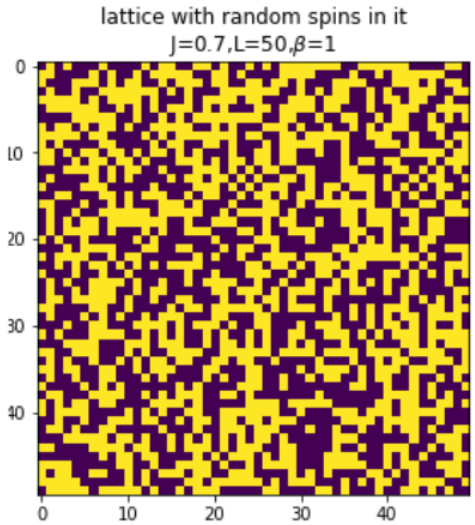


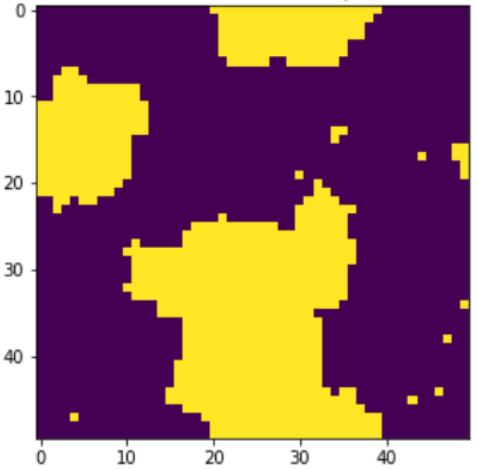
Our Simulation Ising Model

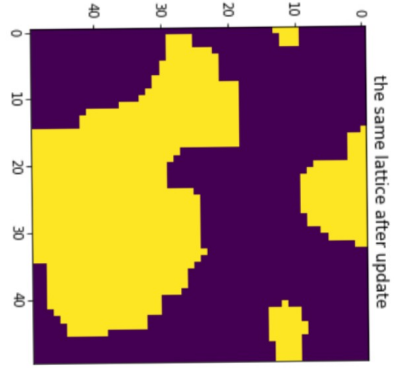


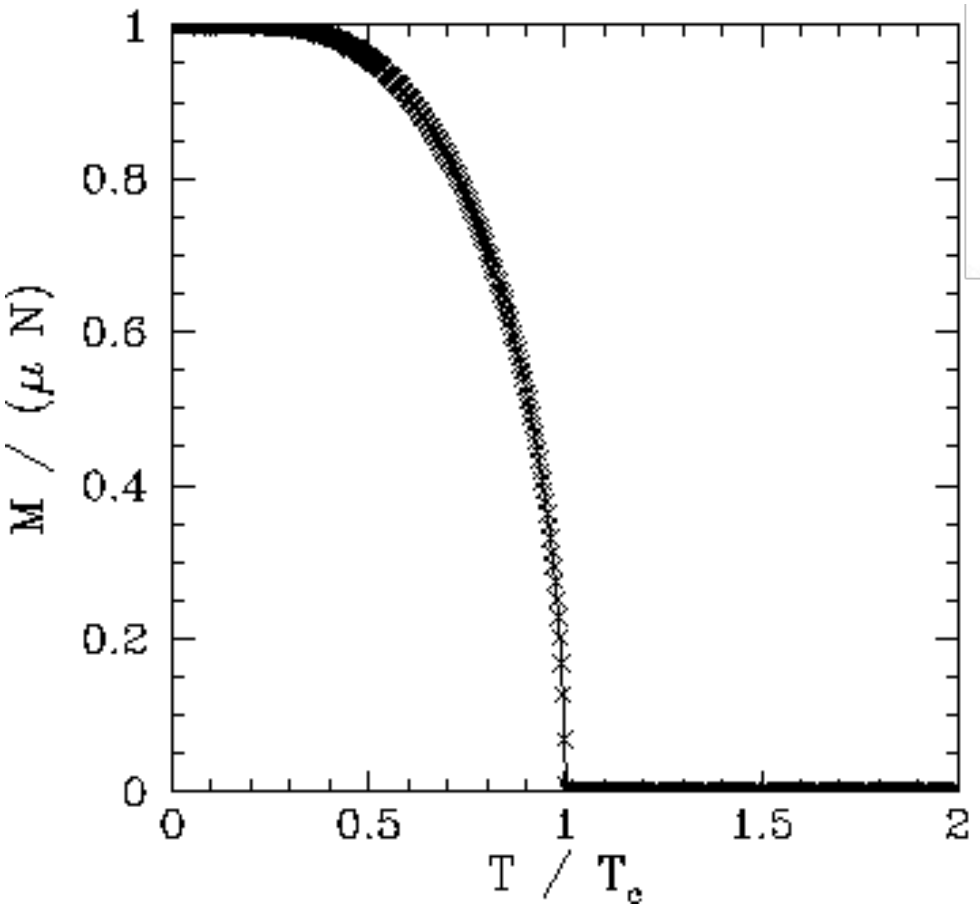










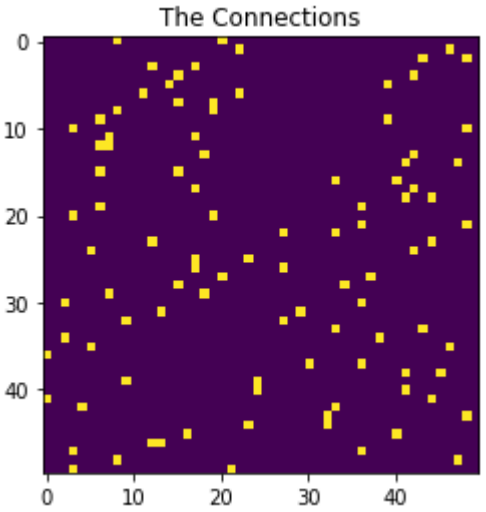


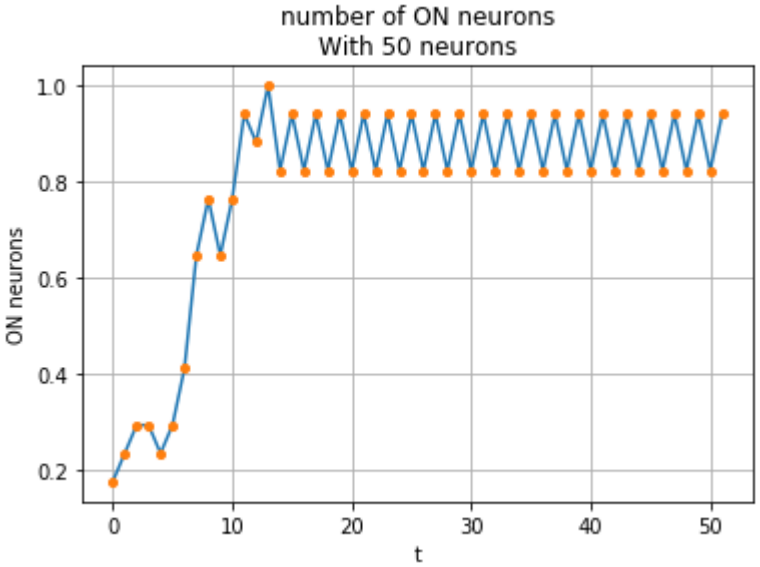
M is The mean of Spins

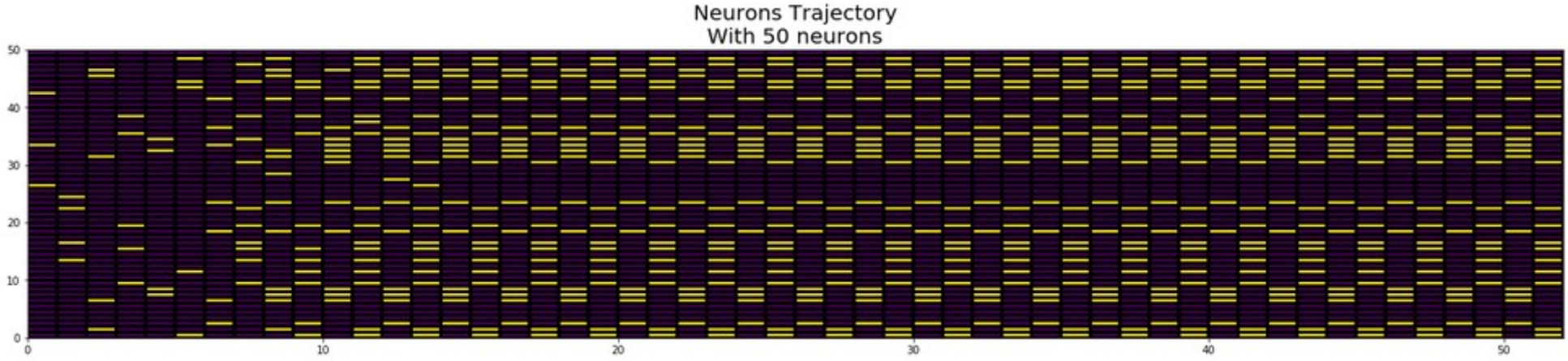
So let’s at the Sum of the active neurons

Simulating Large systems

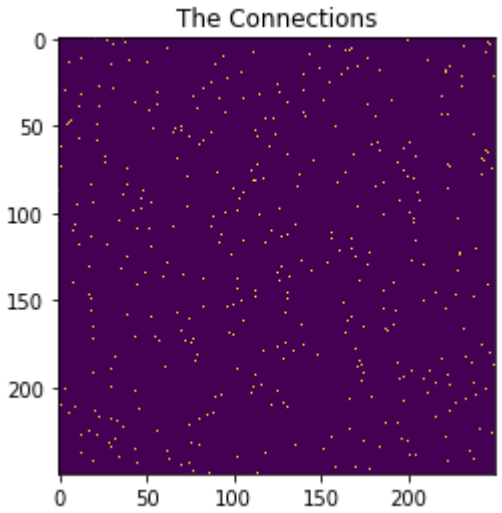
- Optimizing the code for Large system calculation

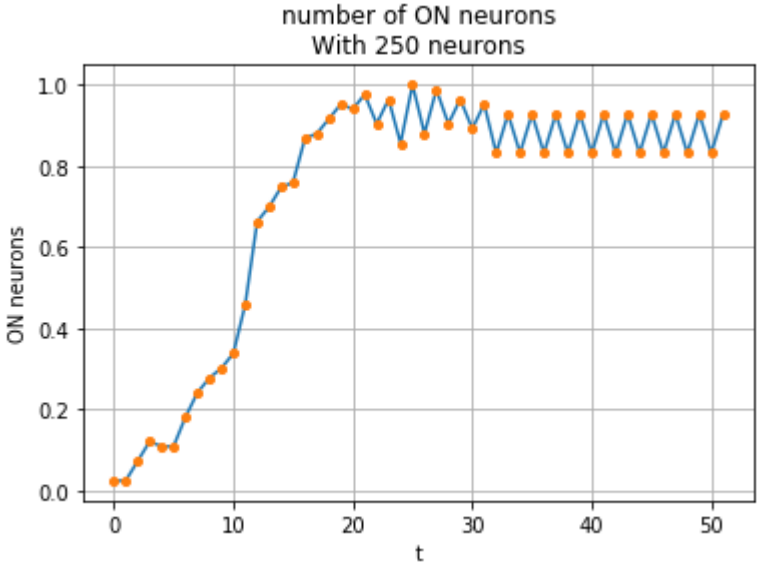


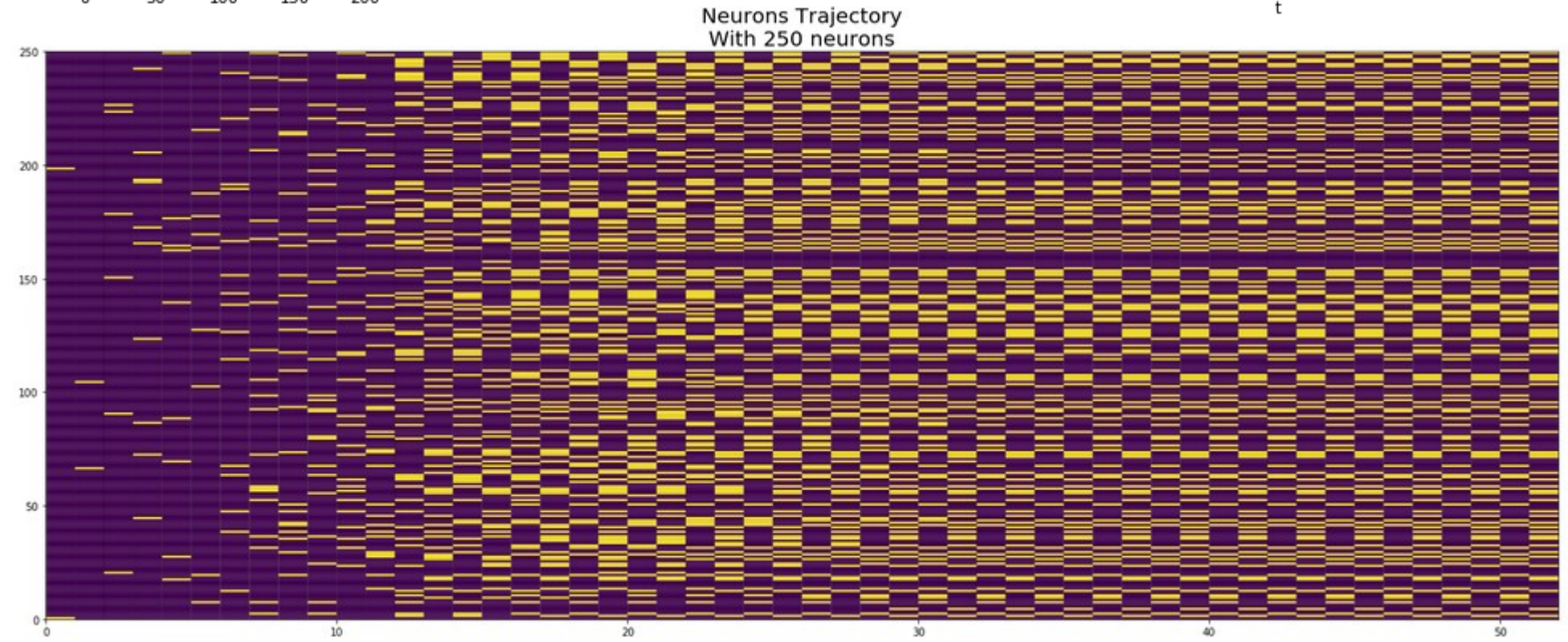




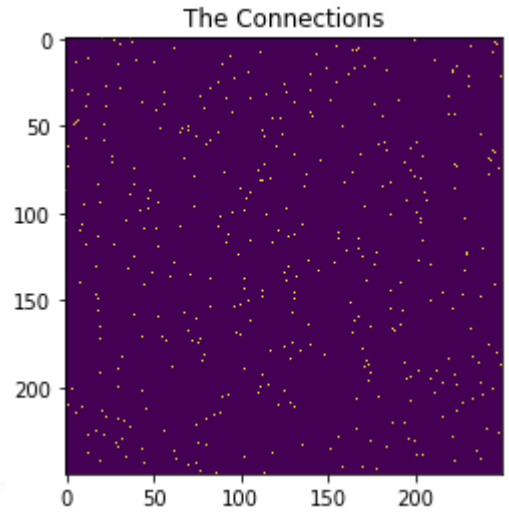
Simulating Large systems

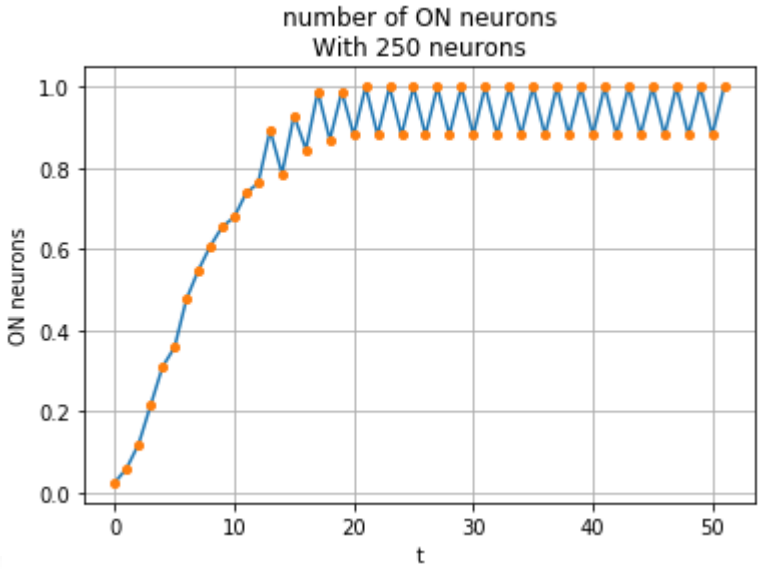


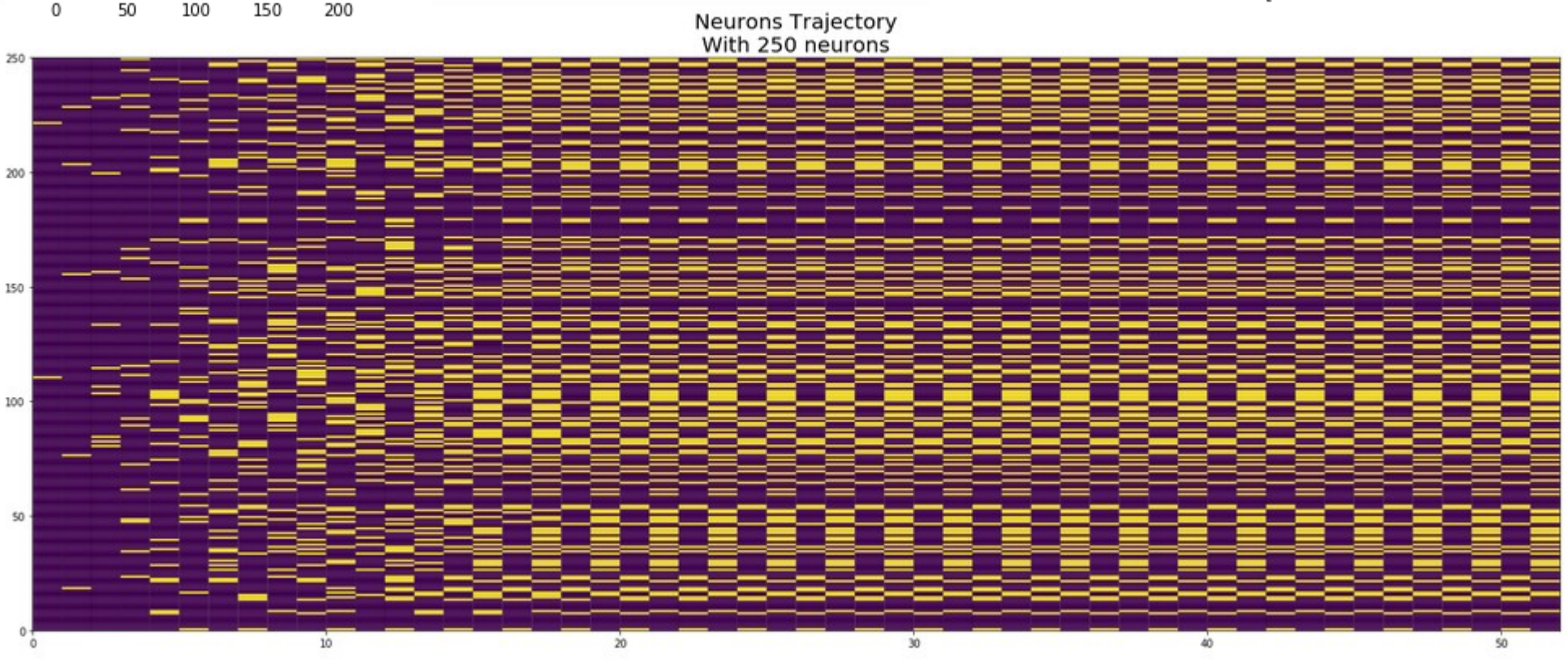




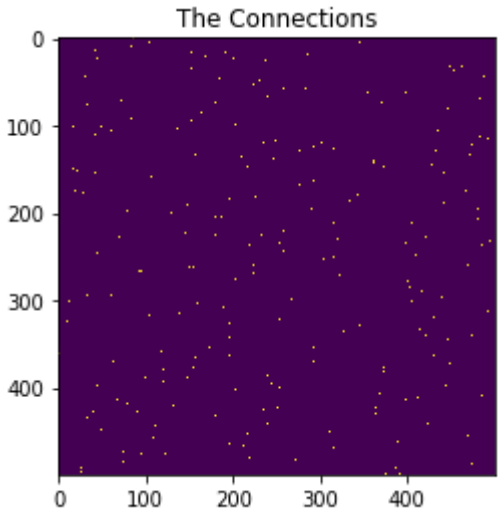
Simulating Large systems

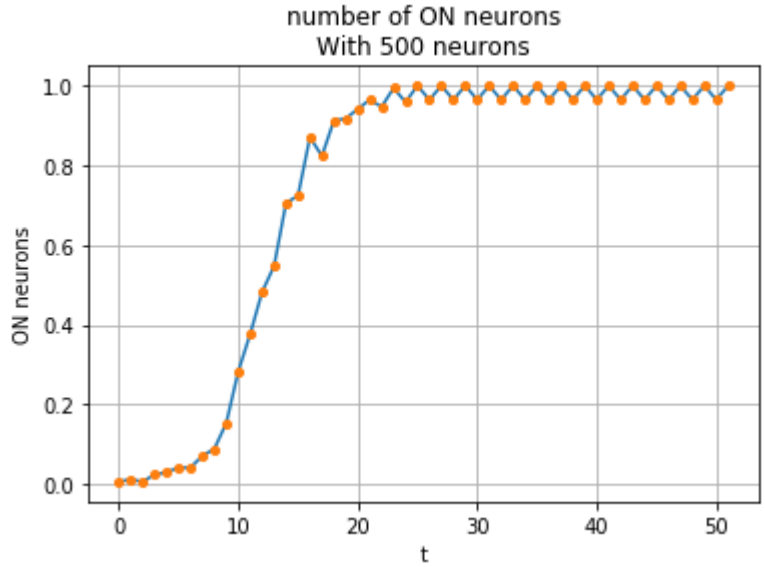


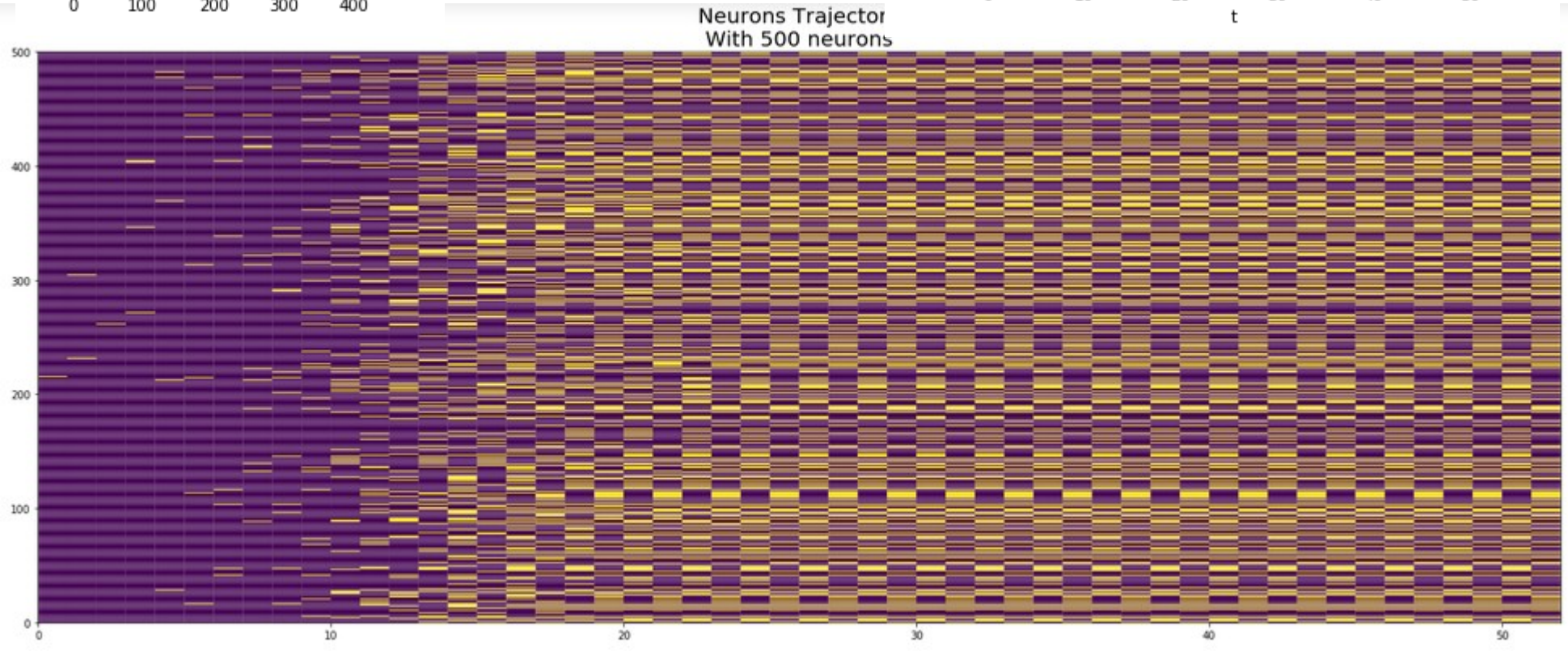




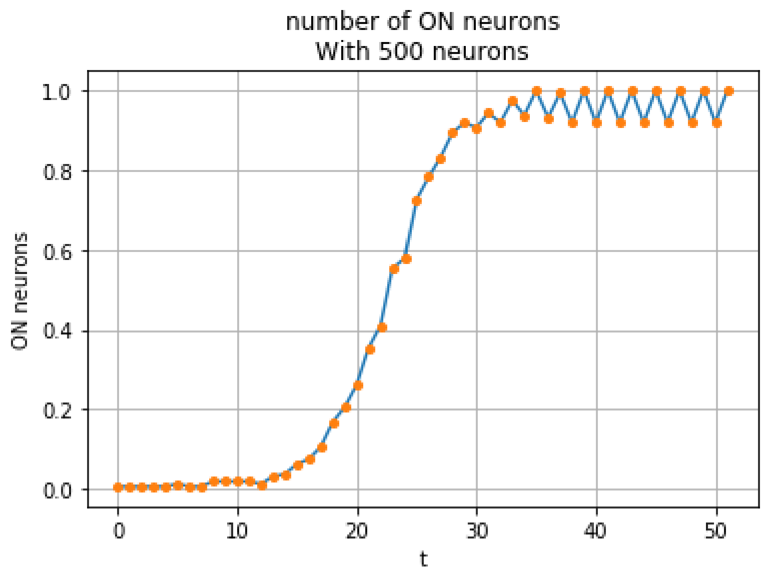
Simulating Large systems

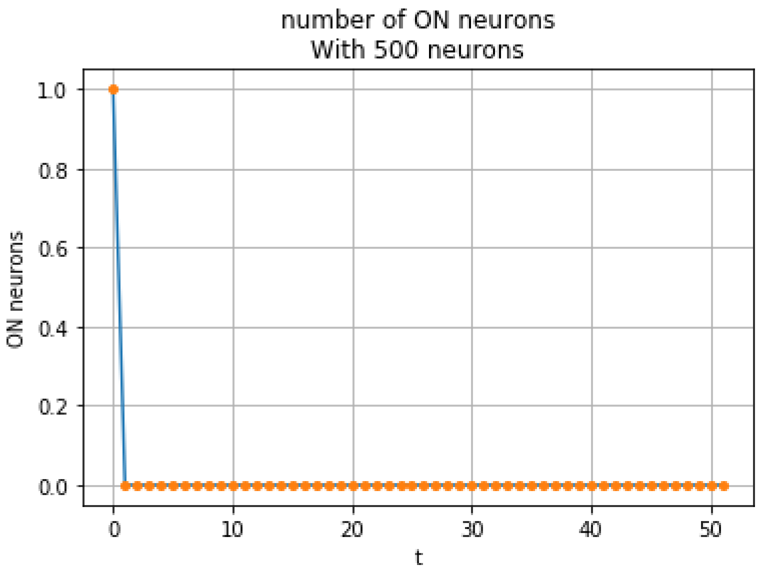


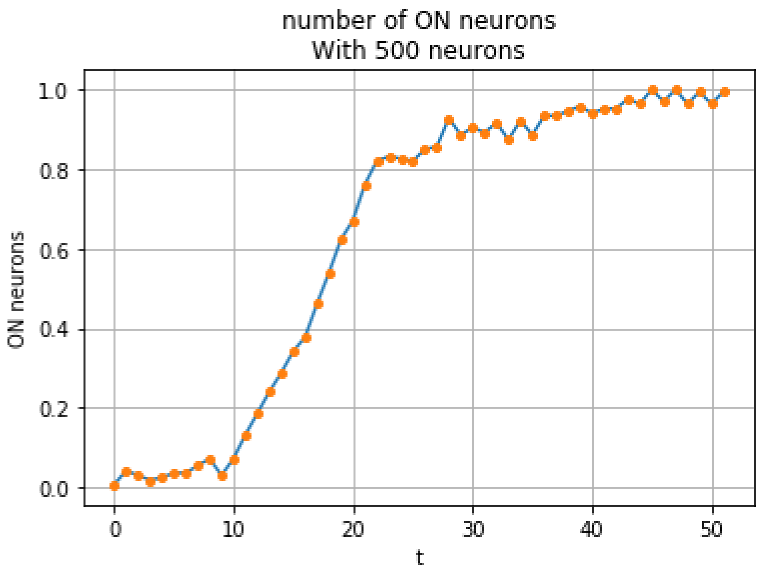


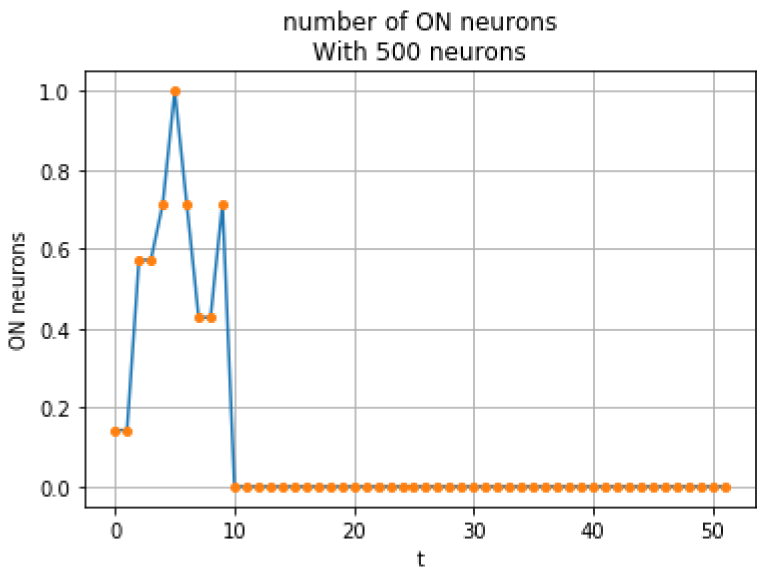


Simulating Large systems

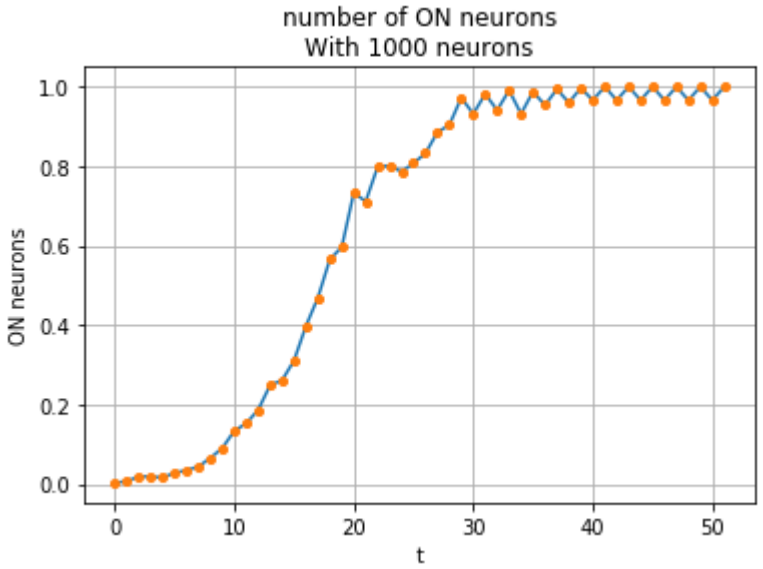


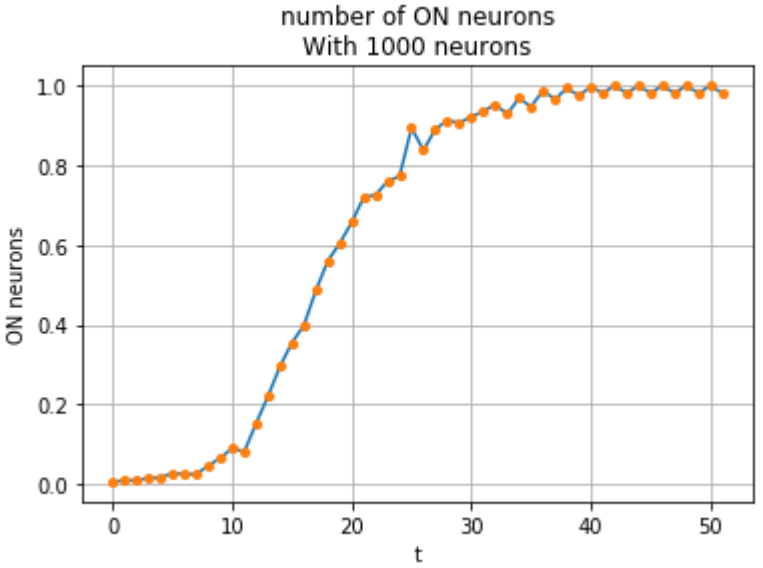


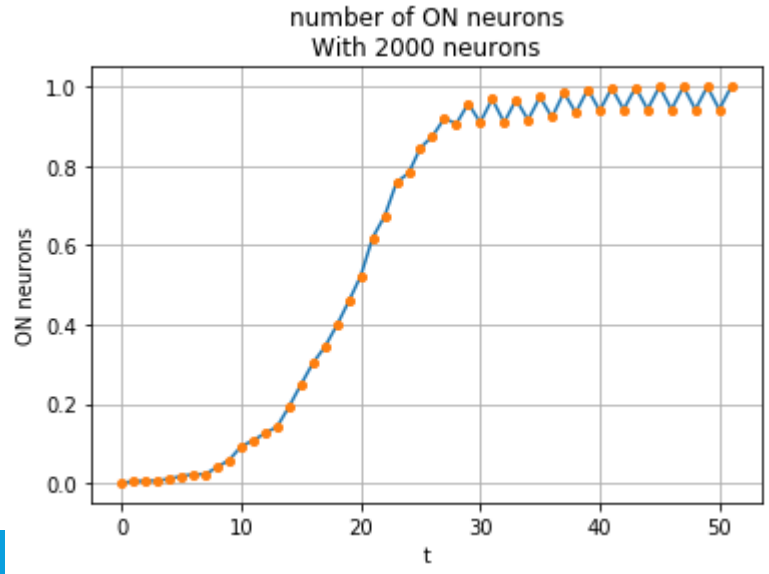


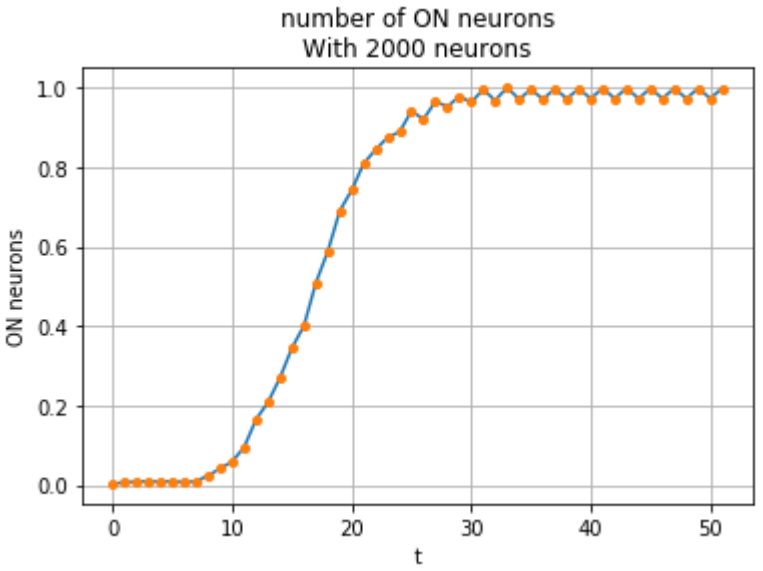


Simulating Large systems

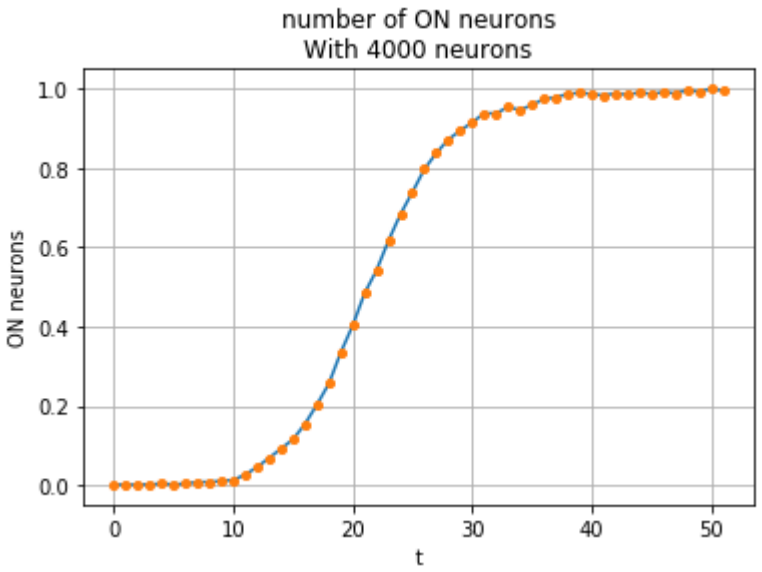


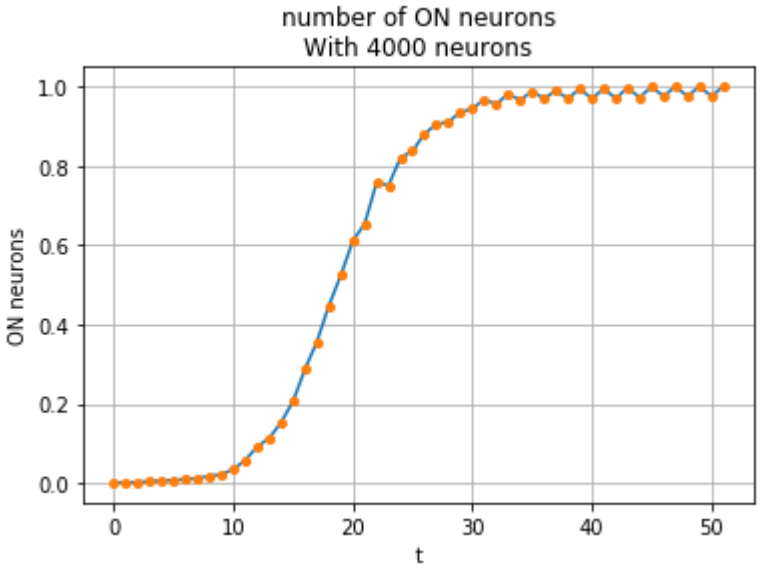


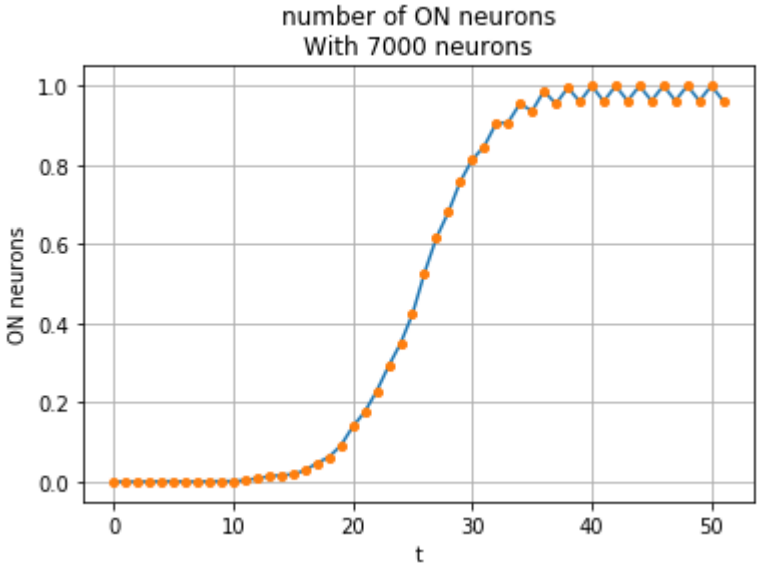


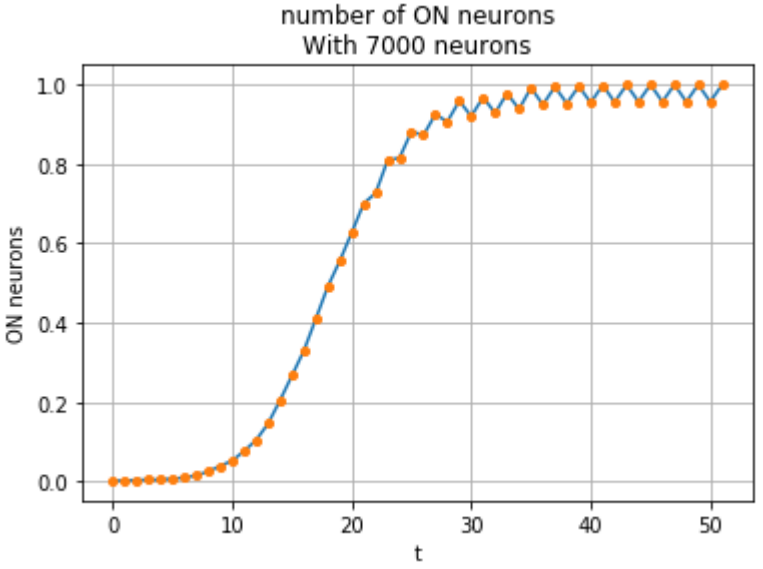


Simulating Large systems

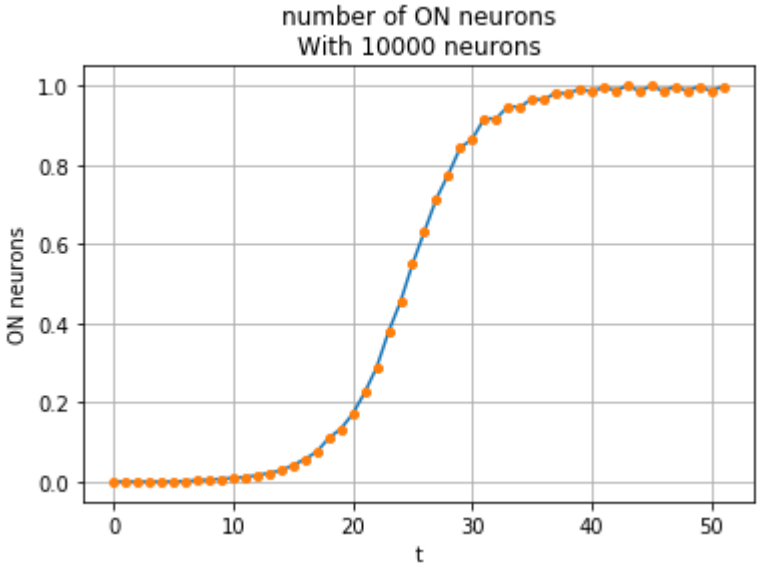


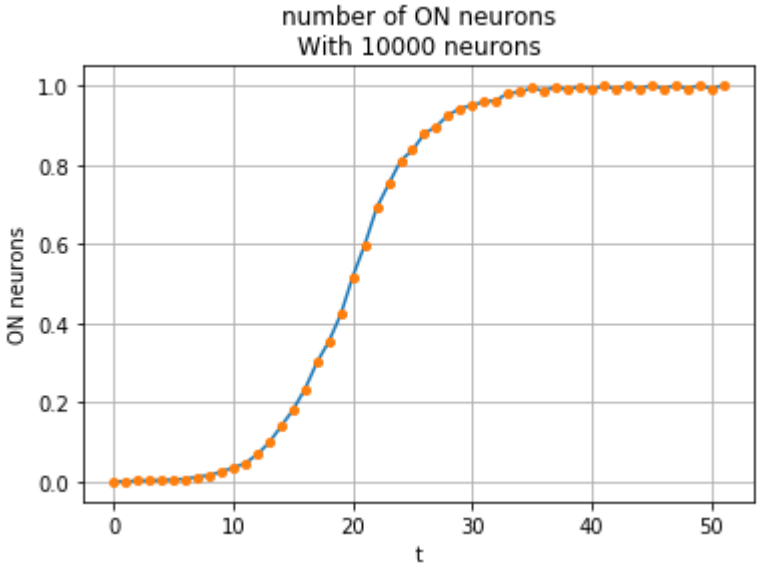


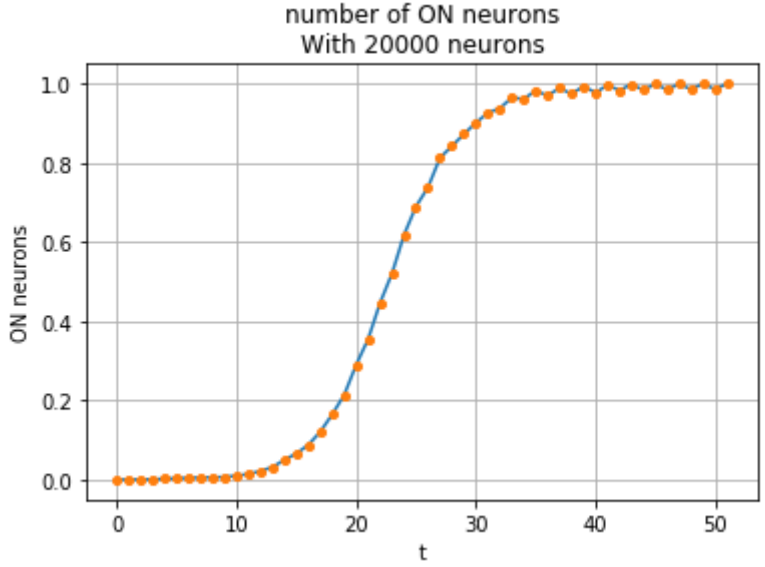


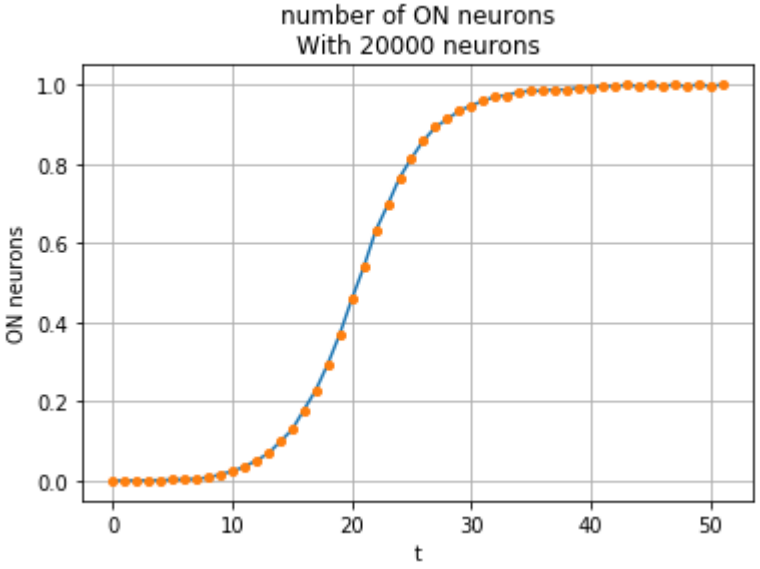


Simulating Large systems

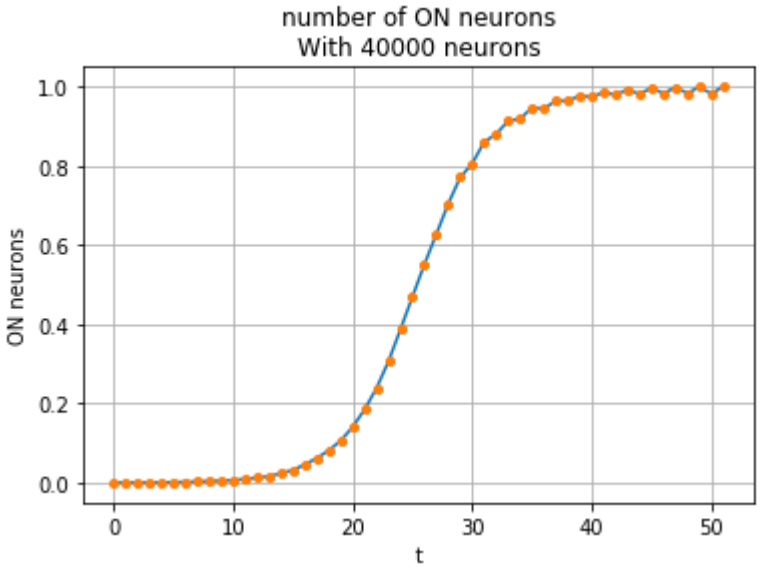


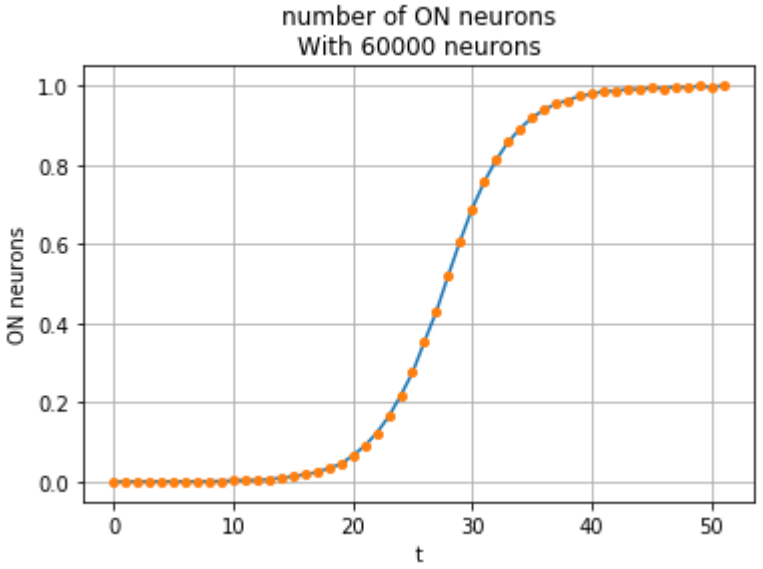


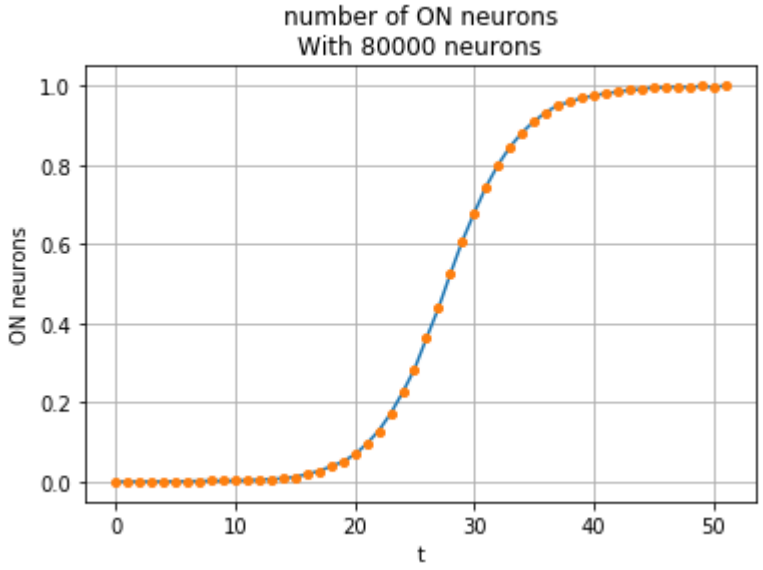


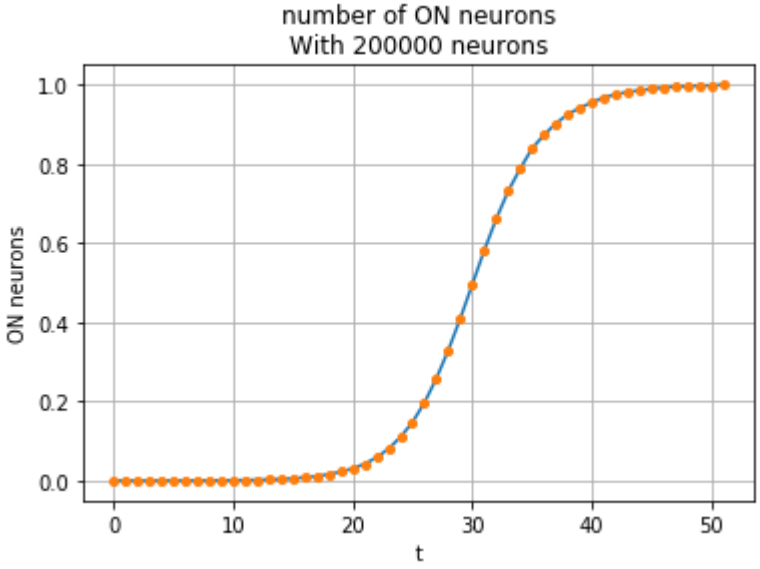


Simulating Large systems

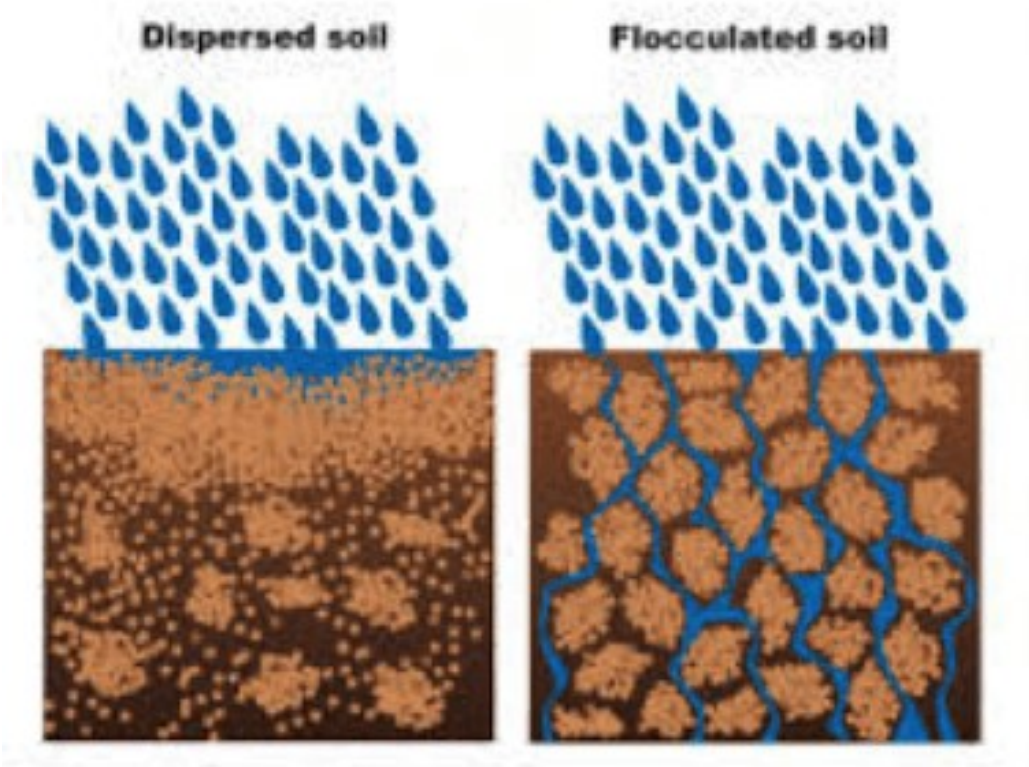




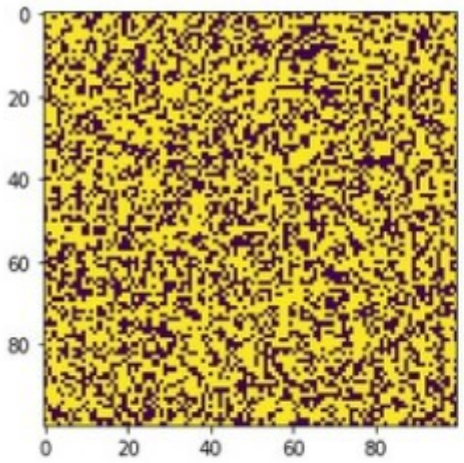


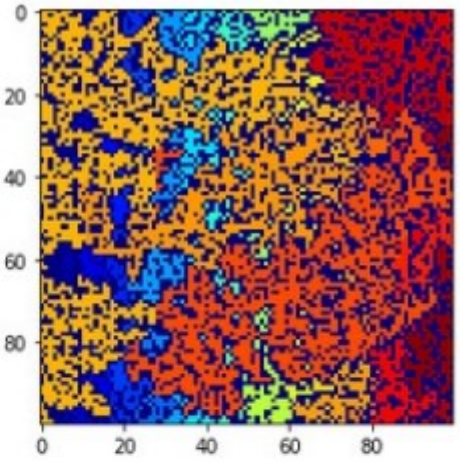


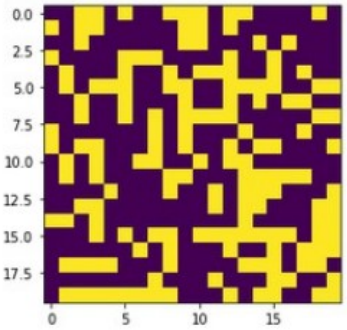
Percolation

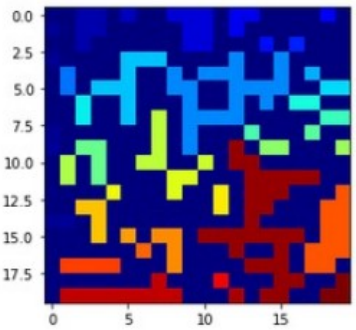


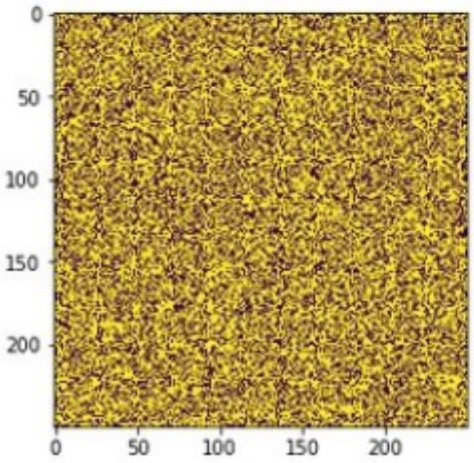
Our Simulation for Percolation

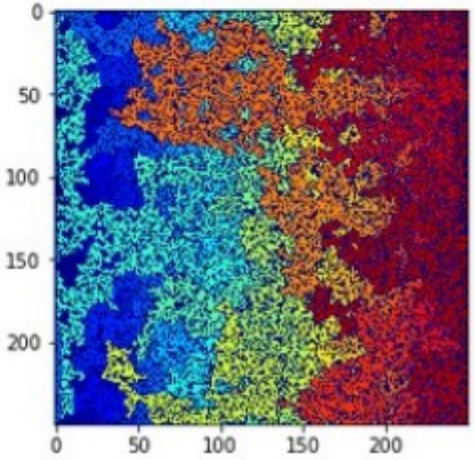


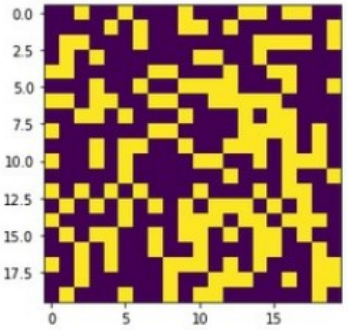


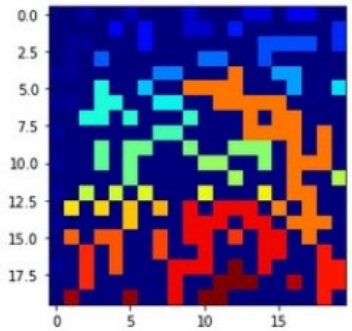




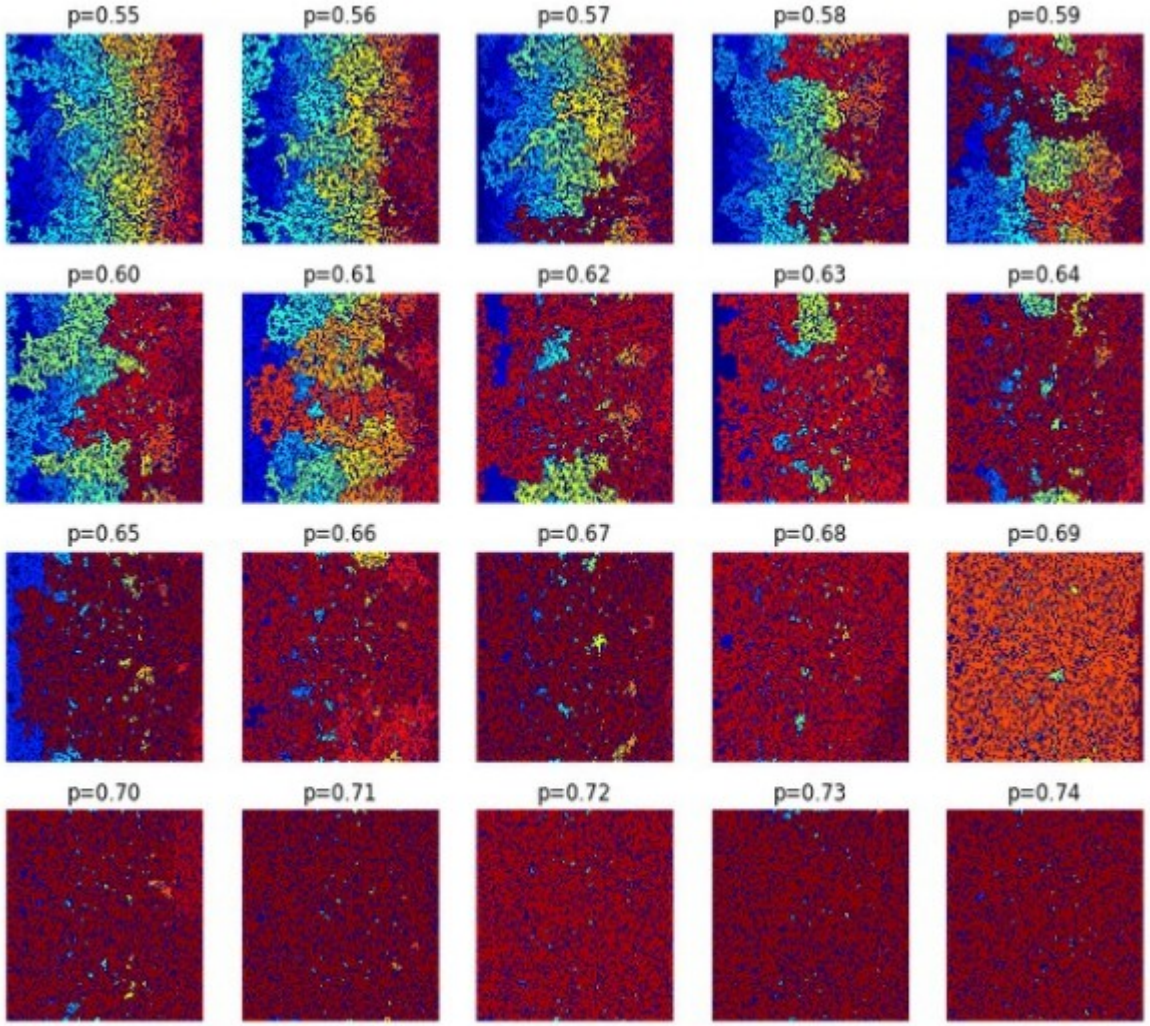




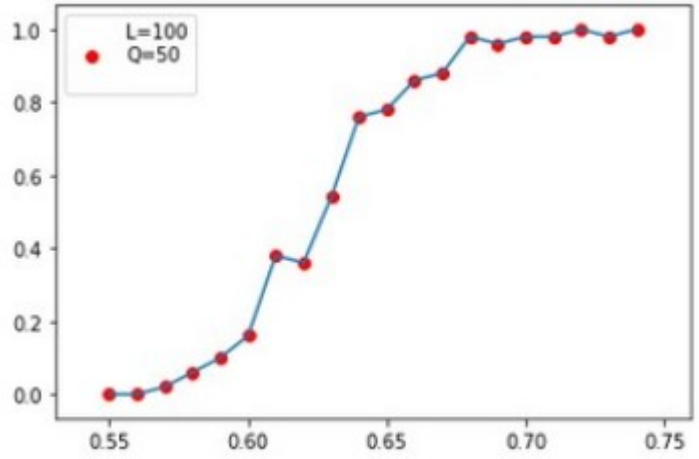


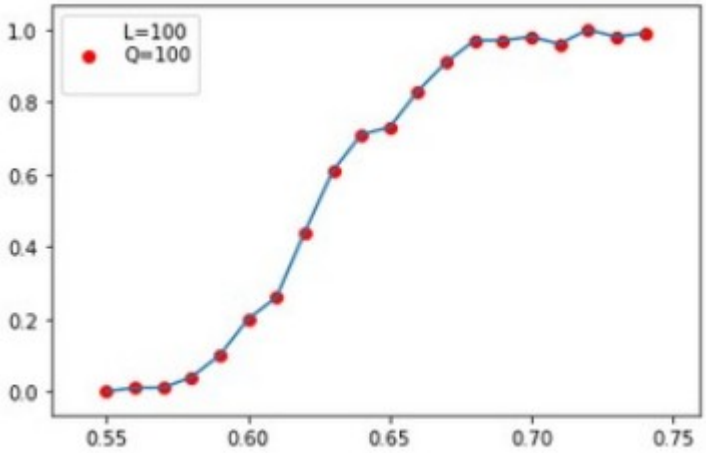


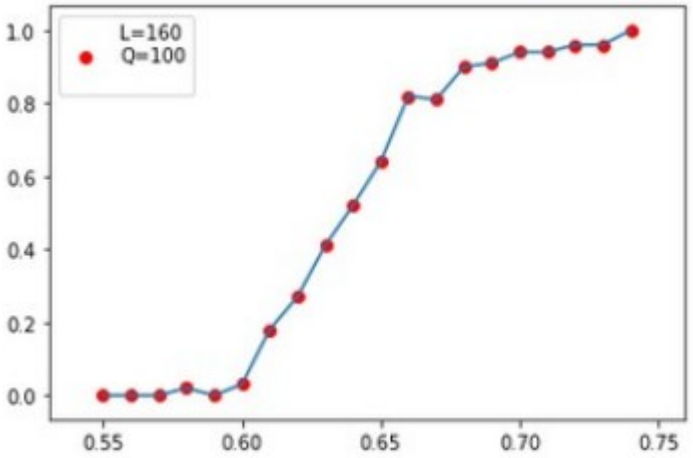
Our Simulation for Percolation

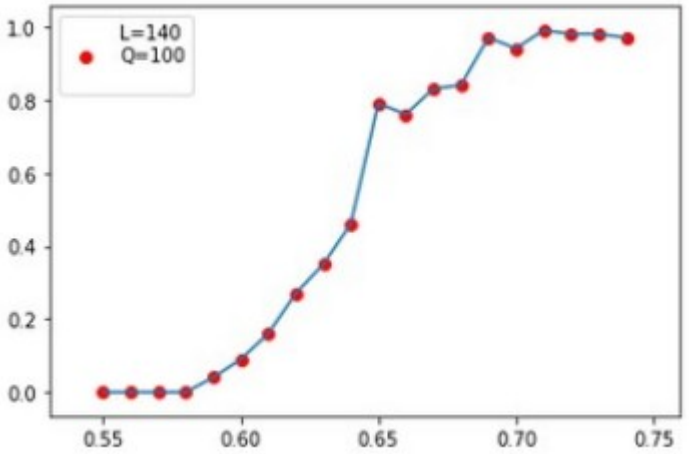


Our Simulation for Percolation

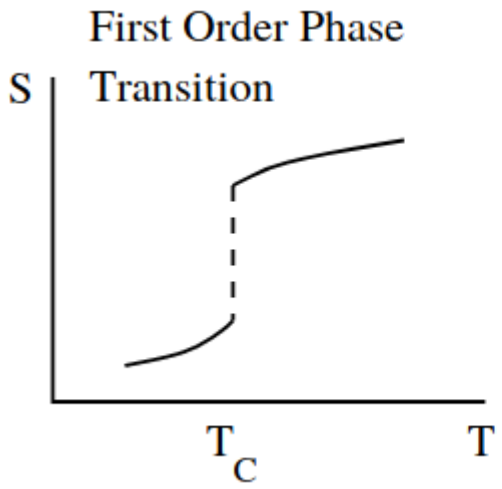


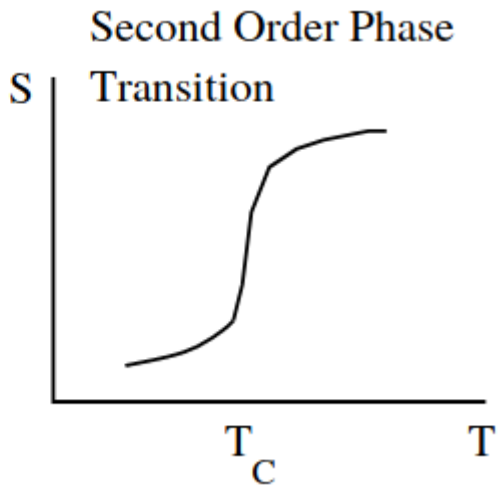


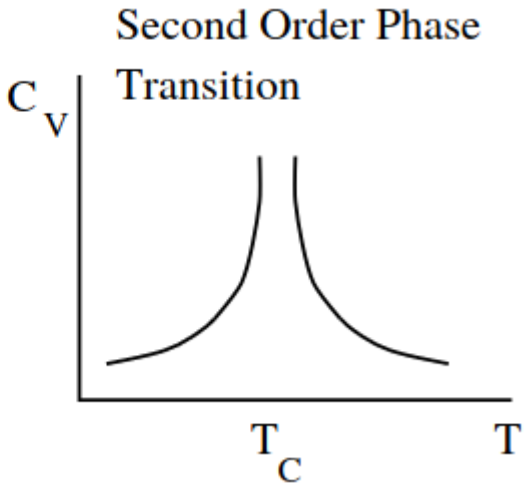




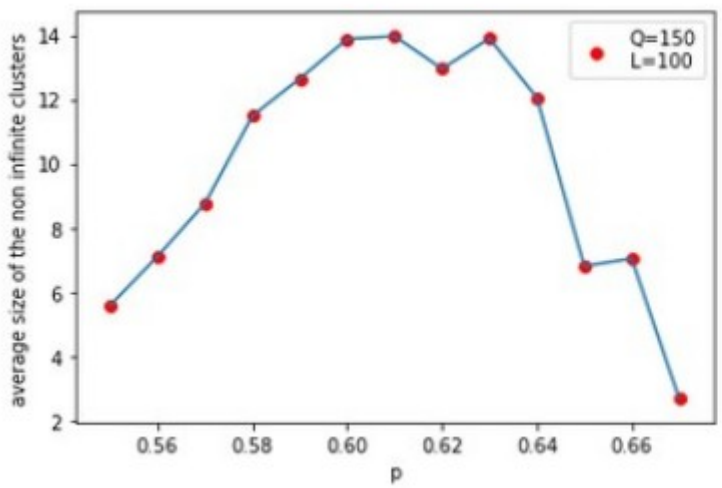
Types of Phase Transitions

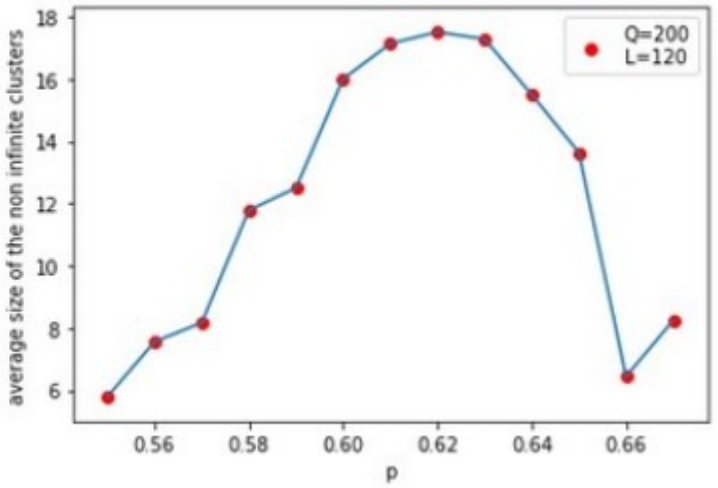




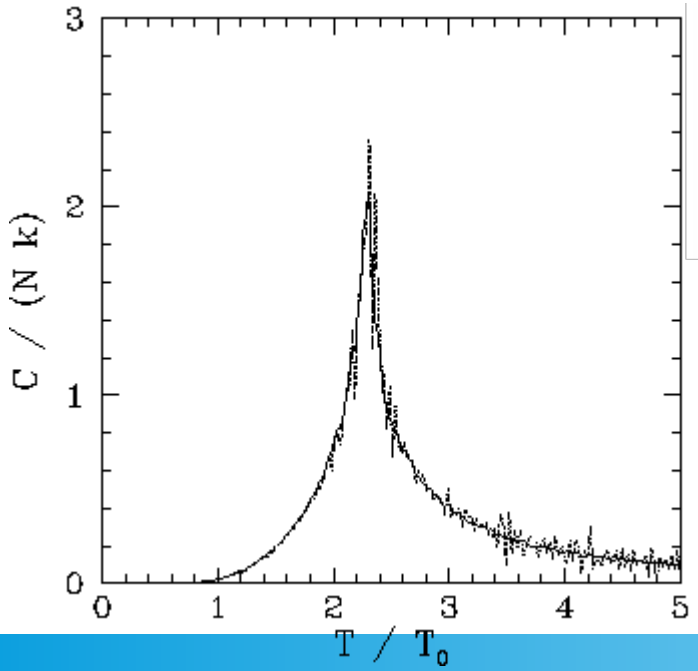


Second Order Phase Transition





The Average size of Non infinite Clusters Over ensembles



The Heat Capacity of the lattice Modeled by Ising model

Future Plan

- Exploring the phase transition of the network more accurately
- Calculating the critical exponents to investigate the profitability of the machine learning methods
- Applying topological structures on the graph