TrafficBoard: Digital Spatio-Temporal Pinboard for Human Trafficking Detection

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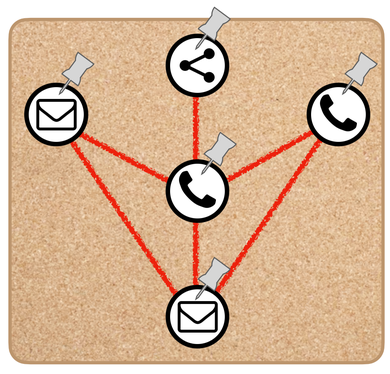
Human trafficking for forced sexual exploitation (HT) affects an estimated 6.3 million people world-wide. Practitioners can detect HT in online escort websites by analyzing connections between metadata (emails, phone numbers, social media accounts, URLs) throughout time of related ads. They use *pinboards* (node-link diagrams), which get cluttered when parts of the graph are densely connected. **TrafficBoard** combines *graph compression techniques* and *interactivity* to enable practitioners to investigate connections between suspicious metadata over time, as well as their geographic spread.

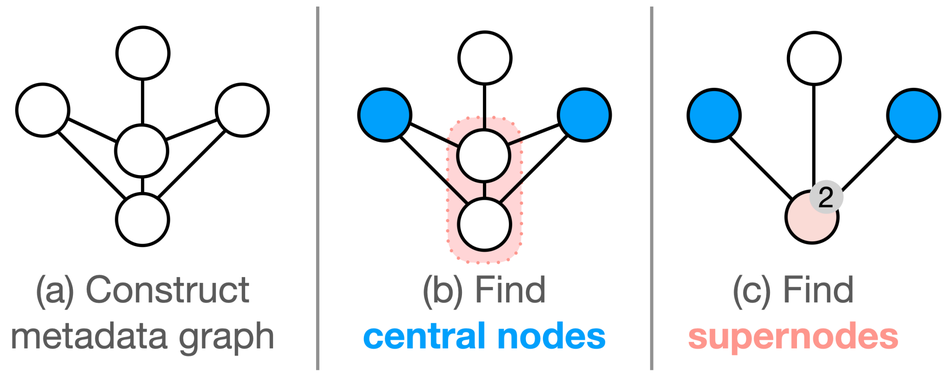
✓ *Summarizing the display graph* ✓ *Fast spatio-temporal exploration*

Example of a pinboard used by detectives:



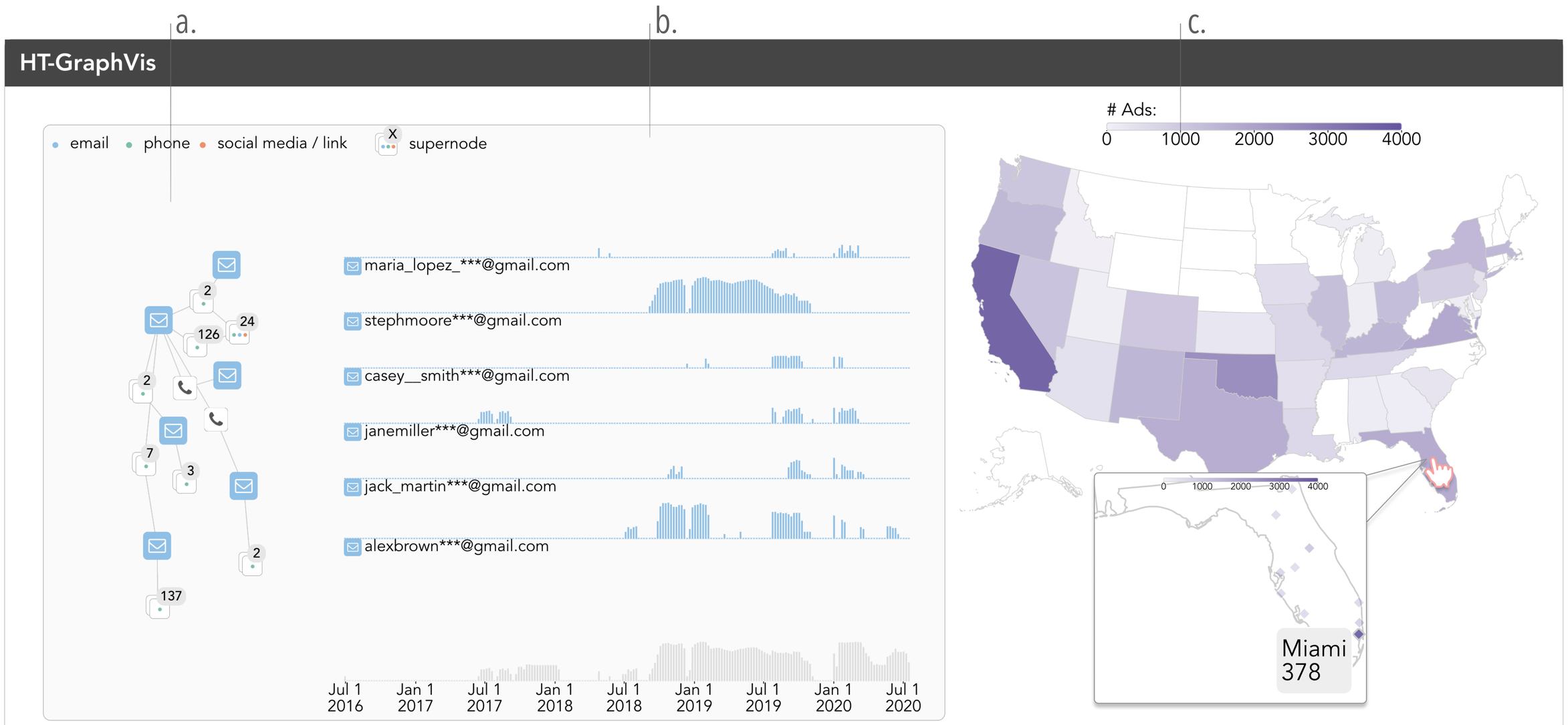
1 Graph compression.

(a) First, we construct our graph by linking two metadata nodes if an ad uses both of them simultaneously. (b) We then pick the top 6 nodes (due to space constraints) with highest betweenness centrality and call them the *central nodes*. (c) Finally, we compress any non-central nodes with the same neighbor set into *supernodes*, resulting in our final display graph.



2 Fast spatiotemporal exploration.

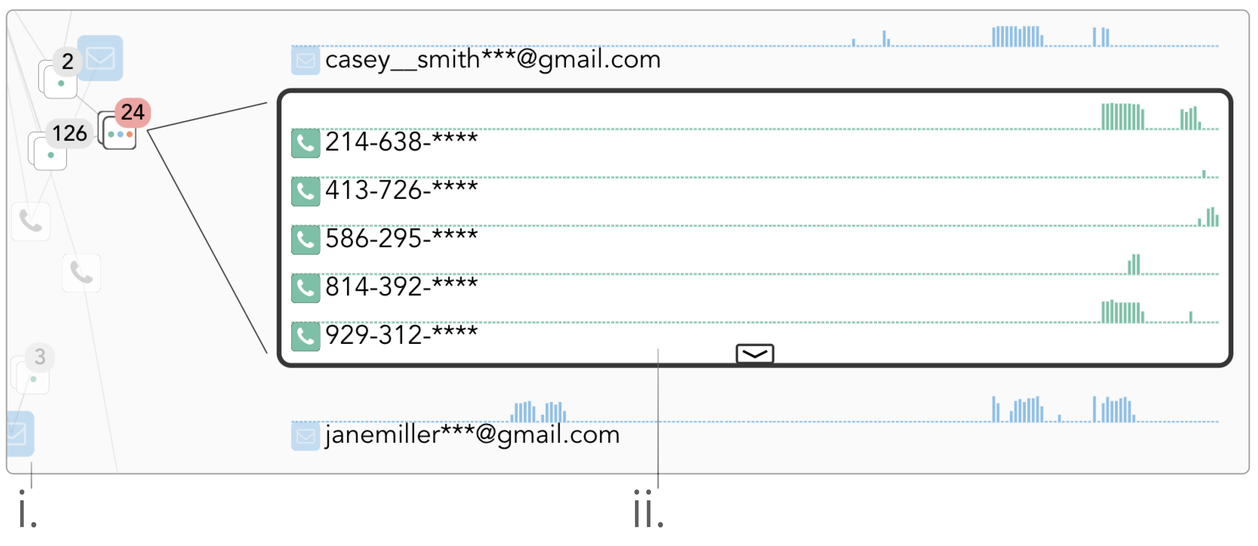
(a) Expert uses *Graph view* to discover connections between metadata and select nodes of interest. (b) Aligned time series in *Timeline view* let experts examine synchronized behavior and select particular weeks. (c) Expert finds hotspots in *Map view* and can **select** a state to zoom in and investigate city-level data.



When an expert selects a supernode…

i. **Central nodes** move to make space for other timeseries

ii. Expert can scroll through the time series of all contained nodes



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