Visualization of Graphs and Analysis Results in Multiple Ways

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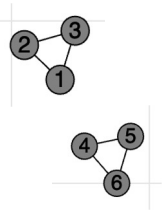
Big Data Visualization Problem

- **Understanding structured data using text format is quite difficult**
- Perks of visualization shown below

```
# Edge Community File for Layer
L1
# Number of Vertices
6
# Number of Non-Singleton Communities
2
# Number of Community Edges
6
# Edge Community Allocation: v1,v2,commID
1,2,1
1,3,1
2,3,1
4,5,2
4,6,2
5,6,2
```

Graph Text File

vs.



Graph Visualization

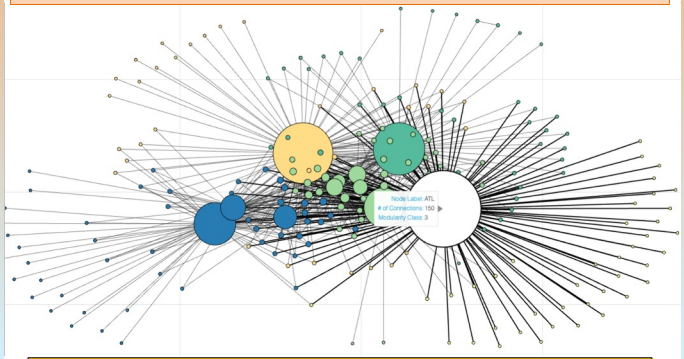
Our Approach

- **Provide a web-based user interface to generate multiple visualizations of a structured object (e.g., graph)**
- **Alternatives** are critical for **in-depth understanding** of the analysis results
- **Visualization Alternatives**
  General graph to understand nodes, edges, and connectivity
  Interactive visualization of graph
  Community Network Visualization
  Word Clouds
  Community Visualization using **Circle Packing**
  Map Visualization

Experimental Results

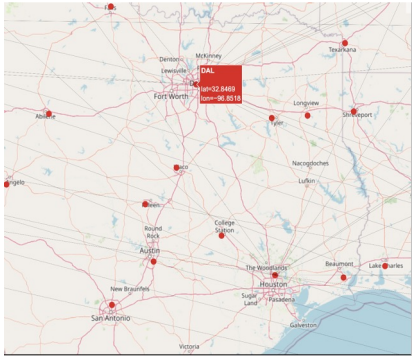
Network Visualization

Allows users to explore the node interactions in the base network

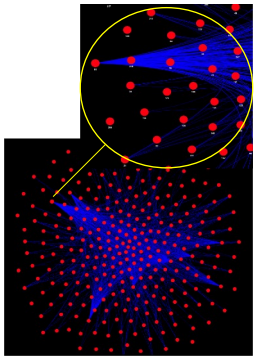


Delta Airlines Network: **High Degree, Larger Node Size → Airline Hub**

- Different colors of nodes in the Delta Airlines Network shows different communities that have been detected using a Community Detection algorithm



Spirit Airlines Map Visualization: **Flight Network marked on US map**

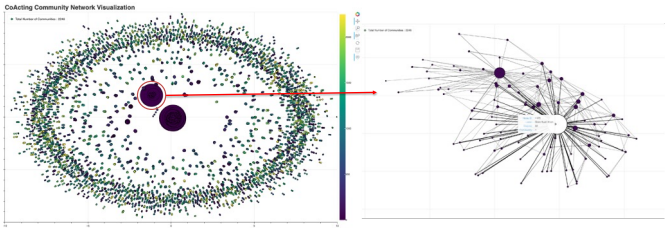


Interactive Network: **Allows dragging of nodes**

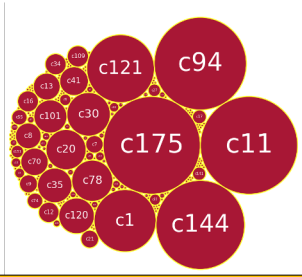
Experimental Results

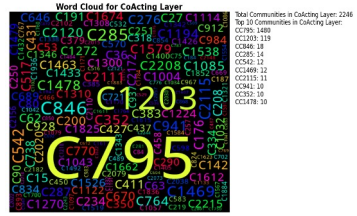
Community Visualization

Allows users to explore the community structure of a network



Co-Actor Communities: **Zoom-in, Hover Capability for enhanced clarity**





Similar Genre Actor Communities: **Circle Packing plots communities relative to the number of nodes**

Co-Actor Communities: **Word Cloud with Top 10 Communities**

Conclusions

An **interactive web-based dashboard** offering a **comprehensive platform** for **visualizing different types of graphs and analysis results**, enabling researchers and practitioners to gain insights into the complex systems of interacting entities.

Tech Stack Used

- Nginx Web Server, Flask, Python
- **Visualization Packages:** NetworkX, Plotly, Bokeh, WordCloud, Circlify, matplotlib, pandas, NumPy

Other Details

Publications: ICDE 2021, KDIR 2022, DB&IS 2022, ICCS 2017

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