

Simulation 1

Graphs, subgraph and Edge Probability - Diameter

Erdos-Renyi Graphs

Table 1: Simulation 1: Graph properties for different probabilities pn of edge existence between nodes in Erdos-Renyi graphs

| index | pn | order | size | density | cluster coefficient | diameter | nodes deg $\geq n$ | largest component |
|-------|----|-------|------|----------------------|---------------------|----------|--------------------|-------------------|
| 0 | 1 | 143 | 117 | 0.011523687580025609 | 0.0 | inf | 0 | 97 |
| 1 | 3 | 143 | 325 | 0.032010243277848911 | 0.03655788655788656 | 7 | 0 | 143 |
| 2 | 5 | 143 | 527 | 0.051905840638235001 | 0.05108083447244284 | 5 | 14 | 143 |
| 3 | 7 | 143 | 757 | 0.074559243573328077 | 0.0733257571774318 | 4 | 49 | 143 |
| 4 | 9 | 143 | 885 | 0.087166354771988572 | 0.08693534635371428 | 4 | 87 | 143 |
| 5 | 11 | 143 | 1111 | 0.10942578548212351 | 0.1088499366852766 | 3 | 128 | 143 |

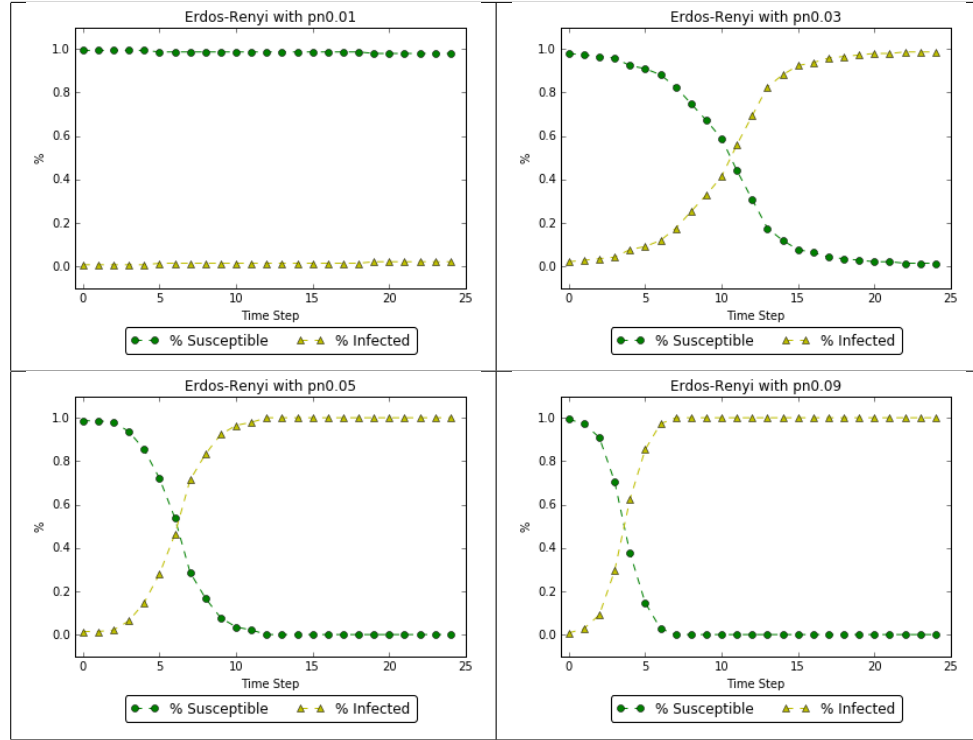


Figure 1: Simulation 1: Plotting Node States for Erdos Renyi Graphs for $pn = 0.1, 0.3, 0.5, 0.9$

Real Airport Graph and subgraphs

Table 2: Real World Airport graph and subgraphs graph properties

| Name | order | size | density | cluster coefficient | diameter | nodes deg \geq n | largest component |
|-----------------------|-------|------|----------------------|---------------------|----------|--------------------|-------------------|
| Real World Graph | 143 | 1452 | 0.14301191765980498 | 0.6410089238208931 | 4 | 73 | 143 |
| Largest Edge Weights | 13 | 10 | 0.12820512820512819 | 0.0 | inf | 1 | 7 |
| Lowest Edge Weights | 27 | 102 | 0.29059829059829062 | 0.6458430700260764 | 3 | 13 | 27 |
| 20 Largest Deg. Cent. | 20 | 177 | 0.93157894736842106 | 0.9423609156581293 | 2 | 20 | 20 |
| Min Span. Tree | 143 | 142 | 0.013986013986013986 | 0.0 | 8 | 3 | 143 |

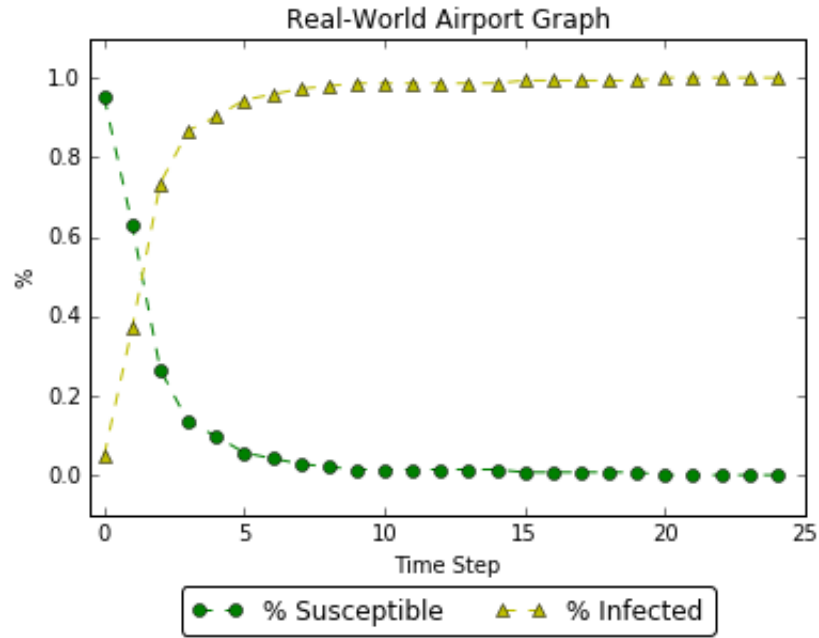


Figure 2: Simulation1: Real-world airport graph properties

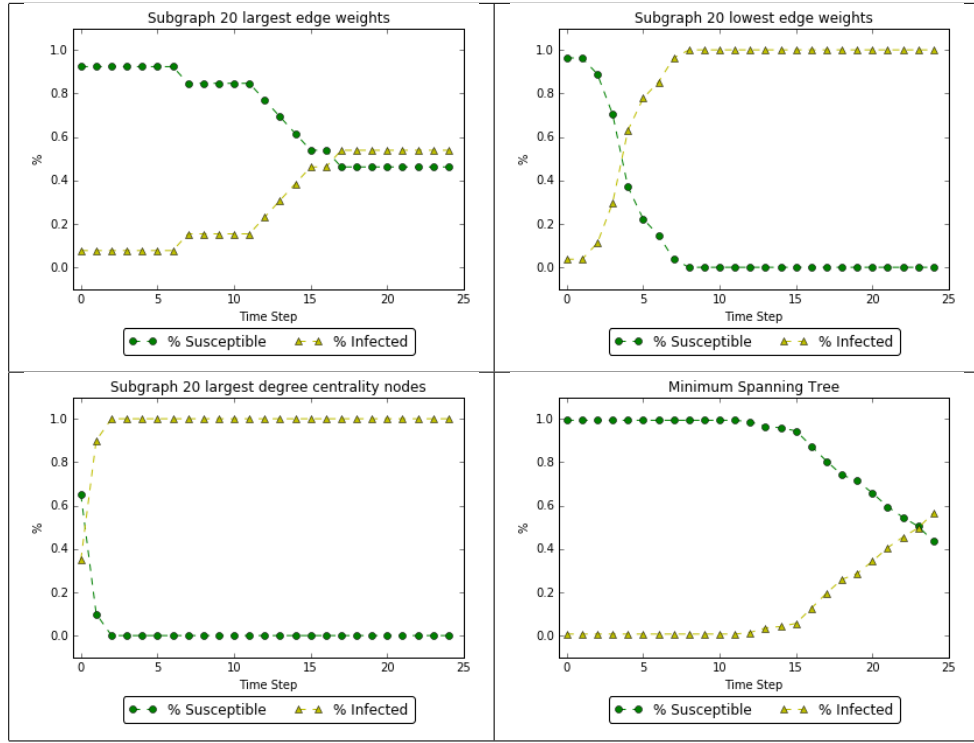


Figure 3: Simulation 1: Subgraph node state plots

Source Node Centrality

Erdos-Renyi Graph with $p = ??$

Real World Graph

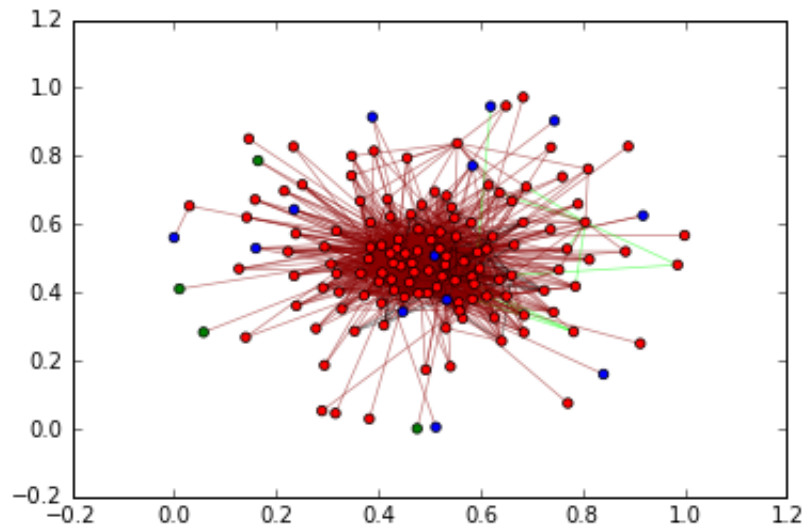


Figure 4: Simulation1: Initial Node Center Of Graph

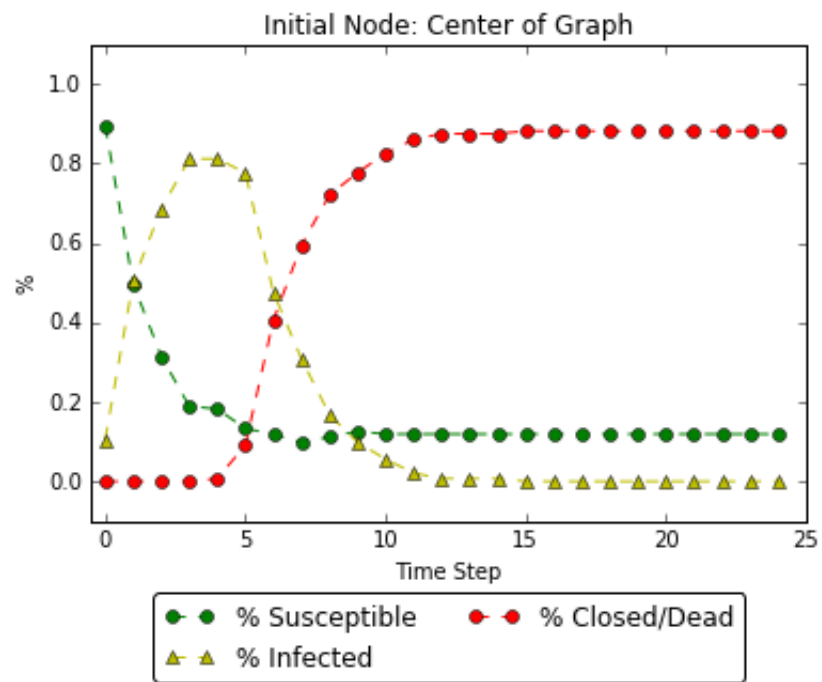


Figure 5: Simulation1: Initial Node Center Of Graph - Statistics

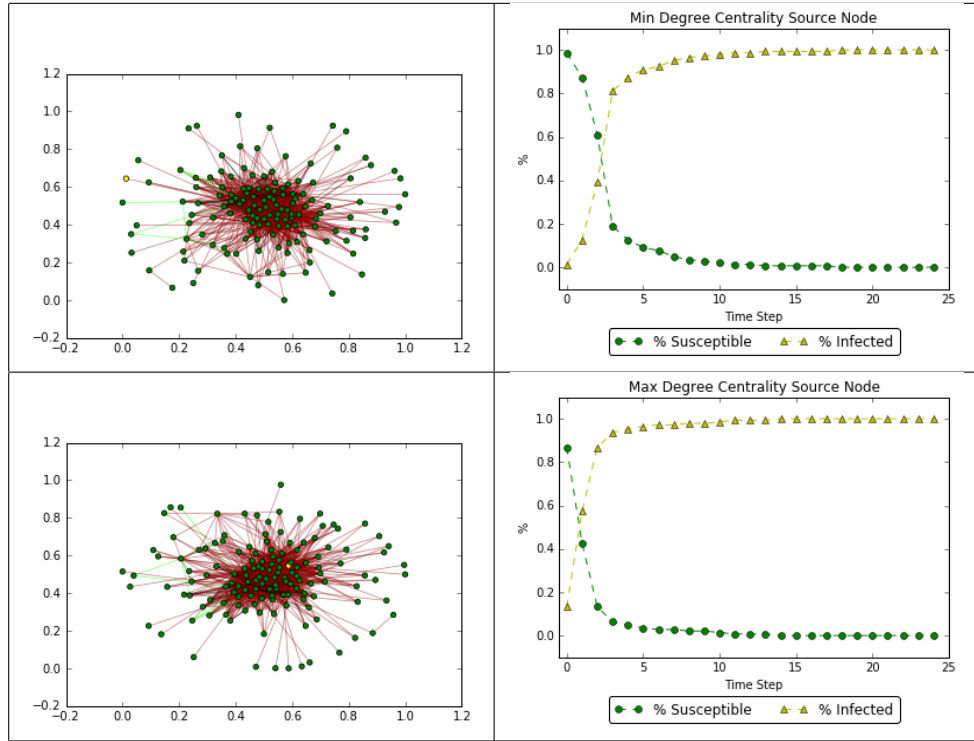


Figure 6: Simulation 1: Max and Min Degree Centrality SourceNode

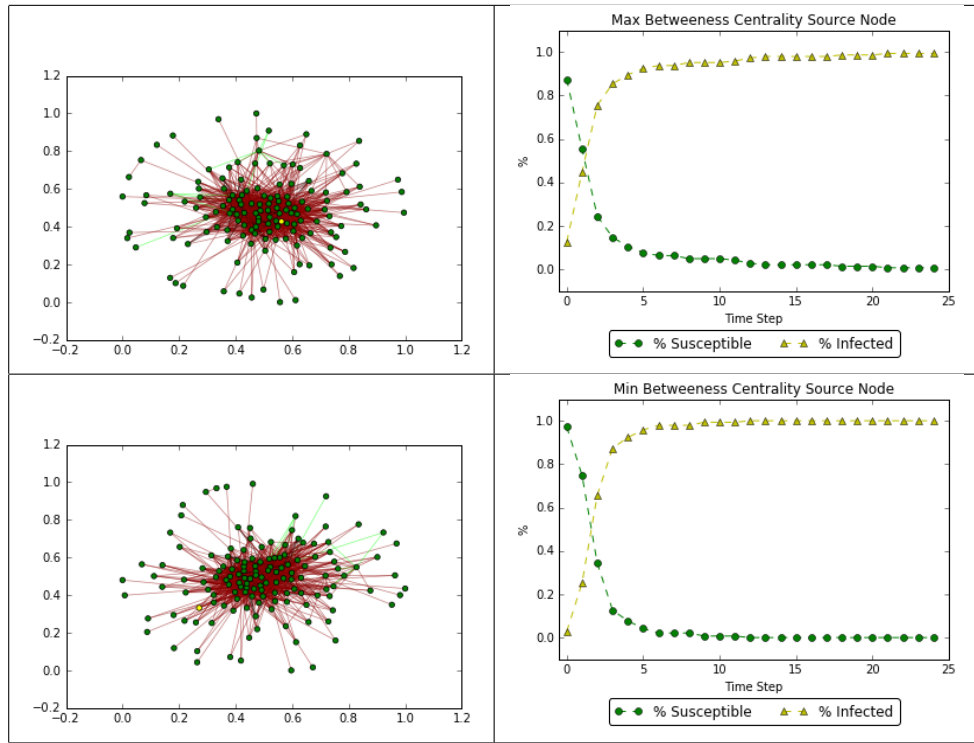


Figure 7: Simulation 1: Max and Min Betweenness Centrality SourceNode

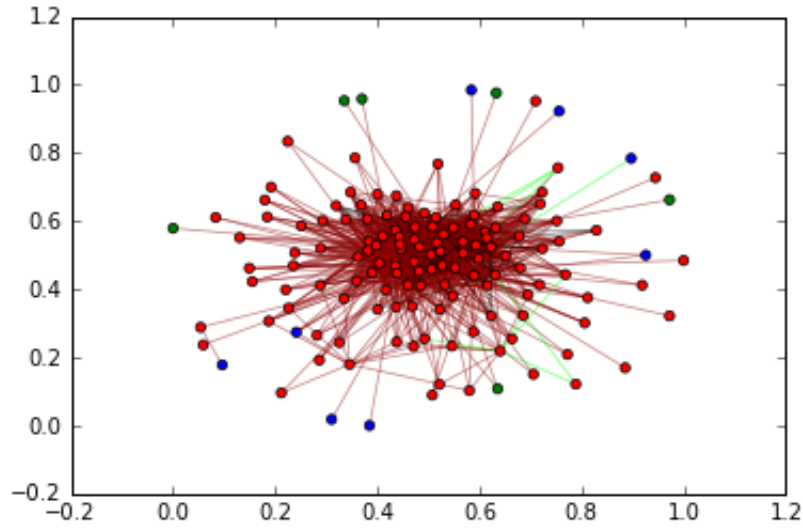


Figure 8: Simulation2: Initial Node Center Of Graph

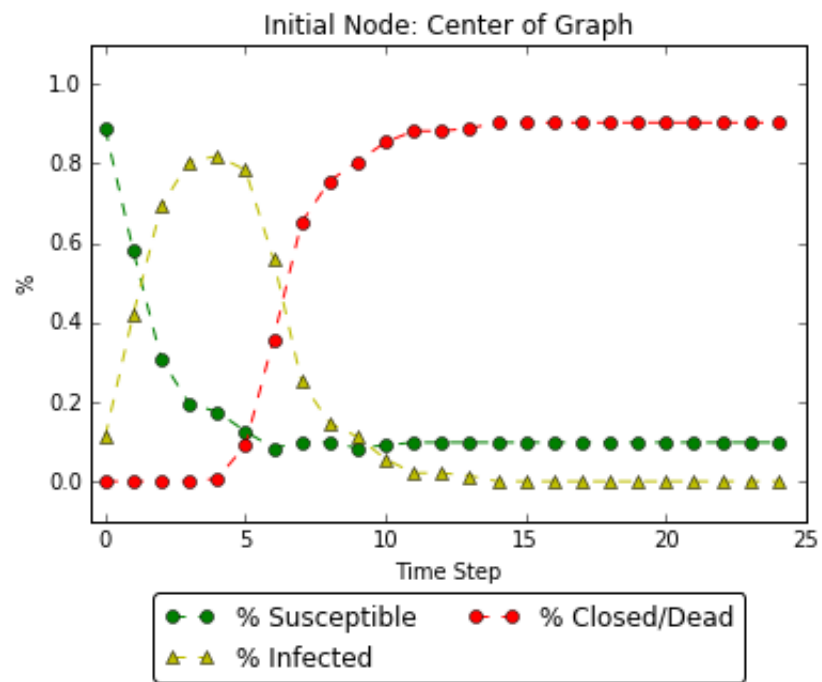


Figure 9: Simulation2: Initial Node Center Of Graph - Statistics

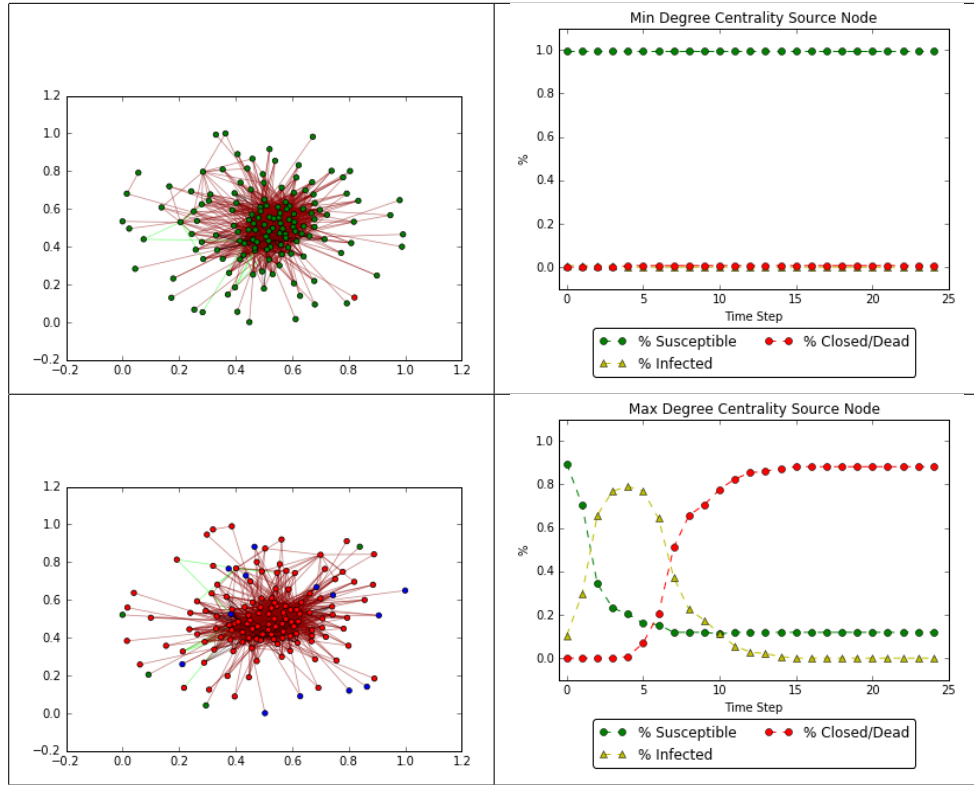


Figure 10: Simulation 2: Max and Min Degree Centrality SourceNode

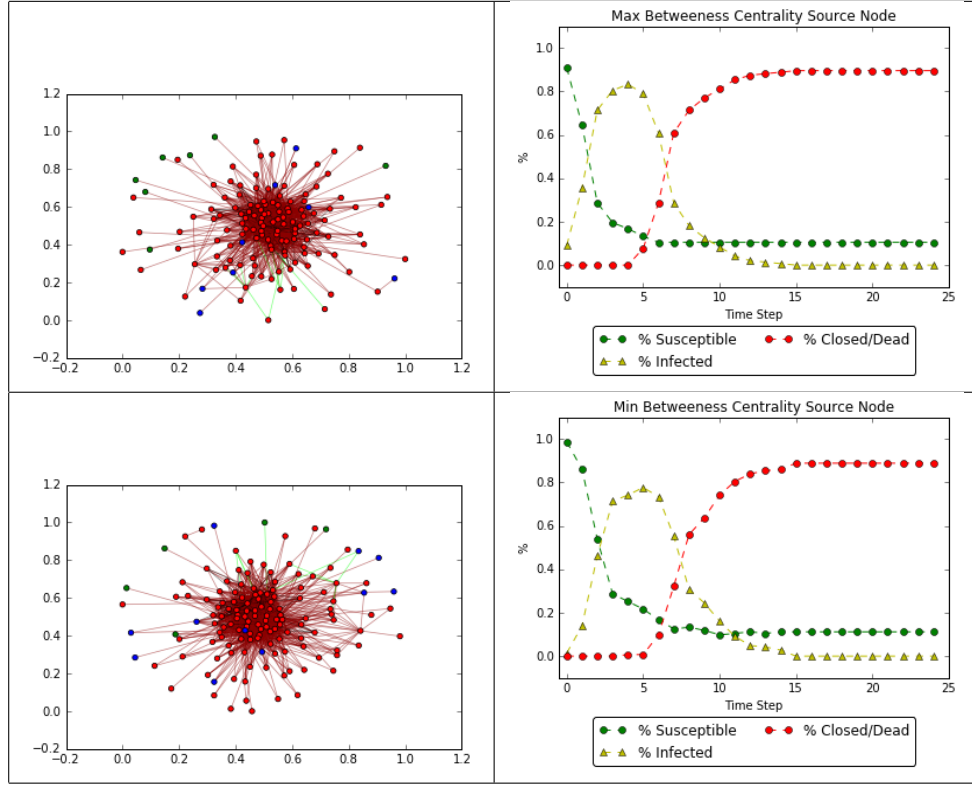


Figure 11: Simulation 2: Max and Min Betweenness Centrality SourceNode

Simulation 2

Erdos-Renyi Graphs

Table 3: Simulation 2: Erdos Renyi Graph properties for $p_n = 0.1, 0.3, 0.5, 0.9$

| index | p_n | order | size | density | cluster coefficient | diameter | nodes $\deg \geq n$ | largest component |
|-------|-------|-------|------|----------------------|----------------------|----------|---------------------|-------------------|
| 0 | 1 | 143 | 103 | 0.010144784792672116 | 0.008857808857808859 | inf | 0 | 81 |
| 1 | 3 | 143 | 310 | 0.030532847434255887 | 0.017199467199467203 | inf | 0 | 141 |
| 2 | 5 | 143 | 530 | 0.052201319806953611 | 0.045021276314982595 | 5 | 12 | 143 |
| 3 | 7 | 143 | 734 | 0.072293903279818772 | 0.07440109217101569 | 4 | 49 | 143 |
| 4 | 9 | 143 | 889 | 0.087560326996946714 | 0.09322985284361361 | 4 | 86 | 143 |
| 5 | 11 | 143 | 1162 | 0.1144489313503398 | 0.11609641591068731 | 3 | 128 | 143 |

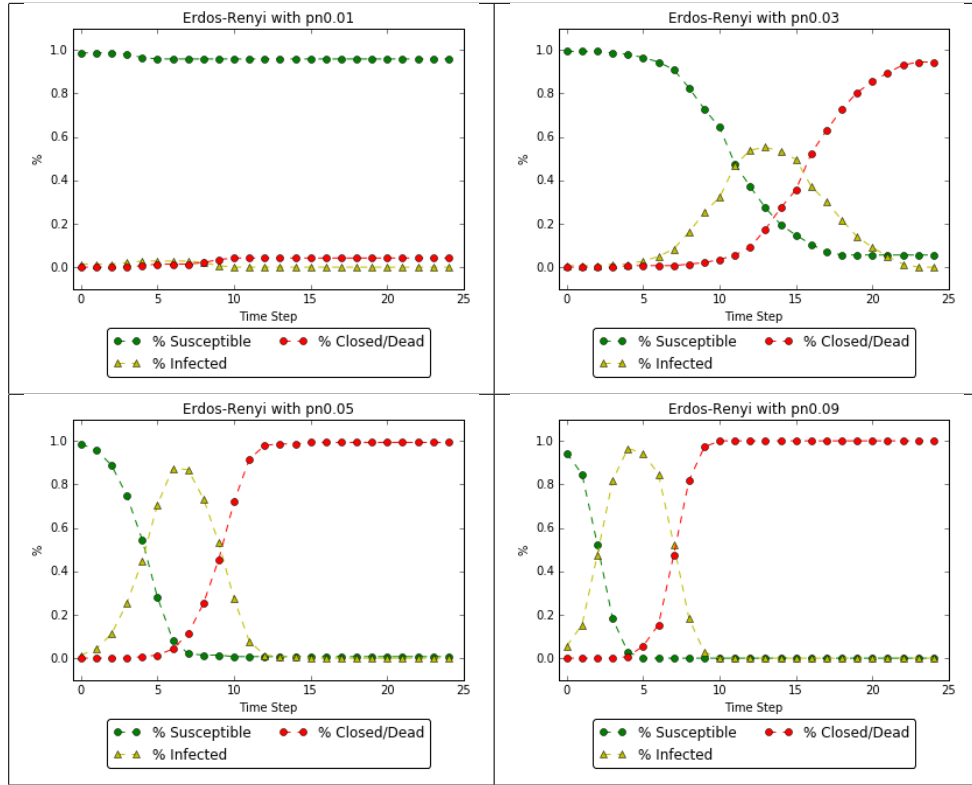


Figure 12: Simulation 2: Plotting Node States for Erdos Renyi Graphs for $p_n = 0.1, 0.3, 0.5, 0.9$

Real Airport Graph and subgraphs

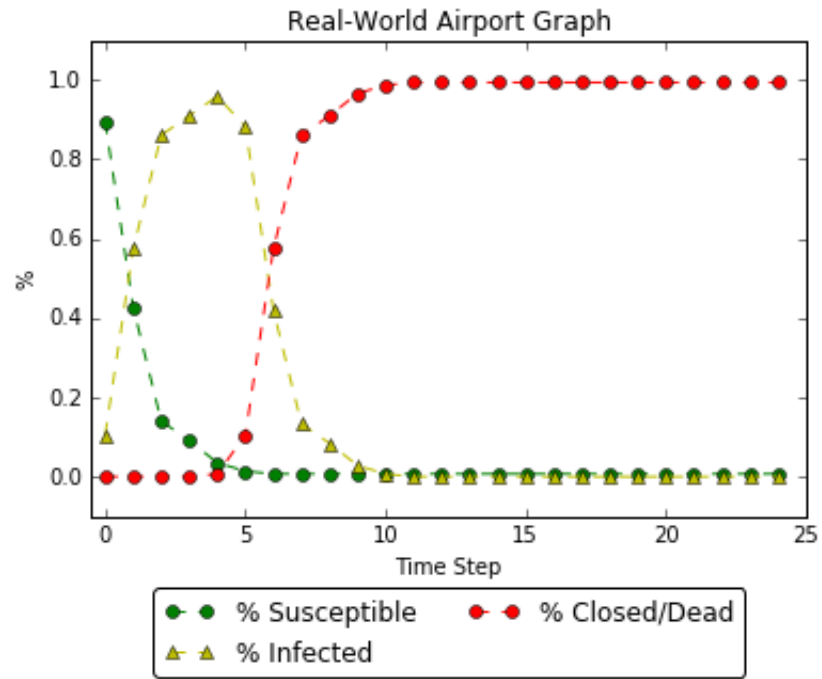


Figure 13: Simulation 2: Real-world airport graph properties

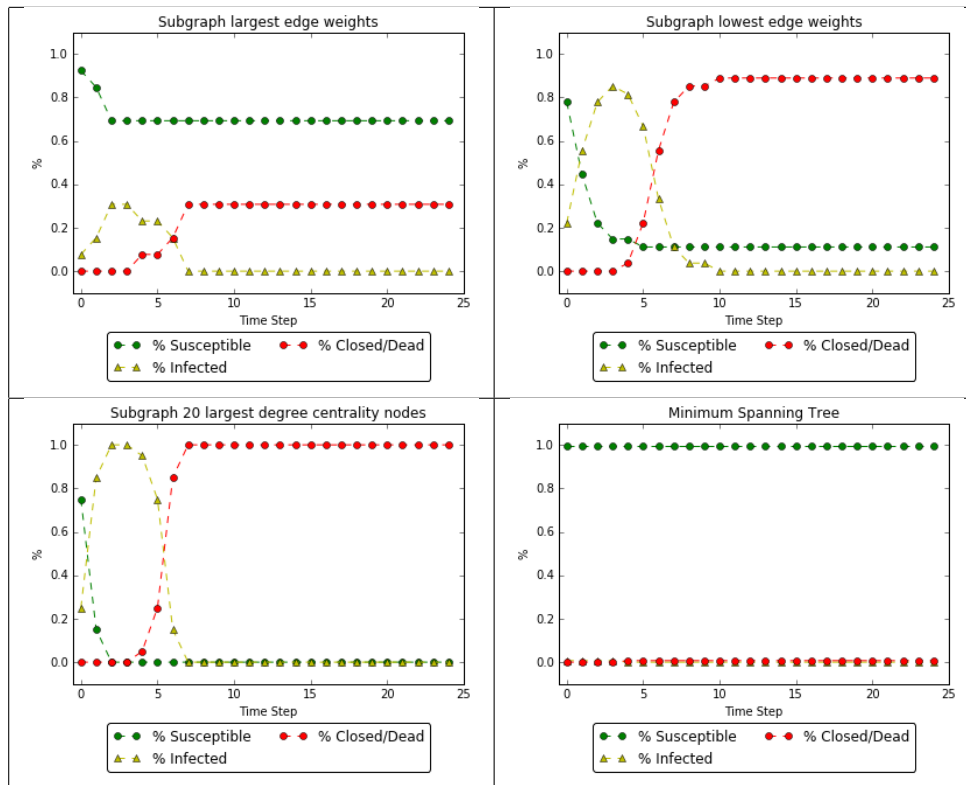


Figure 14: Simulation 2: Plotting Node States for Erdos Renyi Graphs for $p_n = 0.1, 0.3, 0.5, 0.9$

Source Node Centrality

Erdos-Renyi Graph with $p = ??$

Real World Graph