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Pioneering visualization framework makes the picture clearer

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Researchers produce a new framework, StreamEB, which could revolutionise the visual analysis of data and graph streams.

High velocity data streams such as trading data have become ubiquitous since the 1990s and graph streaming is becoming increasingly popular in many areas. Finding patterns in this type of data is a common analytical activity and visualization of these data streams greatly helps these patterns to be found. However, naive visualization methods can result in considerable screen clutter that hides important information. Research by Dr Quan Nguyen and Professor Peter Eades examine "bundling" methods that aggregate relations between data entities as a way of reducing clutter while retaining visual trends. The research work has been crystallised into a framework which has been tested and found to improve the visualization of graph streams.

Nguyen's research, which was presented at the prestigious 20th International Symposium on Graph Drawing at the Microsoft Research Laboratories in the USA, is focused on the visual analysis of data streams, especially graph streams. The research is based on the fact that the connection patterns may change quickly but the aggregated "bundles" change much slower. The research methods assist with the key tasks of community detection and change detection in the underlying network.

The research looks at how edge bundling methods help to unveil the extent to which communities have shrunk, split or emerged over time. Many modern applications nowadays operate on large graph infrastructures such as telecommunication traffic, Internet Data and real-time monitoring systems. These real-world applications produce data as graph streams in which individual edges of the underlying graphs arrive sequentially in a stream every few seconds or less. The streaming model allows the processing and analysis of huge graph streams on the arrival of incoming edges.

Nguyen's research presents a new framework, called StreamEB, which is the first work that addresses edge bundling for graph streams to extract high-level patterns. The framework is the first that aims to re-route edges to reduce visual clutter in the visualization of stream graphs in an automatic way. The framework can be used for visual mining of graph streams and users may adjust the parameters to suit analysis tasks. The framework has been tested successfully on flight data from USA flight monitoring activities and Thompson Reuters trading data from major stock exchanges. The results show the effectiveness of the framework to support various stream mining tasks like identifying important actors and groups of closely related actors and locating abnormal patterns.

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