Supplementary Information

Influence of Spreader Dispersion on rumour Propagation in Complex Networks

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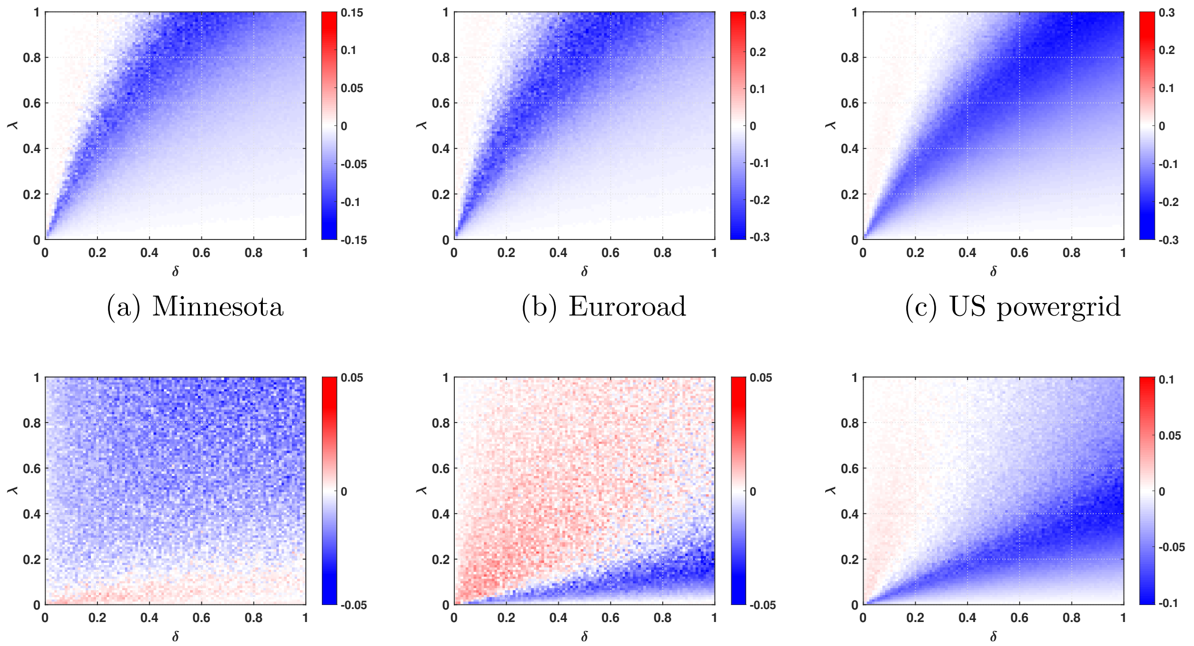
In this supplementary material we provide additional pairwise comparisons of the final rumour size and the peak fraction of spreaders obtained using FF, FFiDC, and DC as initial spreader selection strategies. In the main text, we focus primarily on the comparison between FFiDC and DC. Here, we also compare FF with the other two methods.

S1 Difference in rumour Size

Figures S1 and S2 show the difference in the average final rumour size between FF and FFiDC, and between FF and DC, respectively. In all these figures, red indicates parameter regions where FF yields a larger value of the corresponding observable, while blue indicates regions where FFiDC or DC yields a larger value.



(a) Minnesota (b) Euroroad (c) US powergrid

(d) Political blogs (e) E-mail (f) GRQC

Figure S1. Difference in the average final rumour size obtained using FF and FFiDC-based initial spreader selection for the different datasets. The fraction of initial spreaders is set to $s(0) = 0.01$. For each combination of spreading and stifling probability values, the final rumour size is computed by averaging over 50 independent realizations. The color bar represents the magnitude of the difference in final rumour size between the two selection strategies.

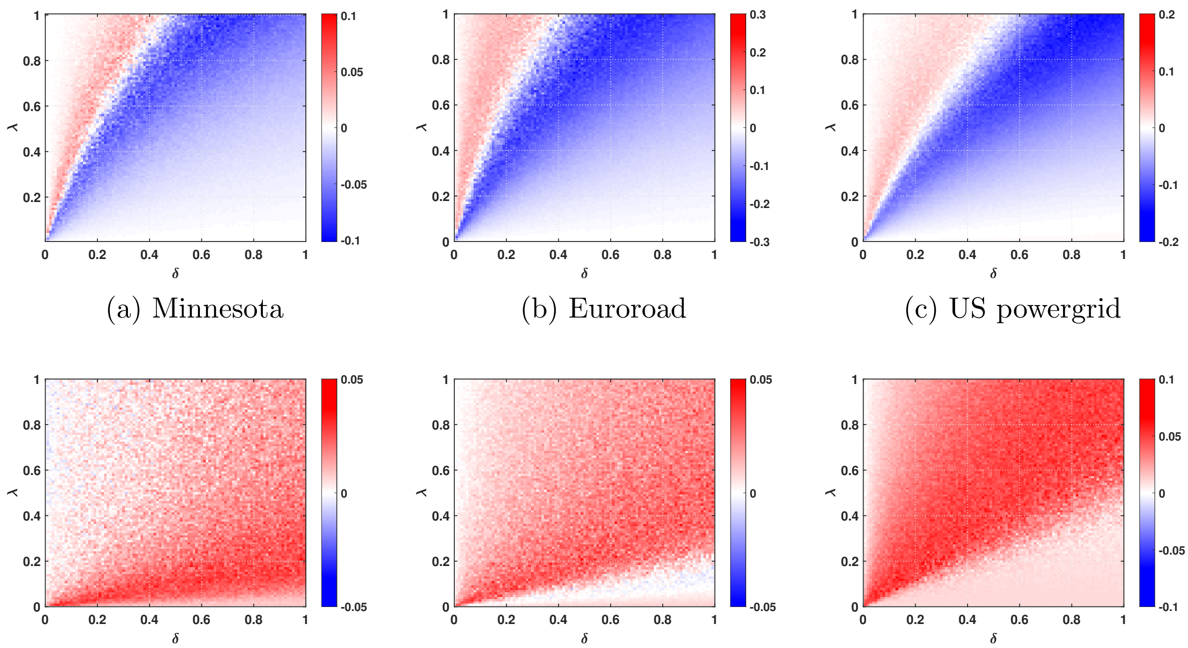


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Figure S2. Difference in the average final rumour size obtained using FF and DC-based initial spreader selection for the different datasets. The fraction of initial spreaders is set to $s(0) = 0.01$. For each combination of spreading and stifling probability values, the final rumour size is computed by averaging over 50 independent realizations. The color bar represents the magnitude of the difference in final rumour size between the two selection strategies.

S2 Difference in Peak Fraction of Spreaders

Figures S3 and S4 show the difference in the average peak fraction of spreaders obtained using FF and FFiDC, and using FF and DC, respectively. Positive values indicate parameter regions where FF produces a larger peak fraction of spreaders, while negative values indicate regions where FFiDC or DC produces a larger value. The fraction of initial spreaders is fixed at $s(0) = 0.01$, and each value is averaged over 50 independent realizations.

S3 Visualization of Initial Spreader Configurations

Figure S5 shows the initial spreaders selected by FF, FFiDC, and DC on each of the real-world networks considered in this work. For each network, the left panel shows the selected initial spreaders on the full network, while the three panels on the right show the corresponding subgraphs formed by the selected nodes. FF is observed to select initial spreaders with larger pairwise separation but relatively low degree, whereas DC selects highly connected initial spreaders that are often located close to one another. FFiDC combines these two features by selecting initial spreaders that remain fairly well dispersed while also having stronger local connectivity.

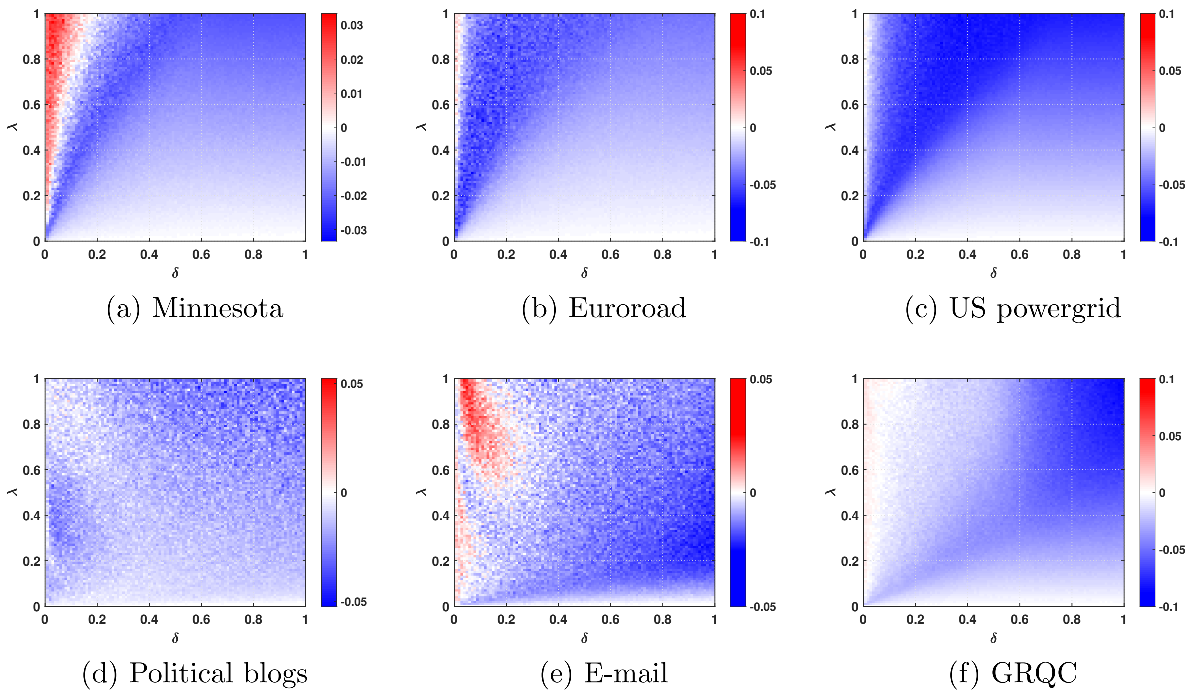
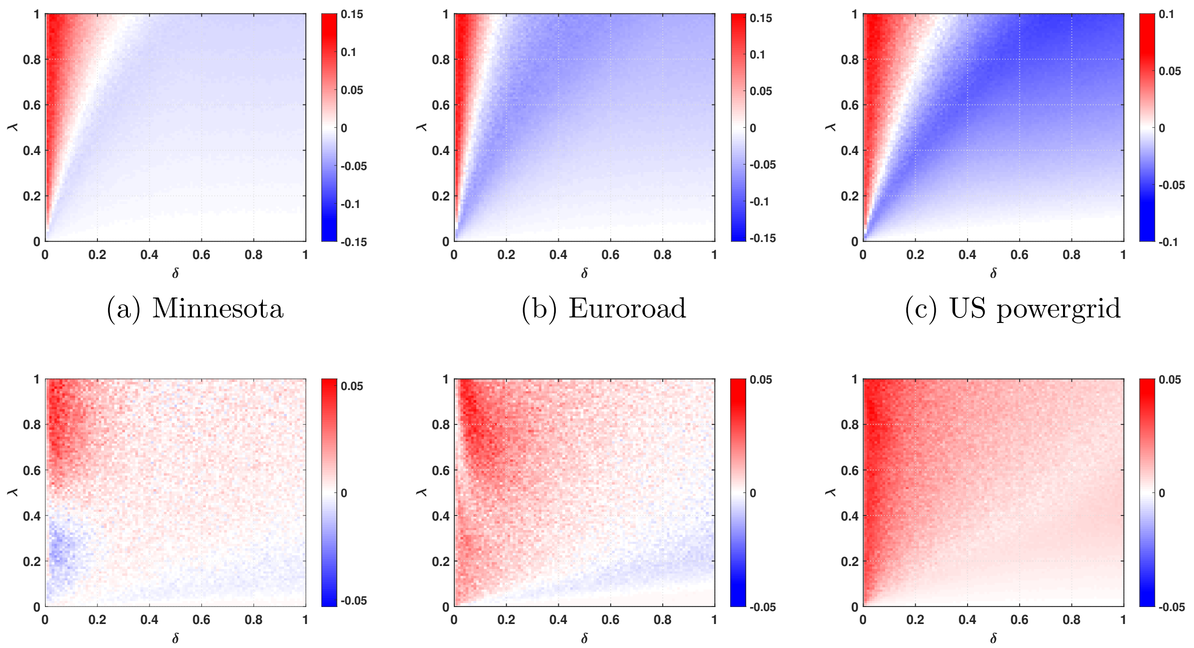


Figure S3. Difference in the average value of peak fraction value obtained using FF and FFiDC initial spreader selection for the different datasets. The fraction of initial spreaders is set to $s(0) = 0.01$. For each combination of spreading and stifling probability values, the peak fraction of spreaders is computed by averaging over 50 independent realizations. The color bar represents the magnitude of the difference in the peak fraction size between the two selection strategies. Red indicates parameter regions where FF yields a larger peak fraction, while blue indicates regions where FFiDC yields a larger peak fraction.



(a) Minnesota (b) Euroroad (c) US powergrid

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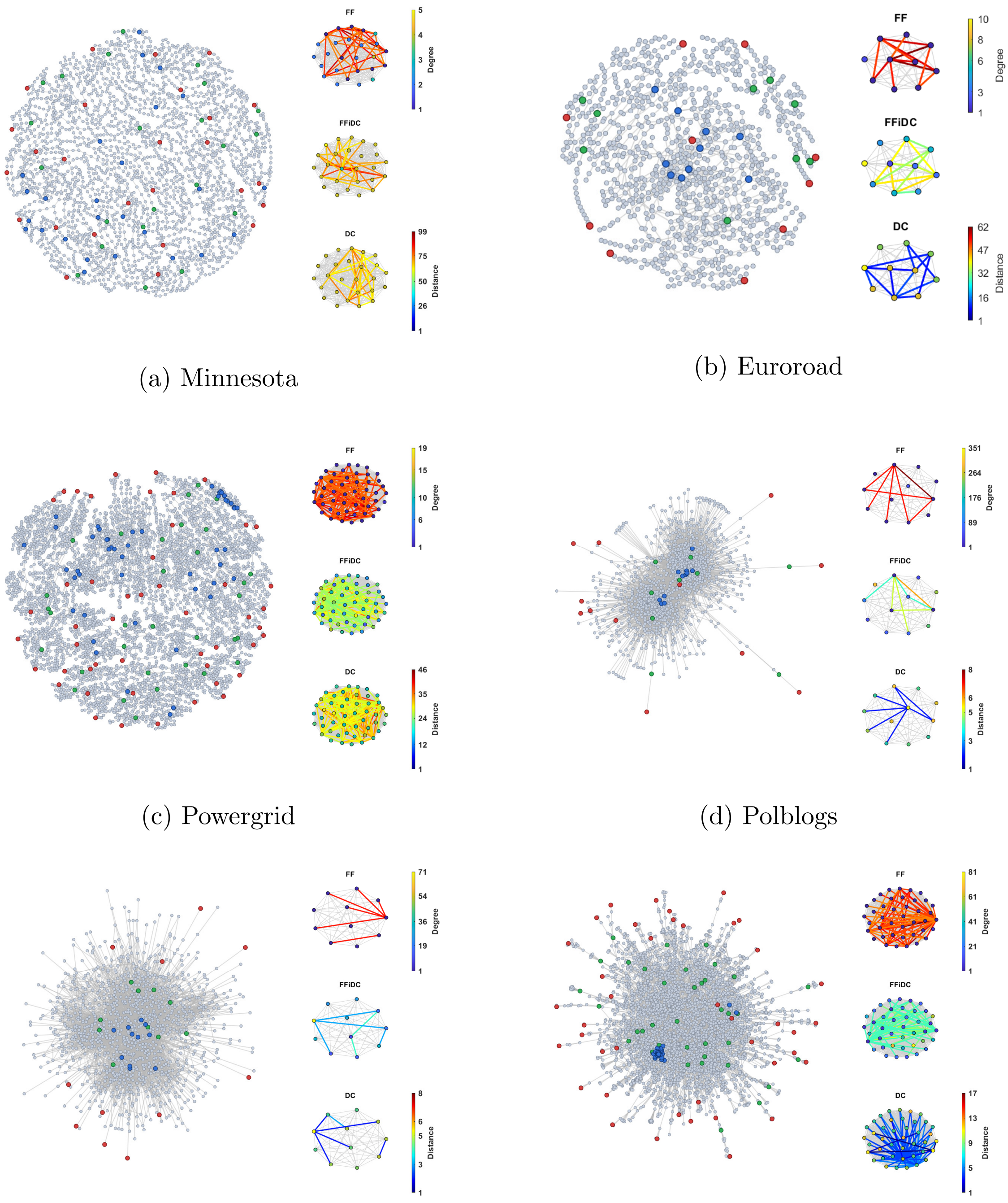
Figure S4. Difference in the average value of peak fraction of spreaders obtained using FF and DC-based initial spreader selection for the different datasets. The fraction of initial spreaders is set to $s(0) = 0.01$. For each combination of spreading and stifling probability values, the peak fraction is computed by averaging over 50 independent realizations. The color bar represents the magnitude of the difference in peak fraction size between the two selection strategies. Red indicates parameter regions where FF yields a larger peak fraction, while blue indicates regions where DC yields a larger peak fraction.



(a) Minnesota

(b) Euroroad

(c) Powergrid

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(f) GRQC

Figure S5. Comparison of initial spreader-selection strategies across the six real-world networks. In each main network panel, the full network is shown in light gray, while the nodes selected as initial spreaders by the three methods are highlighted, with FF in red, FFiDC in green and DC in blue. For each network, the three panels on the right show the corresponding subgraphs formed by selected initial spreaders. In these subgraphs, node color indicates the degree of the selected node in the full network, while edge color indicates the shortest-path distance between pairs of initial spreaders in the full network. All pairwise spreader connections are shown as thin light-gray edges, while the top 10% of edges in terms of shortest-path distance are emphasized with thicker colored lines. The colorbars show the common scales for node degree and shortest path-distance within each network.