Event-Based Visualization of Temporal Networks

Contact
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Research project

Temporal networks, where each edge or node of the graph has its own individual timestamp, has become more prevalent from social media, contact tracing, and cybersecurity. In a social media setting, we would like to understand patterns in the posting behaviour across time and space. In a contact tracing scenario, we want to understand how a disease spreads in an epidemiological context and what policies are effective against it. In a cybersecurity scenario we may want to understand normal and abnormal connections patterns to a system. In all cases, understanding and visualizing temporal networks is critical.

Algorithms for drawing temporal networks within the space-time cube (2D + t) have recently been devised to allow dynamic graphs to be visualised in an event-based way. However, it is well known that three dimensional representations are difficult to navigate and visualisations such as animation are not as perceptually effective for many tasks. This PhD studentship will investigate novel ways of interacting with and visualizing layouts of temporal networks in the space-time cube. We will look at creating technical visualisation methods that are effective for visualising layouts in the space-time cube and methods for evaluating such approaches.

Applicant skills/background

The student should have experience with developing graphical interfaces. It would be good if they have some experience with libraries such as D3 and languages such as javascript and python.

References

P. Simonetto, D. Archambault and S. Kobourov, "Event-Based Dynamic Graph Visualisation," in *IEEE Transactions on Visualization and Computer Graphics*, vol. 26, no. 7, pp. 2373-2386, 1 July 2020, doi: 10.1109/TVCG.2018.2886901.

Arleo, A., Miksch, S. and Archambault, D. (2022), Event-based Dynamic Graph Drawing without the Agonizing Pain. Computer Graphics Forum, 41: 226-244. https://doi.org/10.1111/cgf.14615