

Visualizing Temporal Adjacency Matrices

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Problem Statement & Motivation

The conventional way of modelling dynamic networks is a series of full graph descriptions, often aggregated or “timesliced”. These representations can obscure the finer-grained temporal dynamics.

In contrast, continuous (“event-based” or “temporal”) network representations store the individual, timestamped changes (events) in the network, preserving those dynamics.

Meanwhile, the most common approach to visualizing such networks are node-link diagrams, which can become unreadable as networks grow in size and density. For dynamic networks, animation alone struggles with comparing distant timestamps.

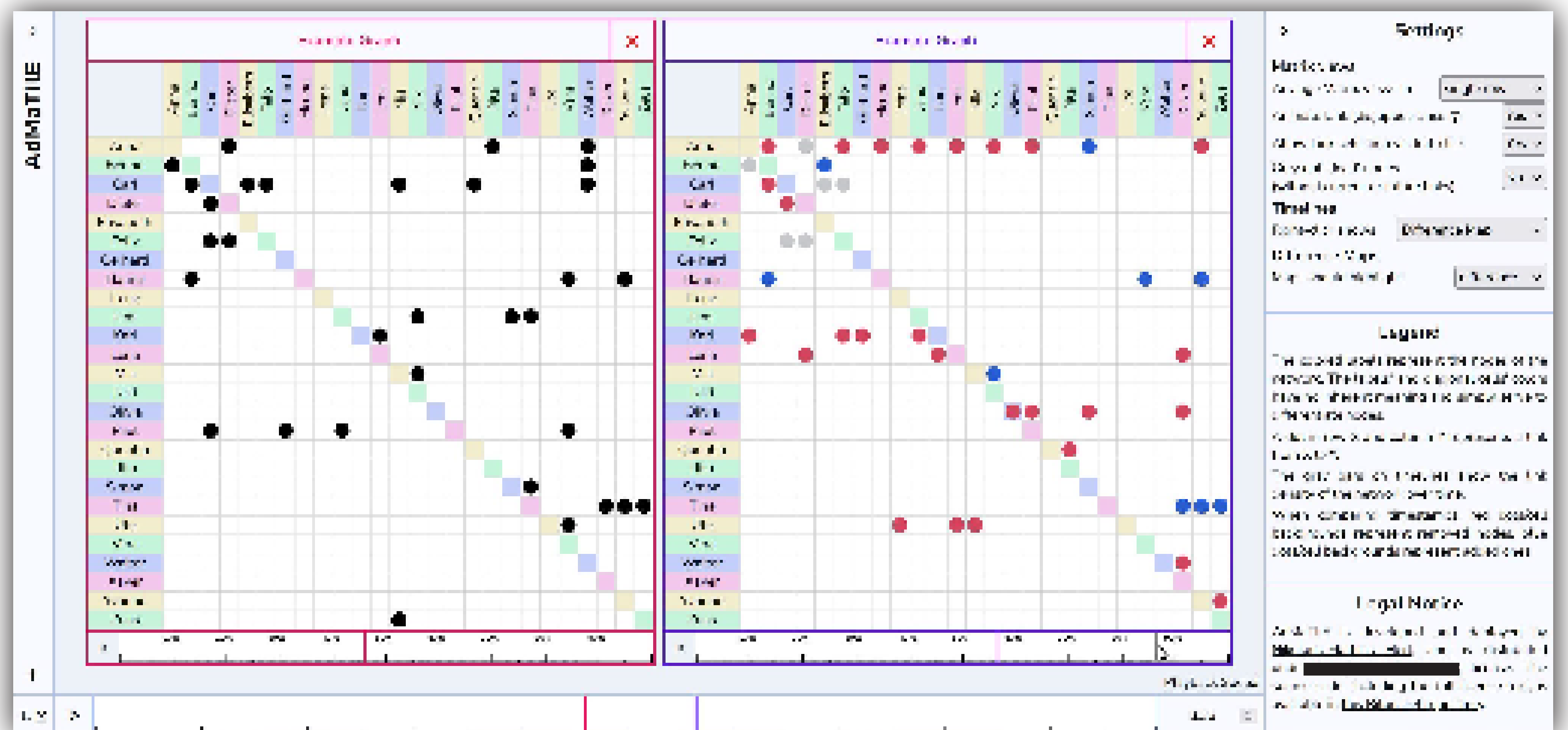


Figure 1: Fullscreen view of AdMaTile, with two displays of the same example graph opened.

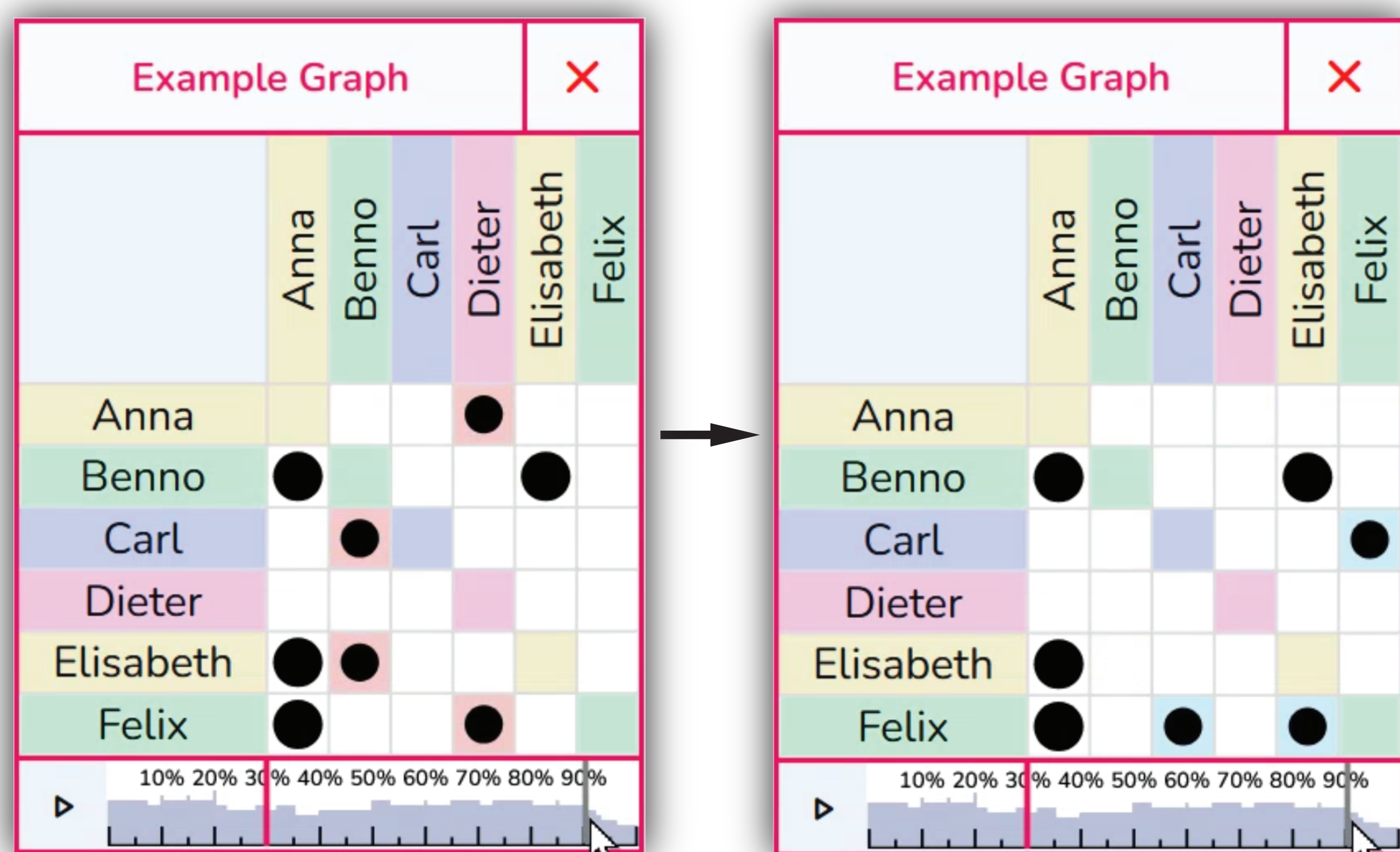


Figure 2: Two snapshots of a staged transition.

AdMaTile: Event-based, Interactive Adjacency Matrices

Our approach utilizes event-based data in the form of GEXF files, and puts the node-link alternative of adjacency matrices on the forefront.

The system offers interactive views combining adjacency matrices, timelines, difference maps, and animated transitions. Users can compare multiple graphs and different views simultaneously using a small-multiples approach (see Figure 1).

Temporal evolution is visualized through animation, with left-clicking enabling precise timeline navigation. Right-clicking on the timeline supports staged transitions, highlighting changes over time, and displays difference maps that instantly show appearing and disappearing edges (see Figure 2).

Hovering over matrix cells reveals crosshairs, highlighting source and target nodes for easier identification.

Hypothesis: Difference Maps Beat Staged Transitions for Dynamic Data

Given our experience with AdMaTile and due to the following characteristics, we suspect that difference maps are - in most analysis tasks - superior to staged transitions:

- They are **instant** and permanently show the **complete difference information**,
- thus pairing well with **brushing** over timelines,
- and making them **printable**.

Future Work

- Evaluating AdMaTile quantitatively against other systems on various analysis tasks.
- Exploring the perceptual traits of (adjacency) matrices further. How can they become more readable, intuitive, insightful?
- Implementing time **range selection**, along with proper support for **weighted edges**.
- **Node reordering** and **clustering/collapsing**

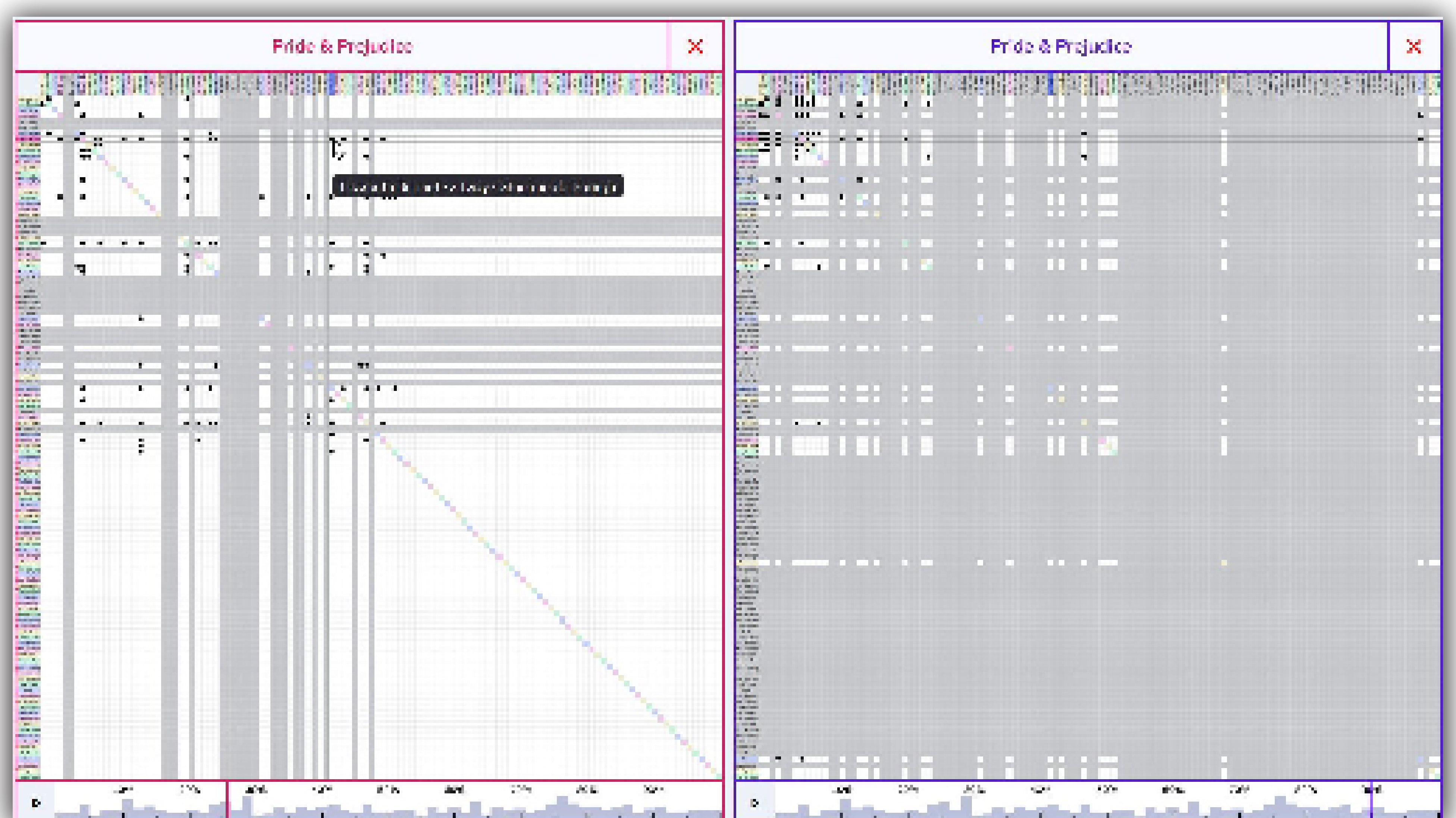


Figure 3: Multiple views with no-longer-active nodes greyed out, and the mouse hovering over an edge, revealing crosshairs and a tooltip.

