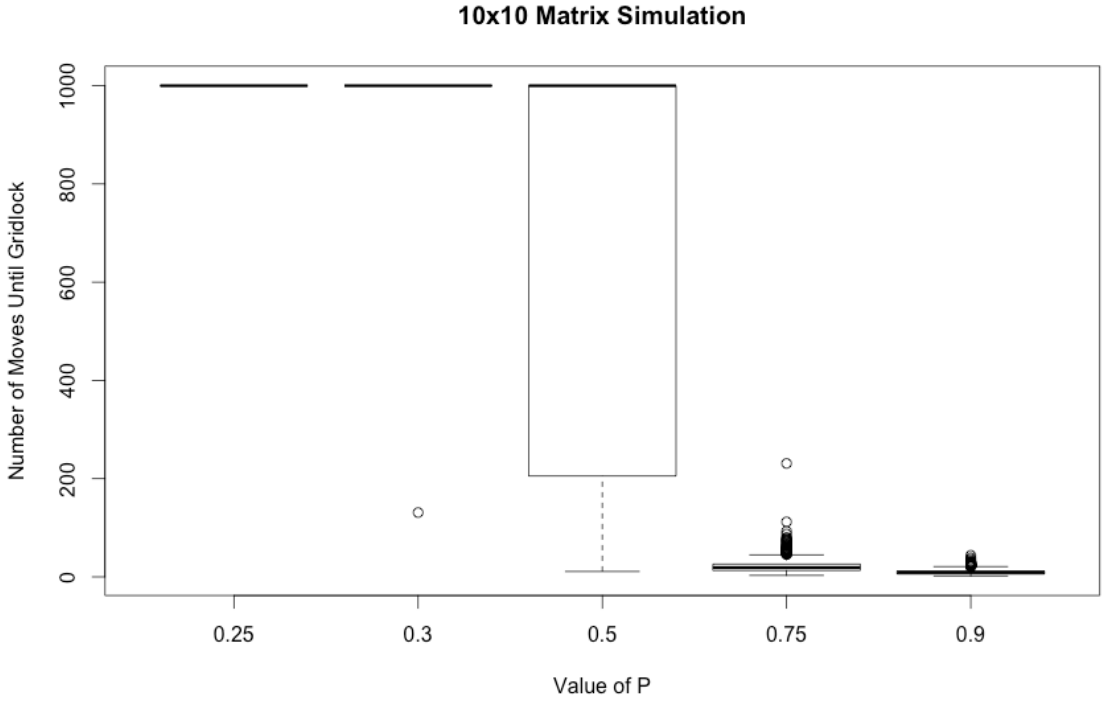
Evan Bell

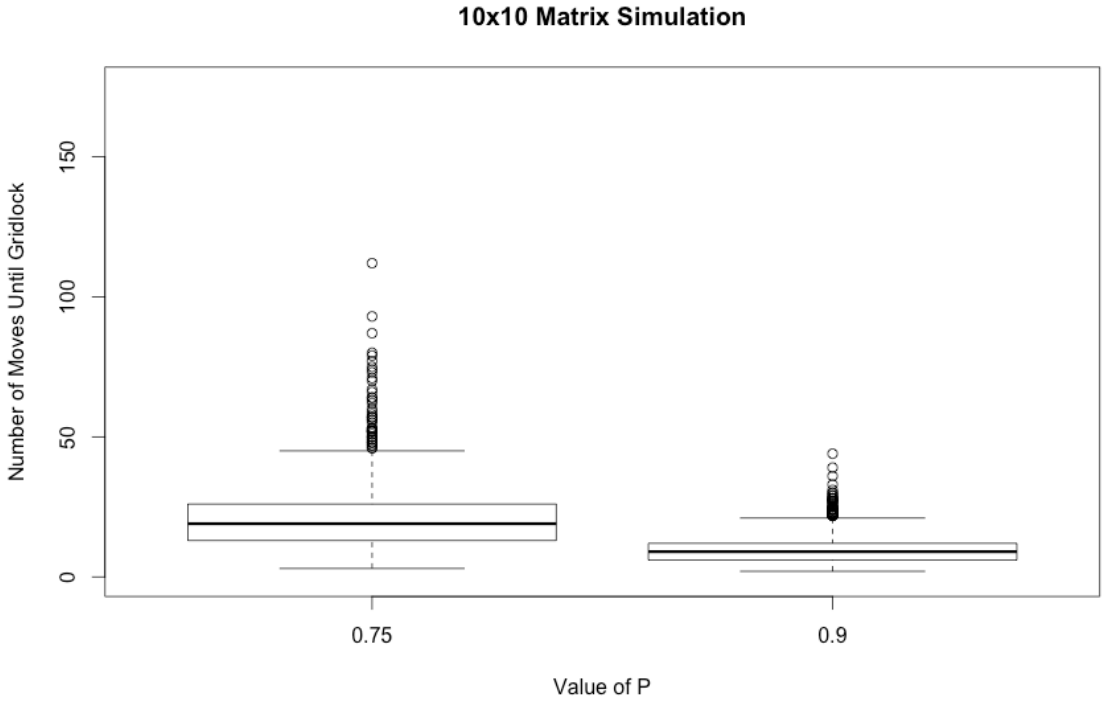
The results from my simulations are summarized in the boxplots below. From the plots, we can see that low densities below 0.5 rarely end in gridlock after 1000 moves. Larger matrices do not necessarily tend to reach gridlock later, since the density is relative to size.

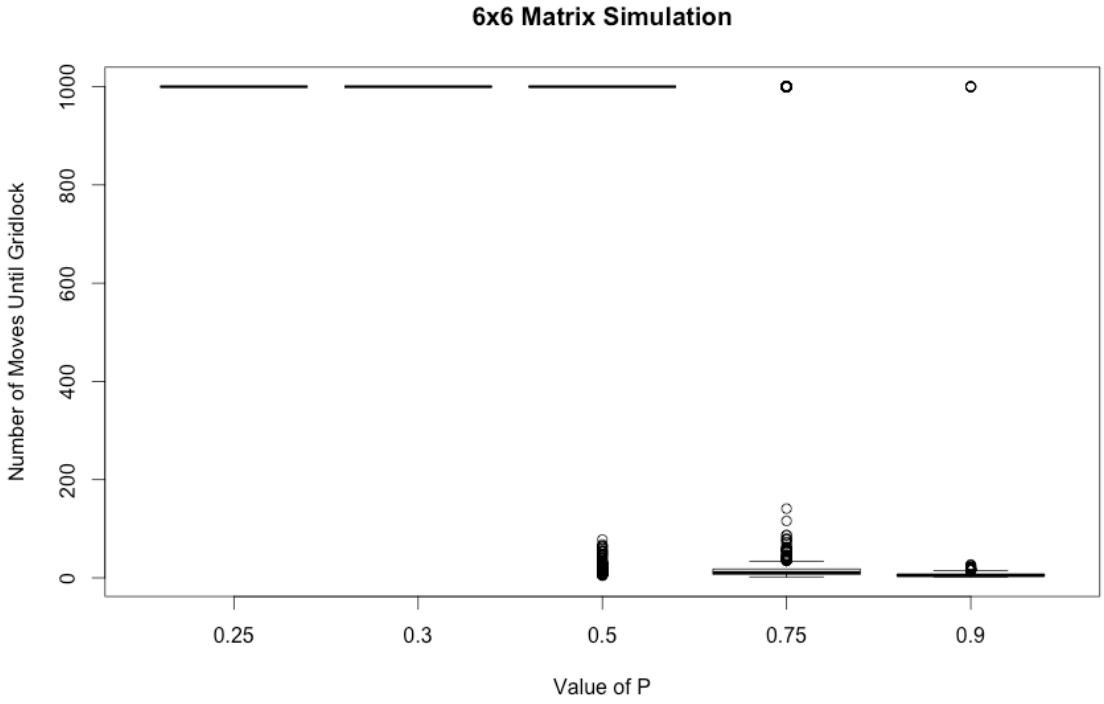
The first boxplot shows the 10x10 matrix. The first instance of gridlock occurs at 0.3. Generally, for values of p less than 0.5, there are almost no simulations that reach gridlock. For density equal to 0.5, the average number of moves until gridlock is 676. The second plot shows the number of moves until gridlock for densities 0.75 and 0.9. The number of moves until gridlock is much lower. The third and fourth boxplots are for the 6x6 matrix. Densities below 0.5 have no instances of gridlock. There are several at density 0.5, but the vast majority do not reach gridlock. In the fourth boxplot, the behavior of the simulations is similar to that of the 10x10 matrix: low median and more spread between the observations.

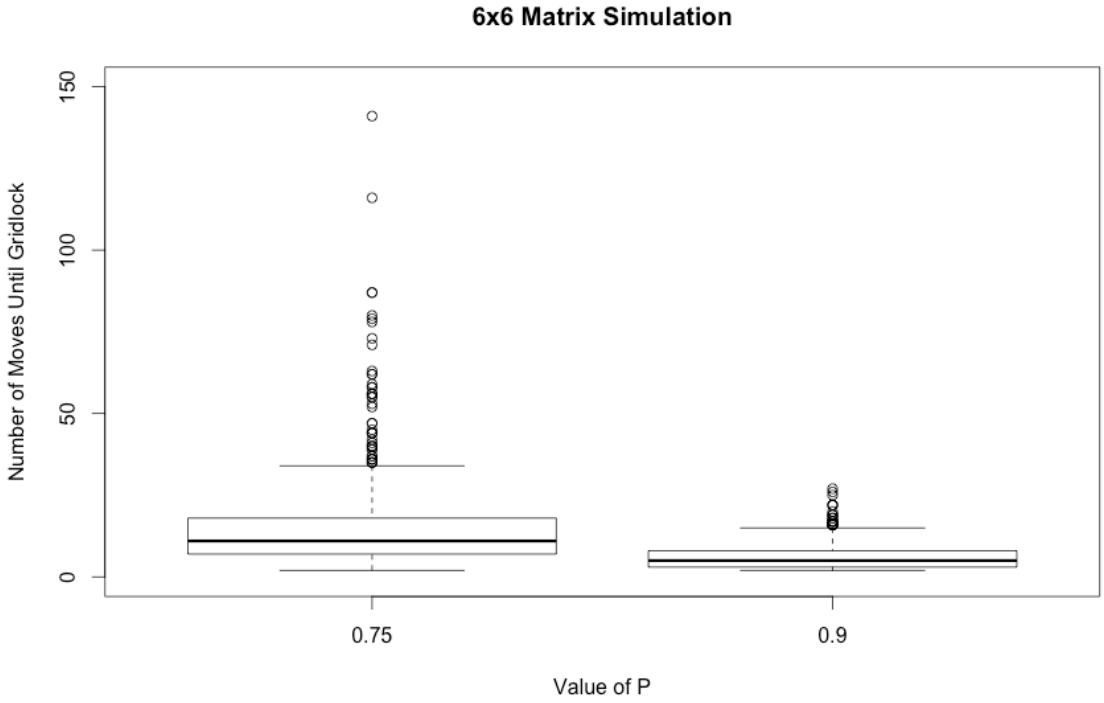
The fifth and sixth boxplots are for the 4x4 matrix. There are instances of gridlock for all densities, even the lowest of 0.25. However, most simulations do not reach gridlock until the density is at least 0.75. The last boxplot shows the simulation for just the density of 0.9. It is shown that gridlock is reached quickly, below 10 moves, for most simulations of this size and density.

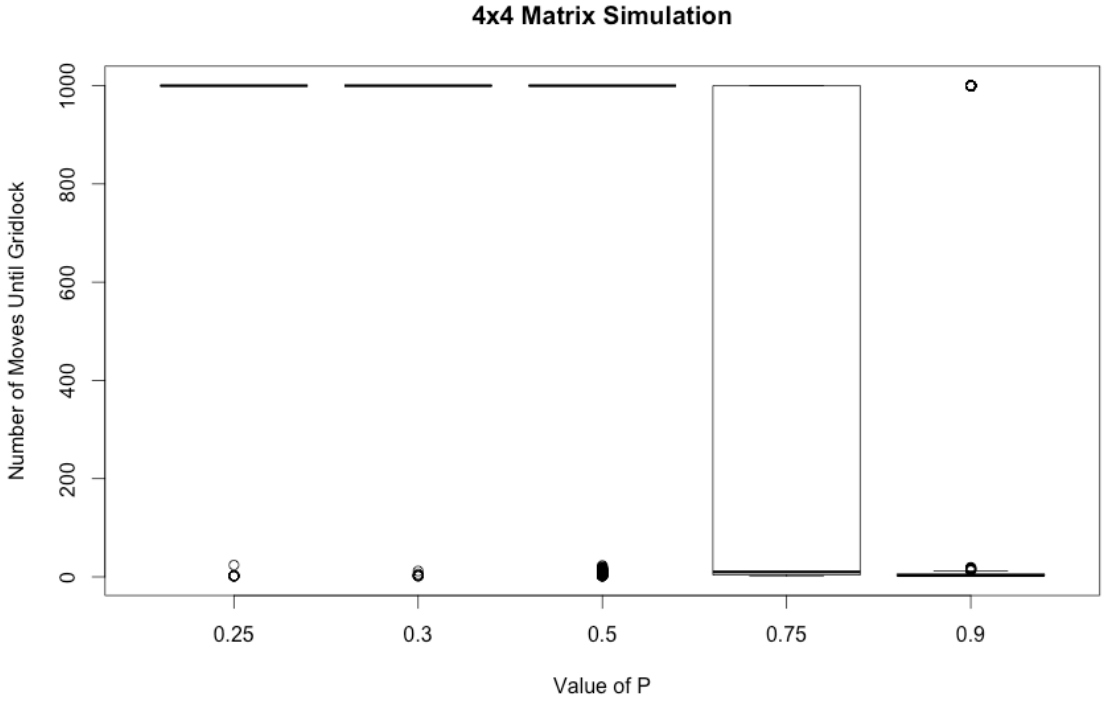
The last page includes sample images of 10x10, 6x6, and 4x4 matrices with densities of 2/3.

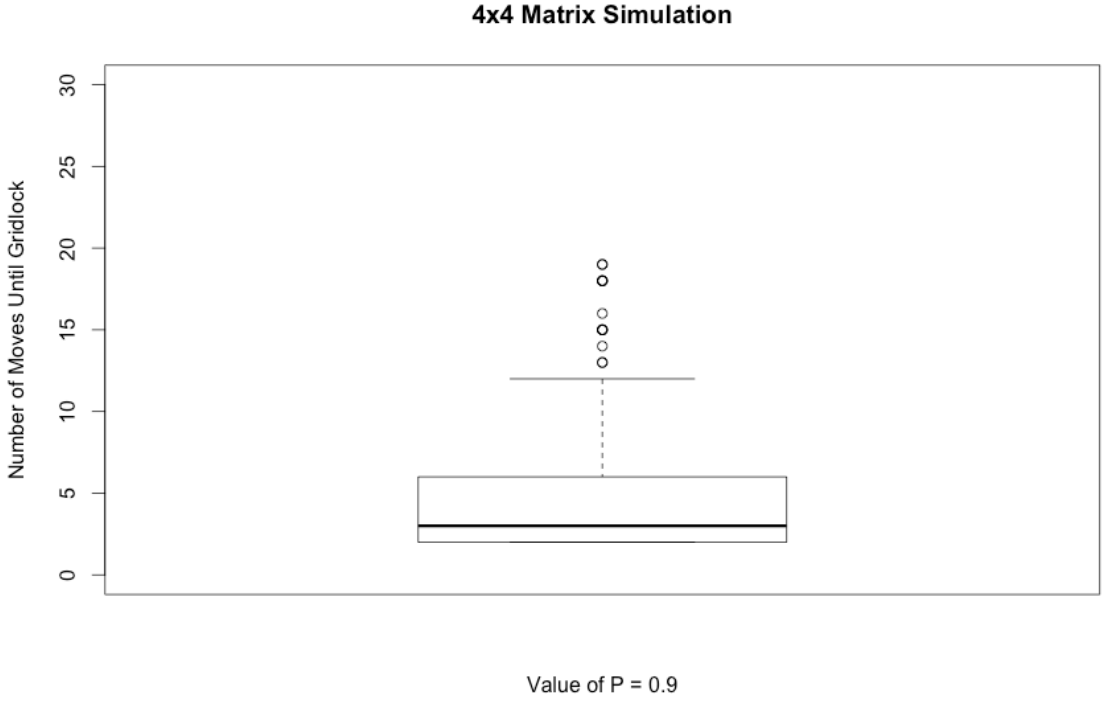


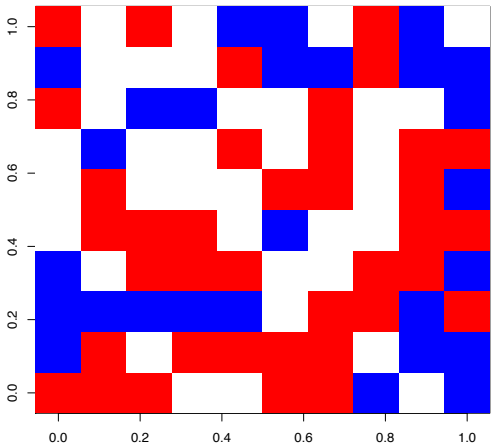

10x10 Matrix Simulation
Number of Moves Until Gridlock
0
50
100
150
0.75
0.9
Value of P

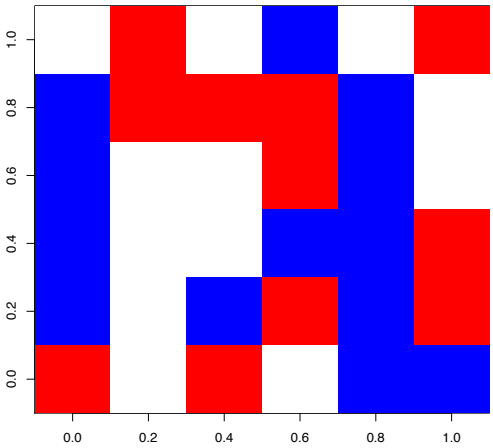

6x6 Matrix Simulation
Number of Moves Until Gridlock
0
200
400
600
800
1000
0.25
0.3
0.5
0.75
0.9
Value of P

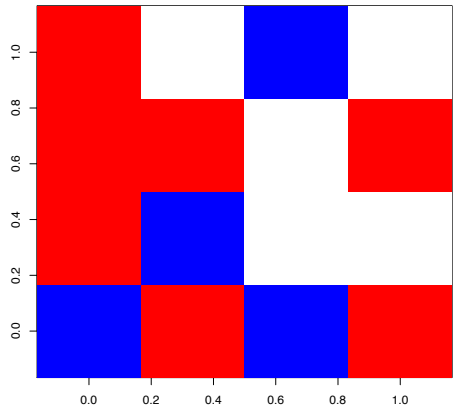

6x6 Matrix Simulation
Number of Moves Until Gridlock
0
50
100
150
0.75
0.9
Value of P


4x4 Matrix Simulation
Number of Moves Until Gridlock
0
200
400
600
800
1000
0.25
0.3
0.5
0.75
0.9
Value of P


4x4 Matrix Simulation
Number of Moves Until Gridlock
0
5
10
15
20
25
30
Value of P = 0.9


0.0
0.2
0.4
0.6
0.8
1.0


0.0
0.2
0.4
0.6
0.8
1.0


0.0
0.2
0.4
0.6
0.8
1.0