

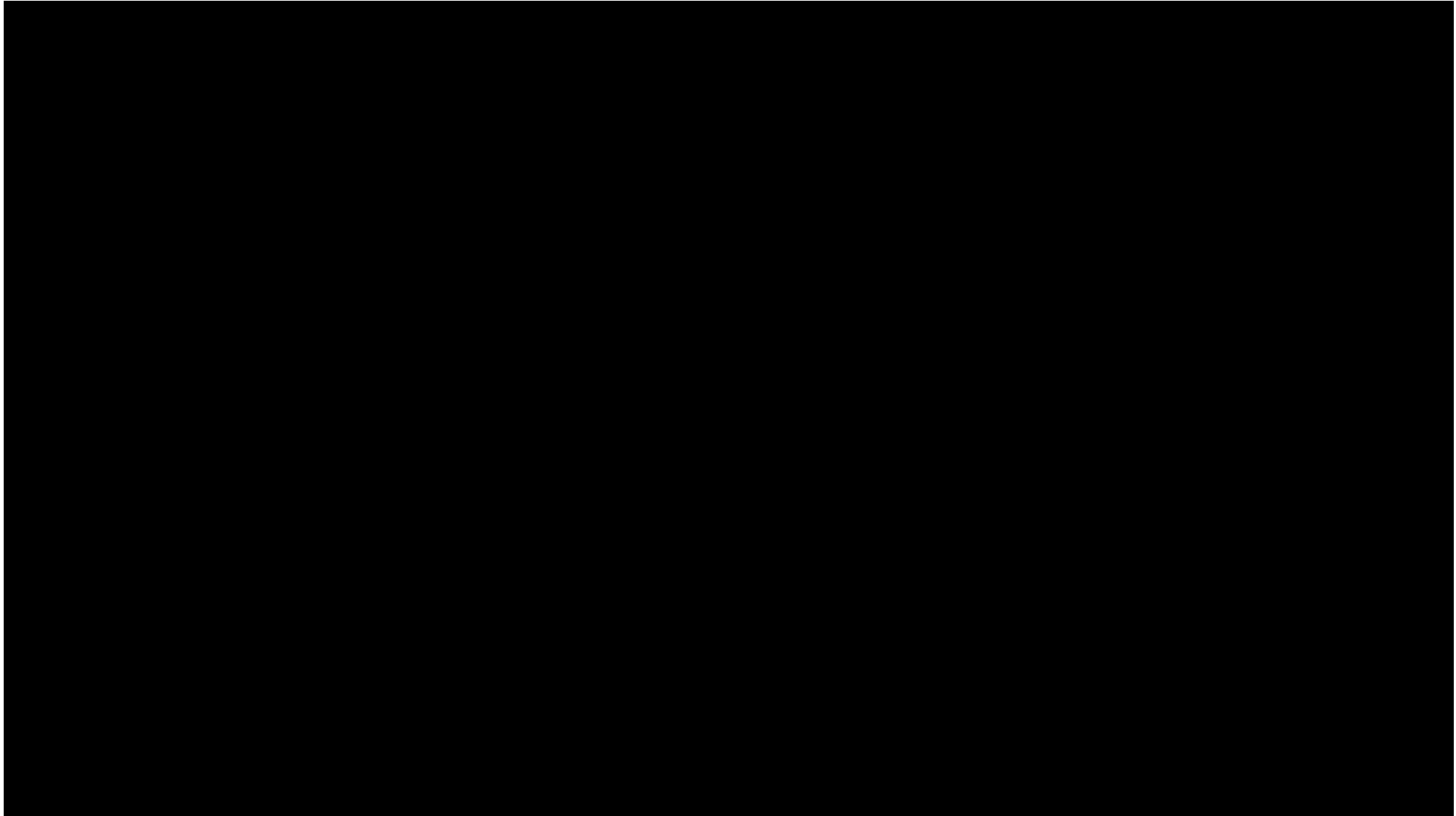
Hub Identification of the Metro Manila Road Network Using PageRank

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Outline

- **Node Hub Identification**
- **PageRank**
- Case Study: The Metro Manila Road Network
- Analysis
- Conclusions
- Future Work

Movie



Research Questions

- Most important hubs?
- Least important hubs?
- Basis/Pattern in hub ranking?

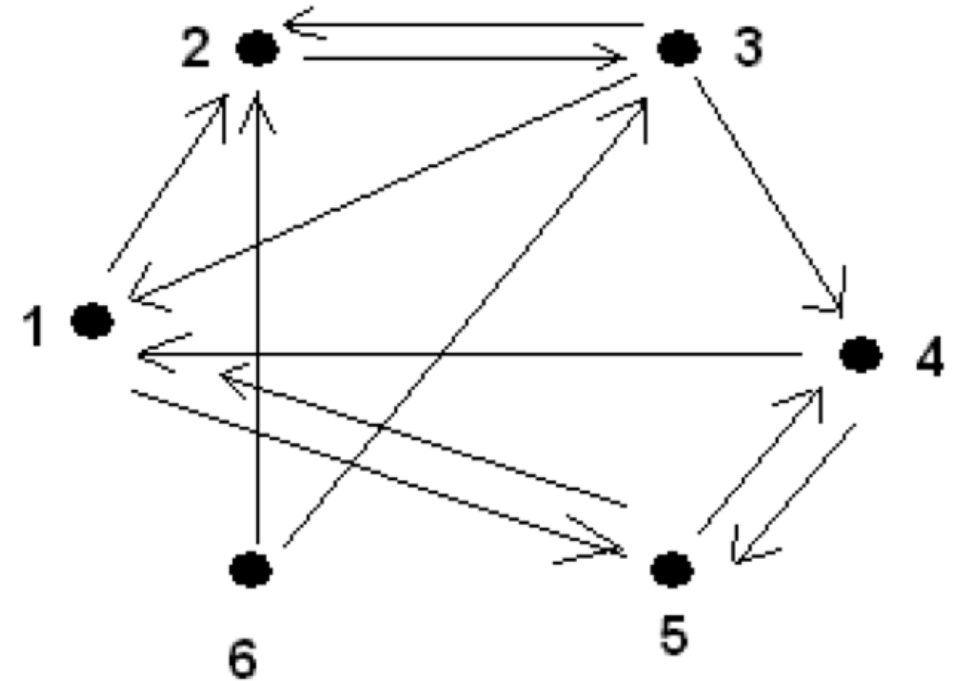
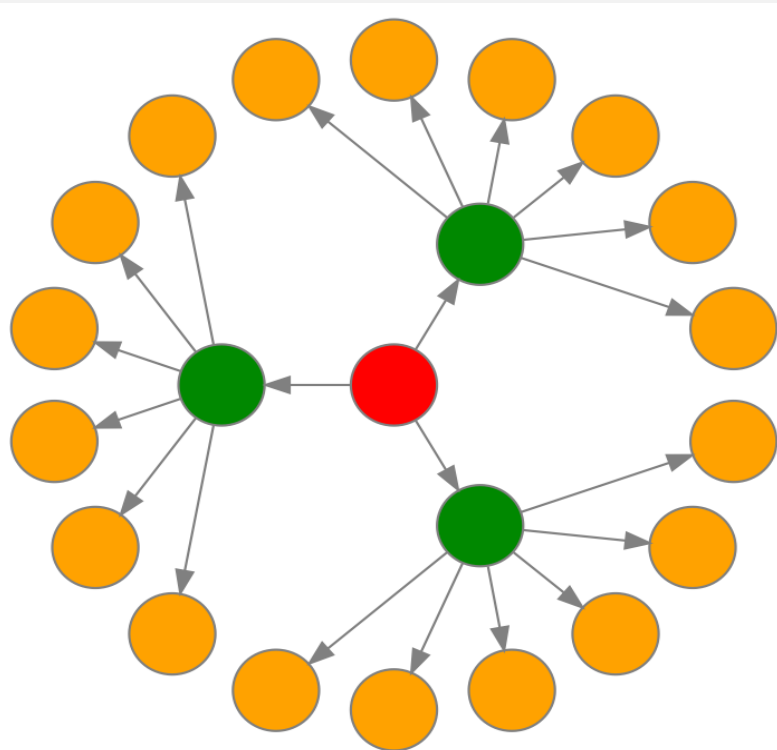
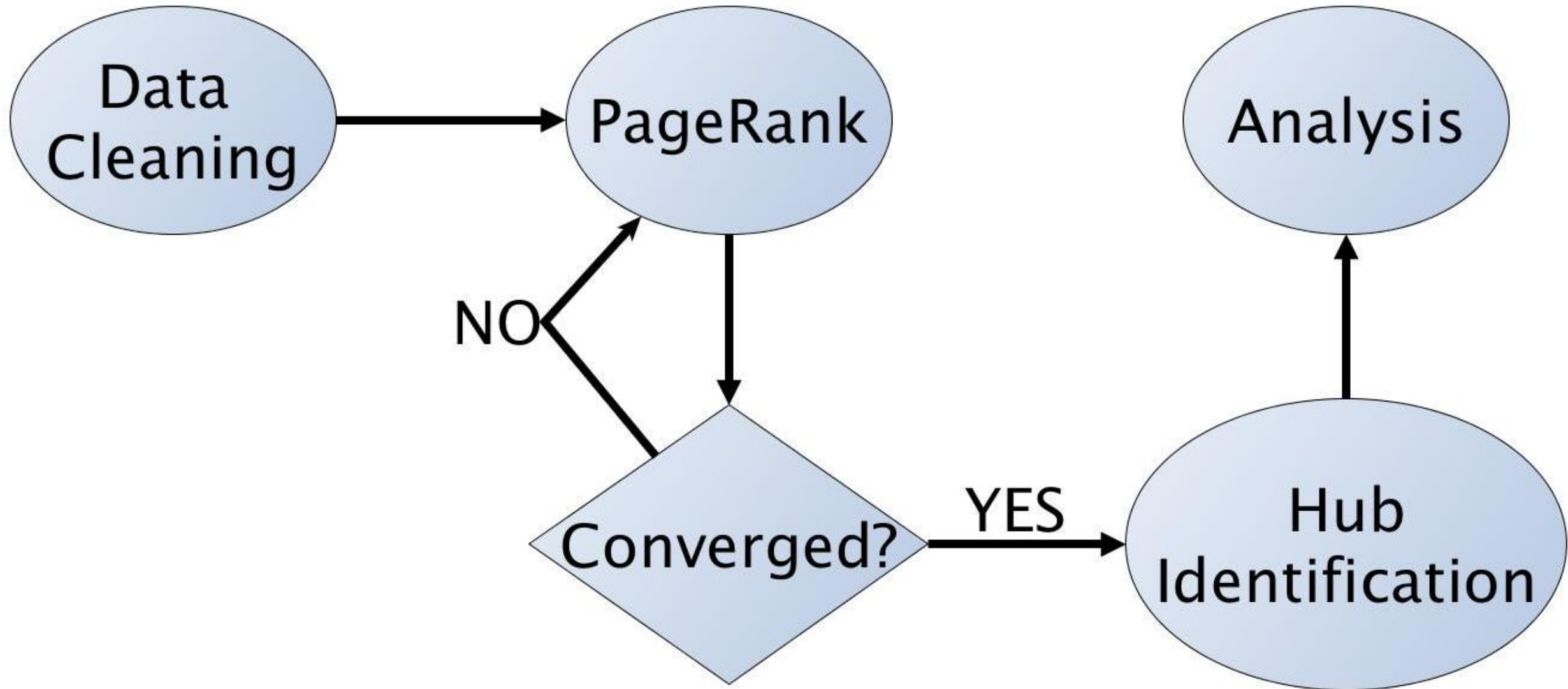
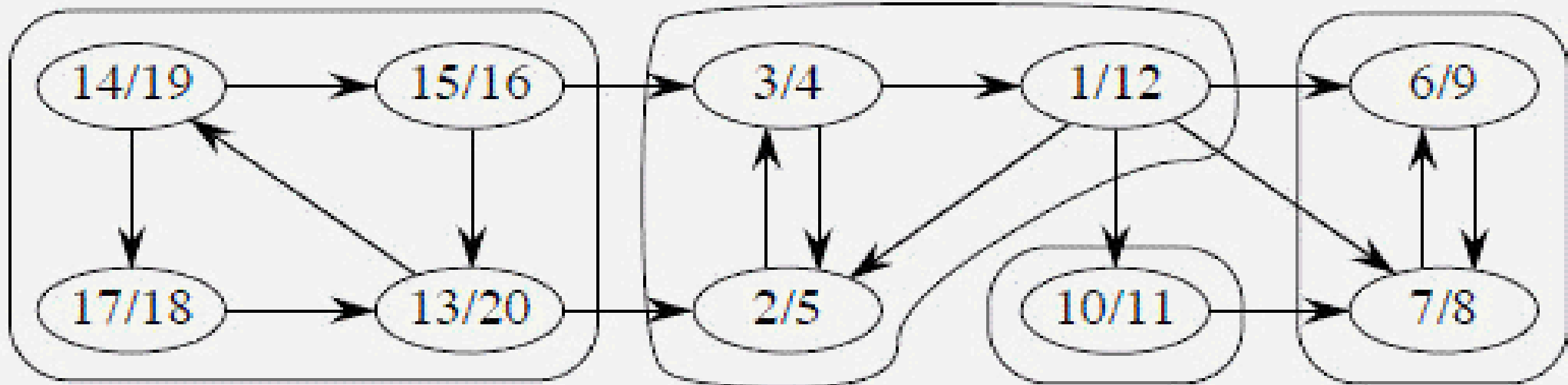


Diagram Summary

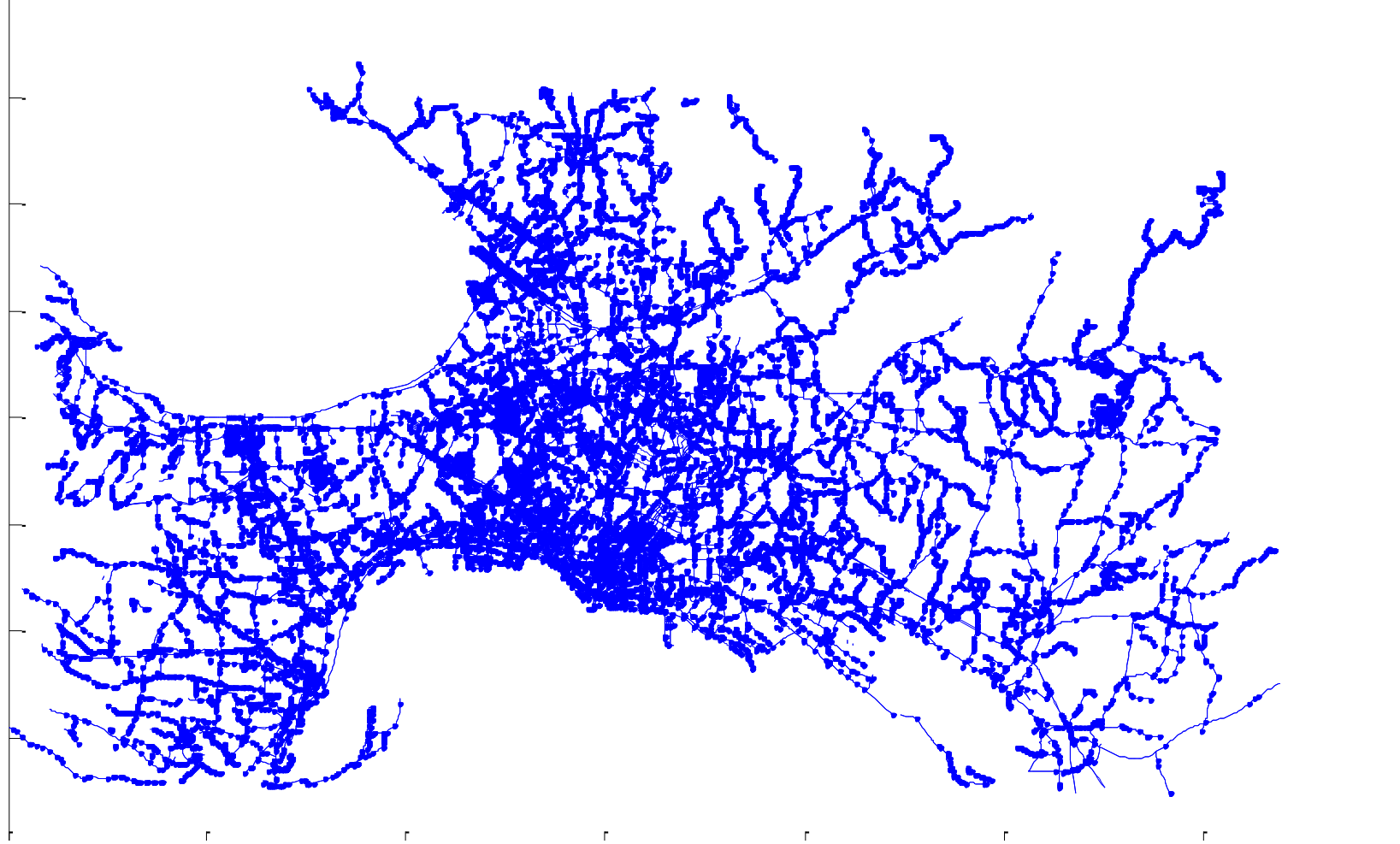


Cleaning Data and Network Connectivity

- Data extraction using OpenStreet Map (OSM)
- Tarjan's Algorithm
 - Core components

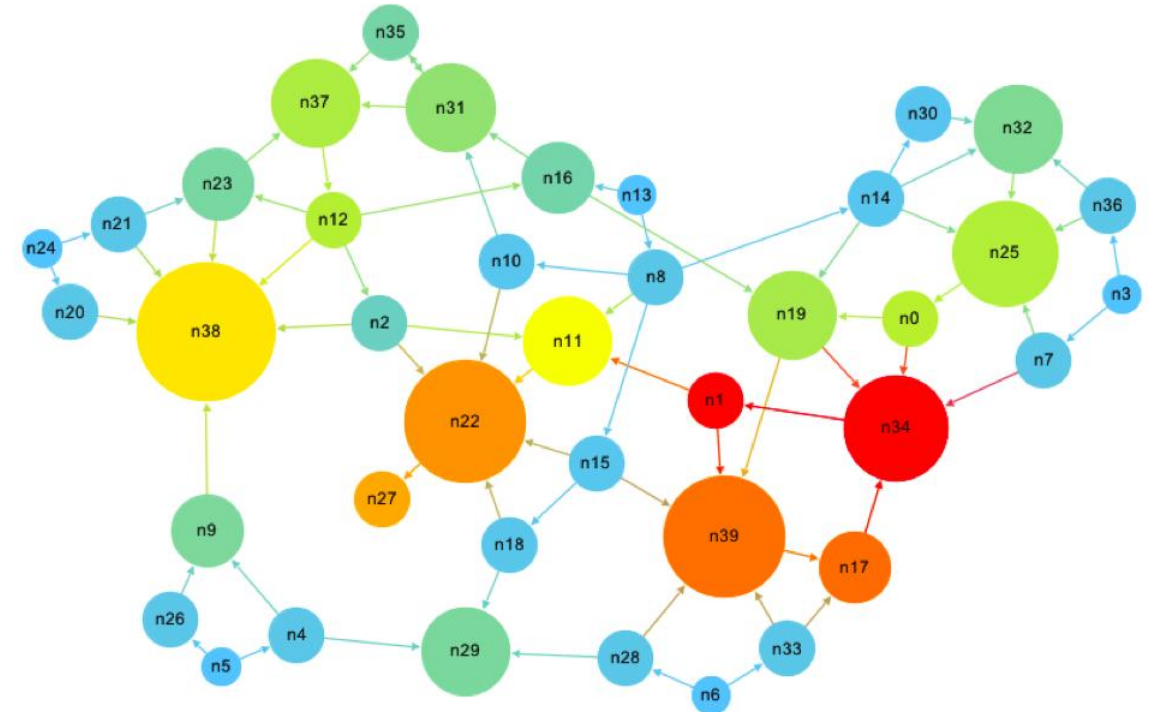


Metro Manila Road Network



PageRank

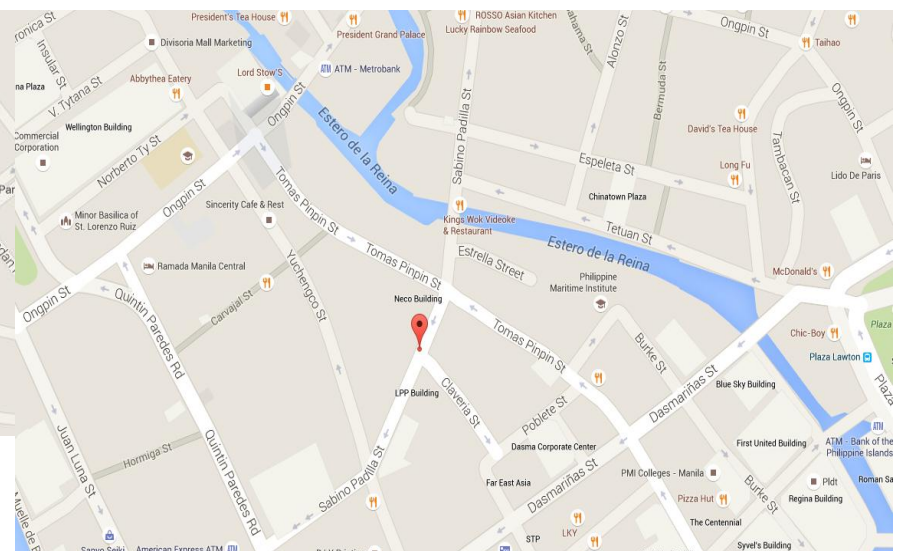
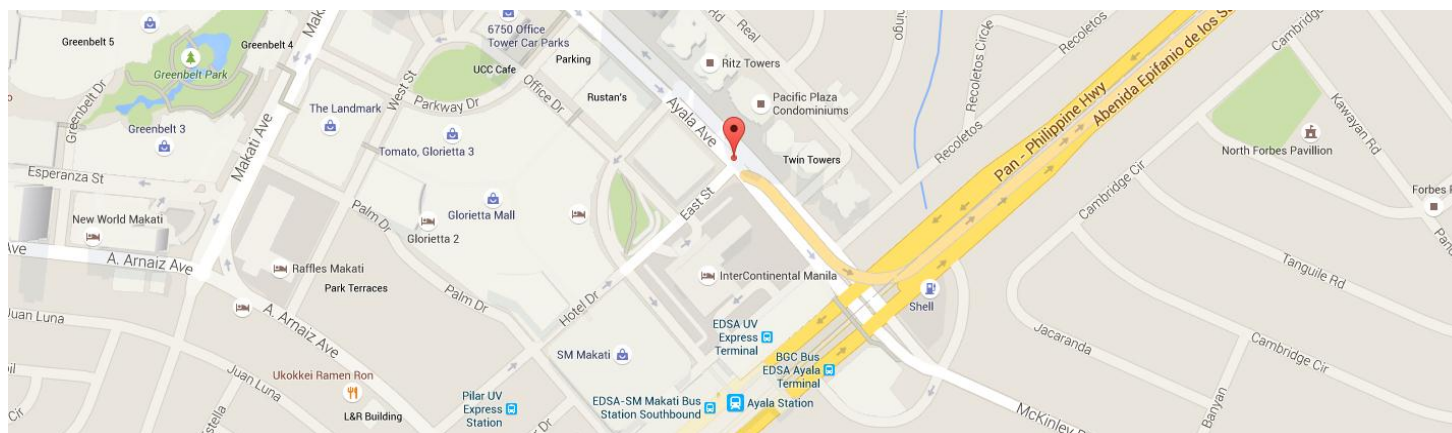
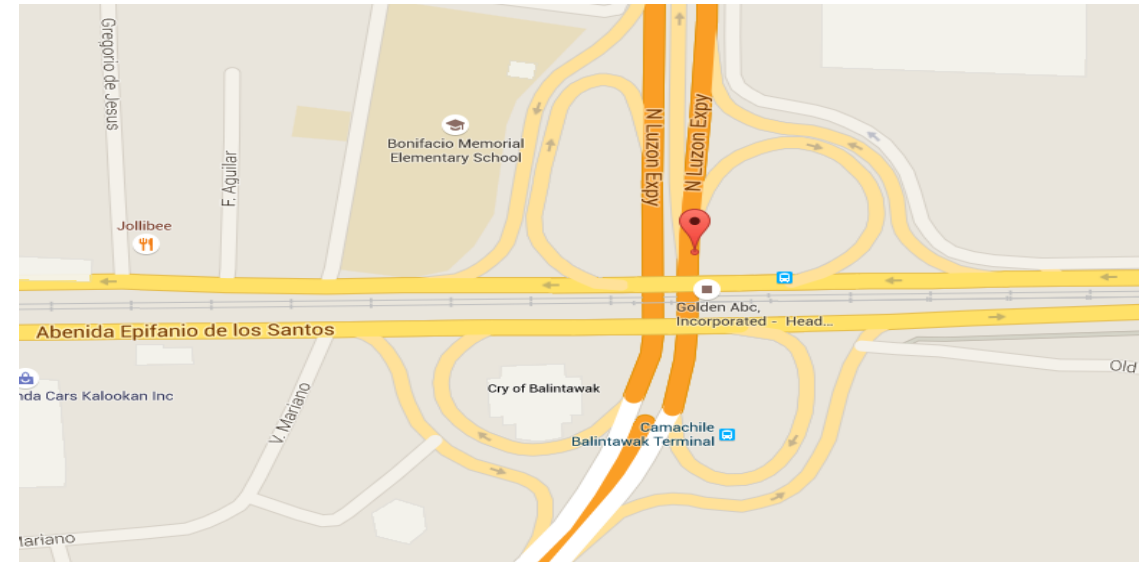
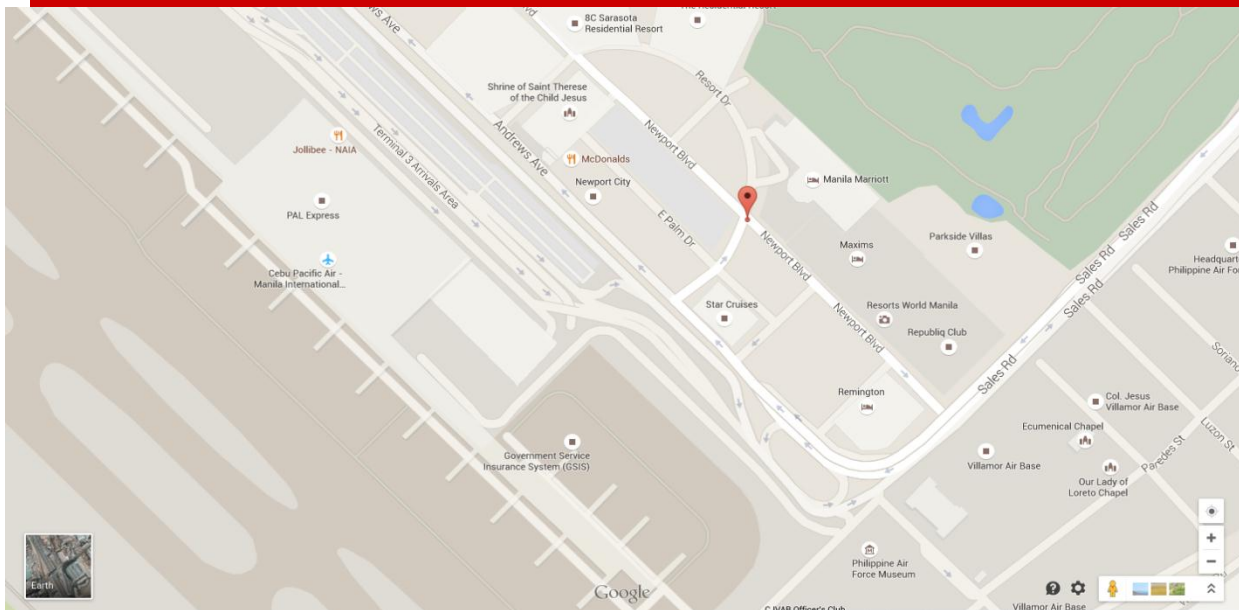
- How important is a node hub?
- ASSUME: Higher rank = more prone to terrorist attacks
 - Budget allocation
 - Defense reinforcement
 - Transportation safety
- 204 iterations for Metro Manila network convergence



Most Important Hubs



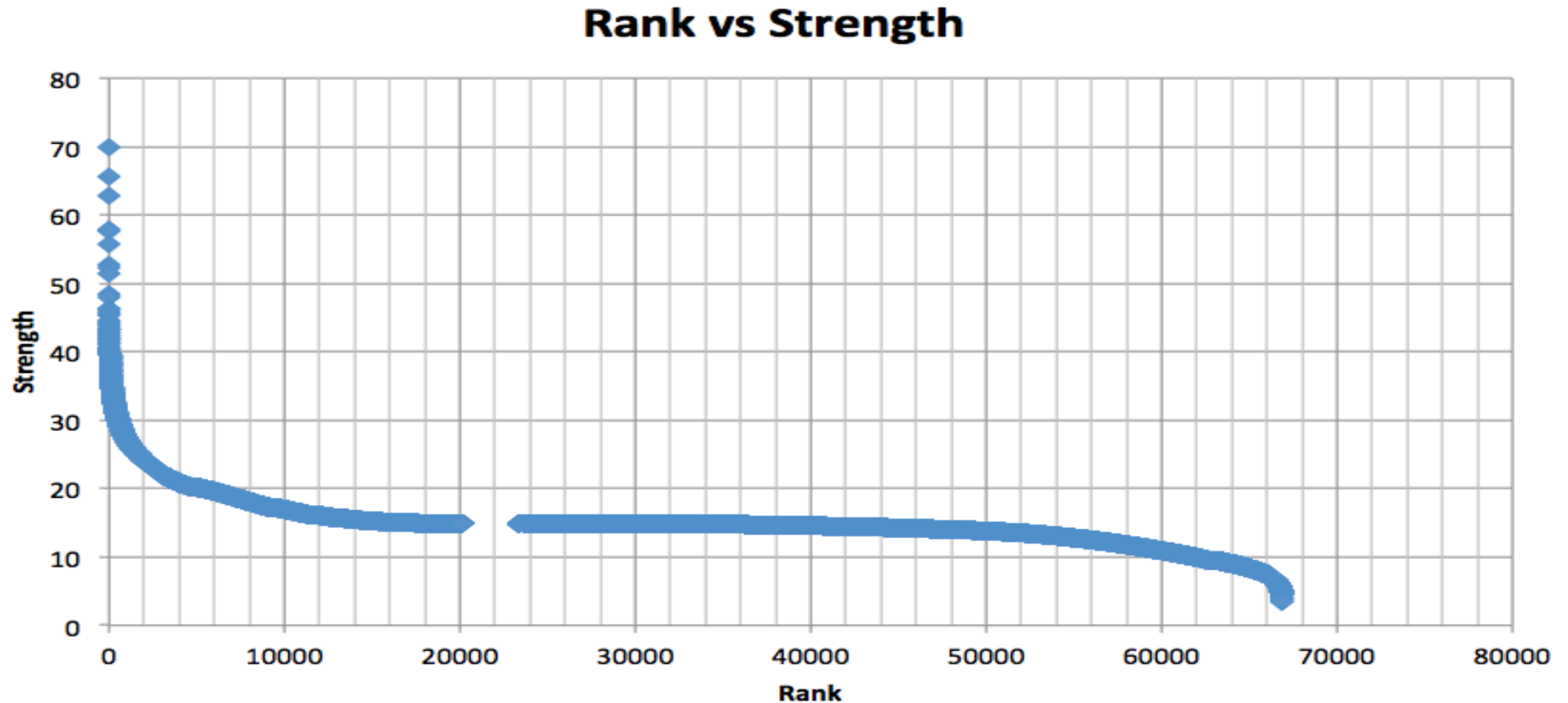
Most Important Hubs



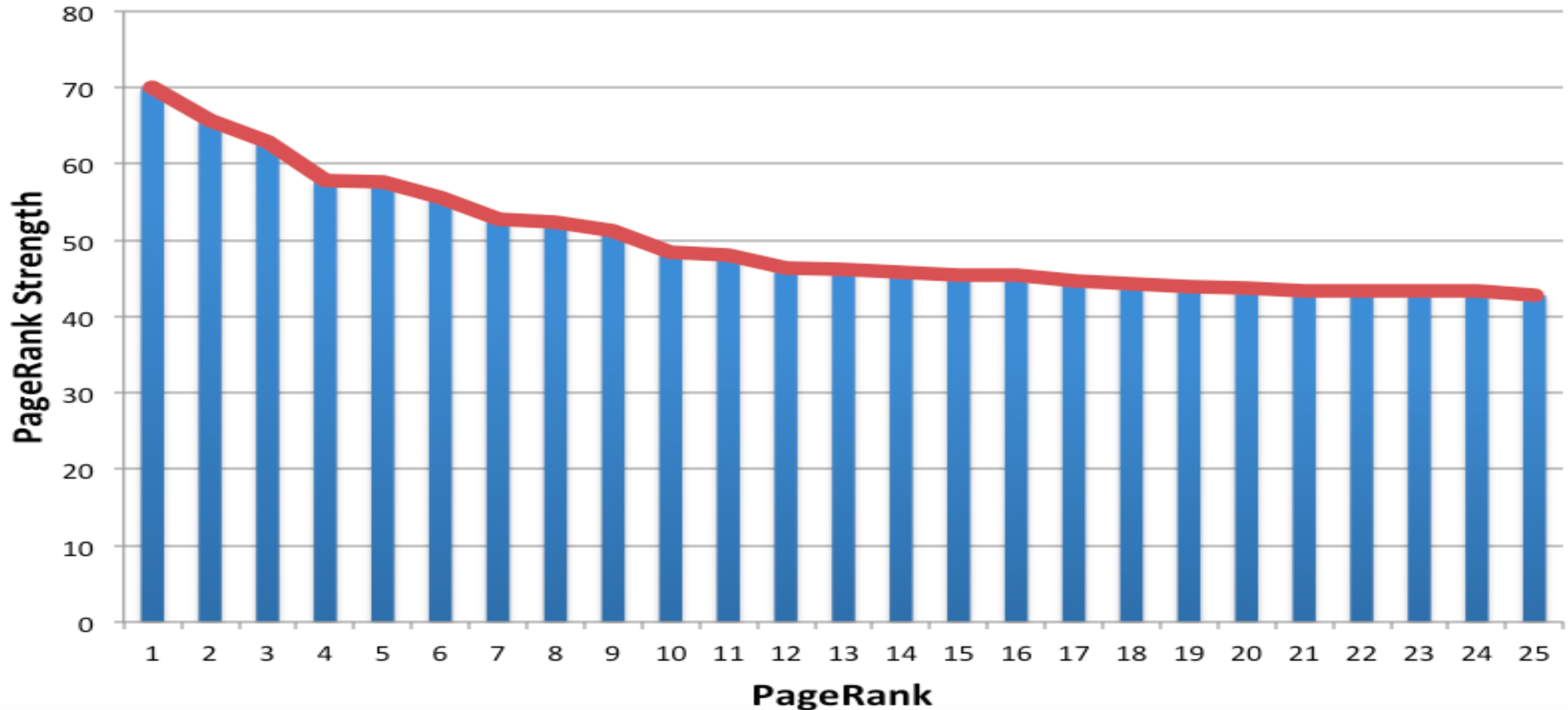
Least Important Hubs

Strength	Location	Landmark
3.55	Kalayaan Ave, Makati	Bel-Air
3.55	Makati Ave., Makati	Bel-Air
3.55	Kalayaan Ave, Makati	Bel-Air
3.63	Meycauayan, Bulacan	McArthur Highway
3.63	Meycauayan, Bulacan	McArthur Highway

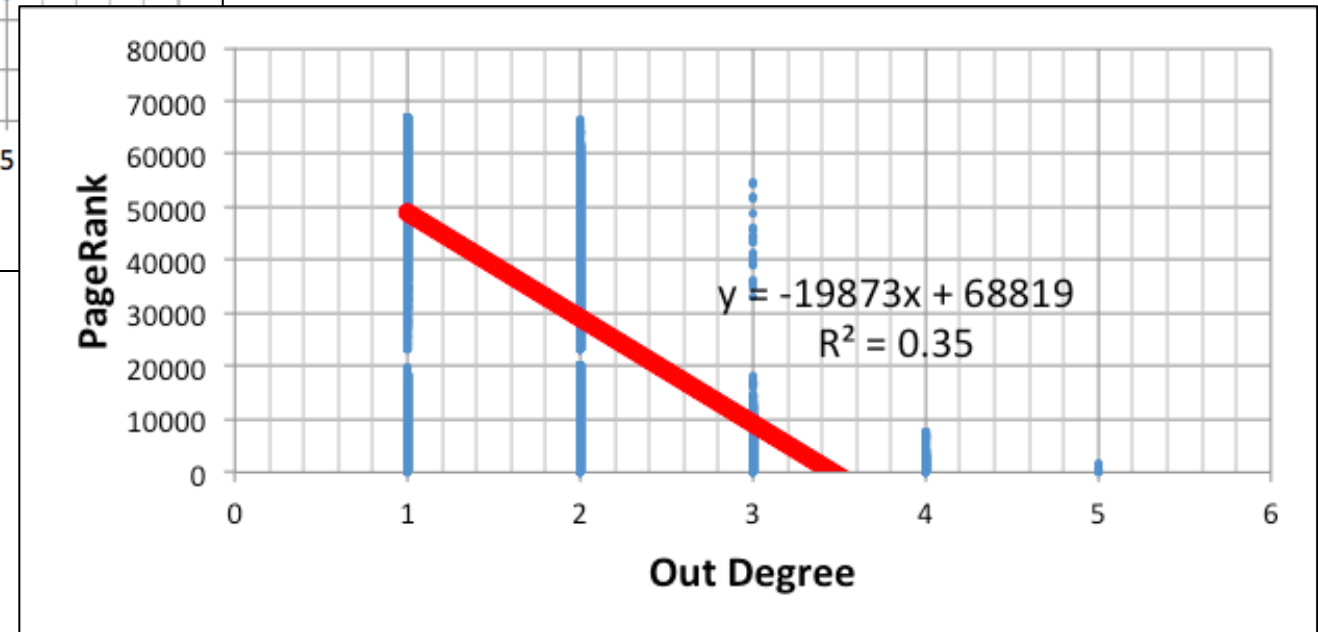
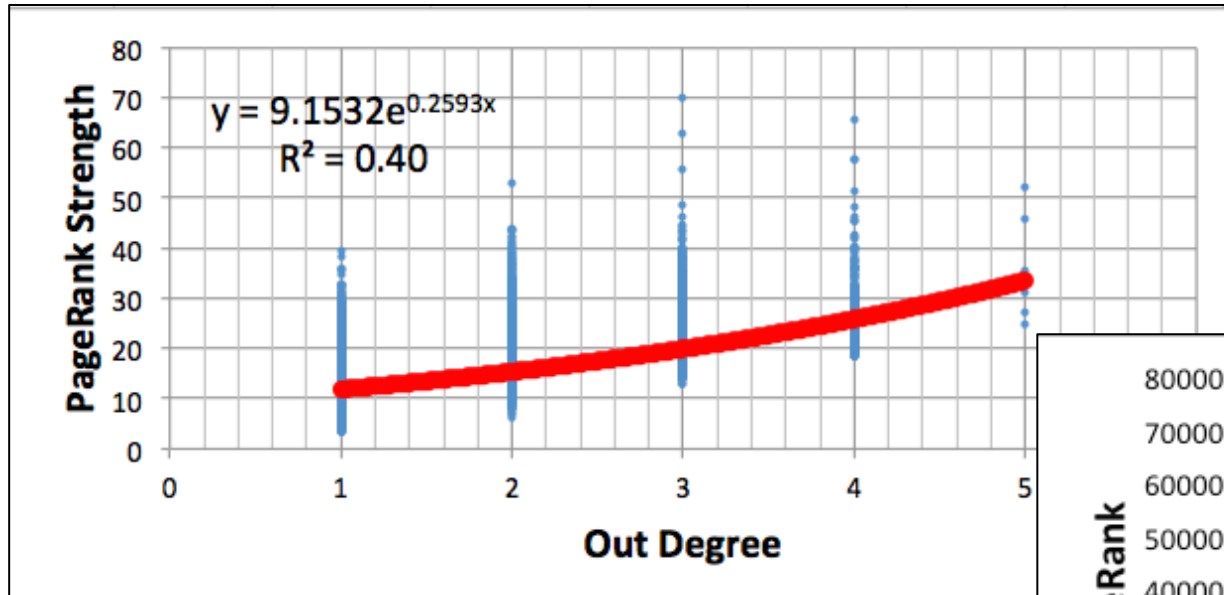
Rank Comparison



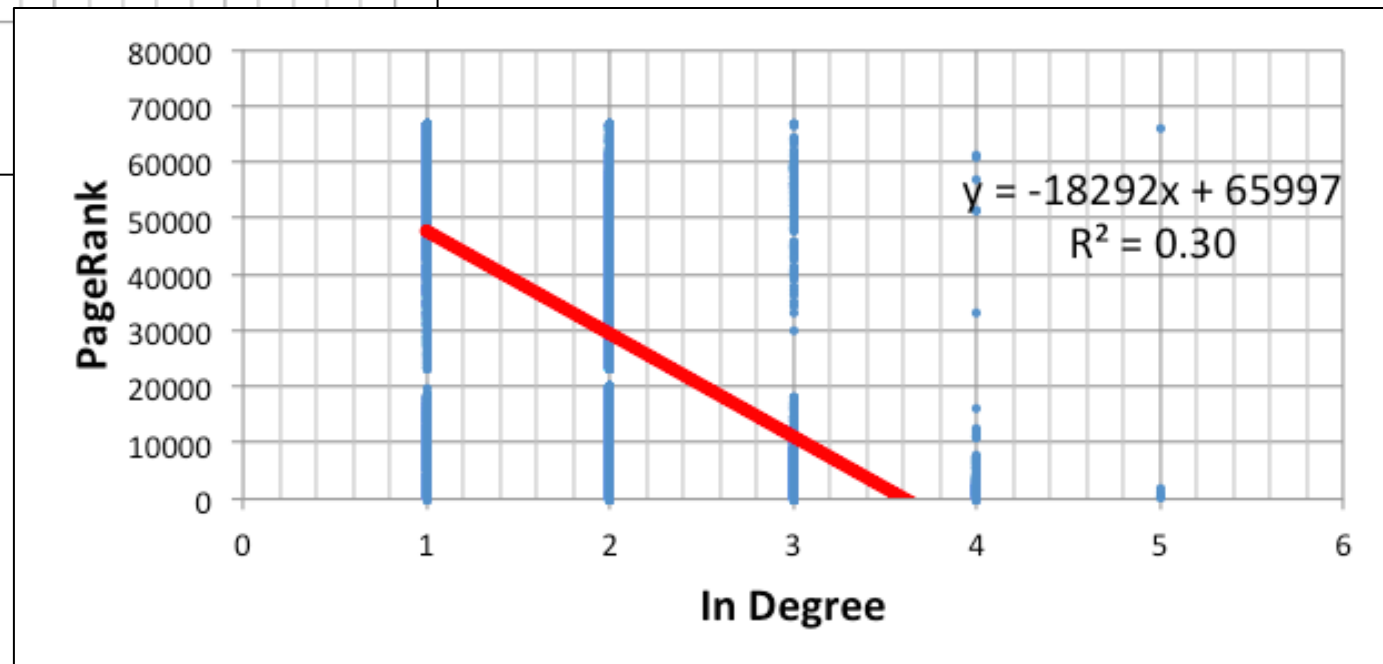
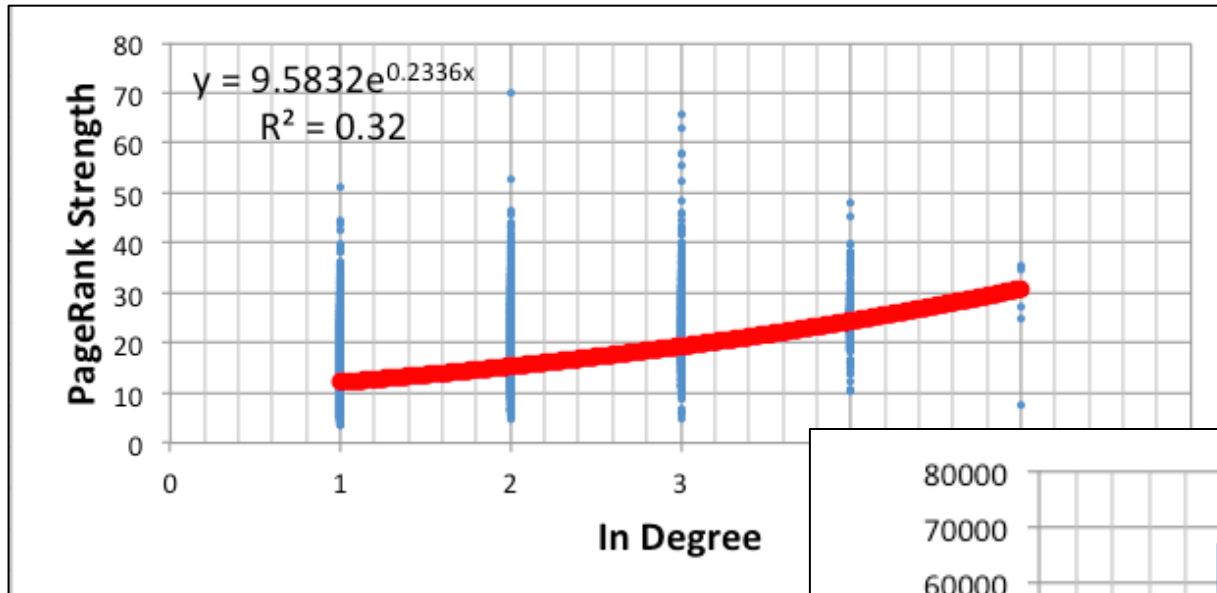
Strength Comparison



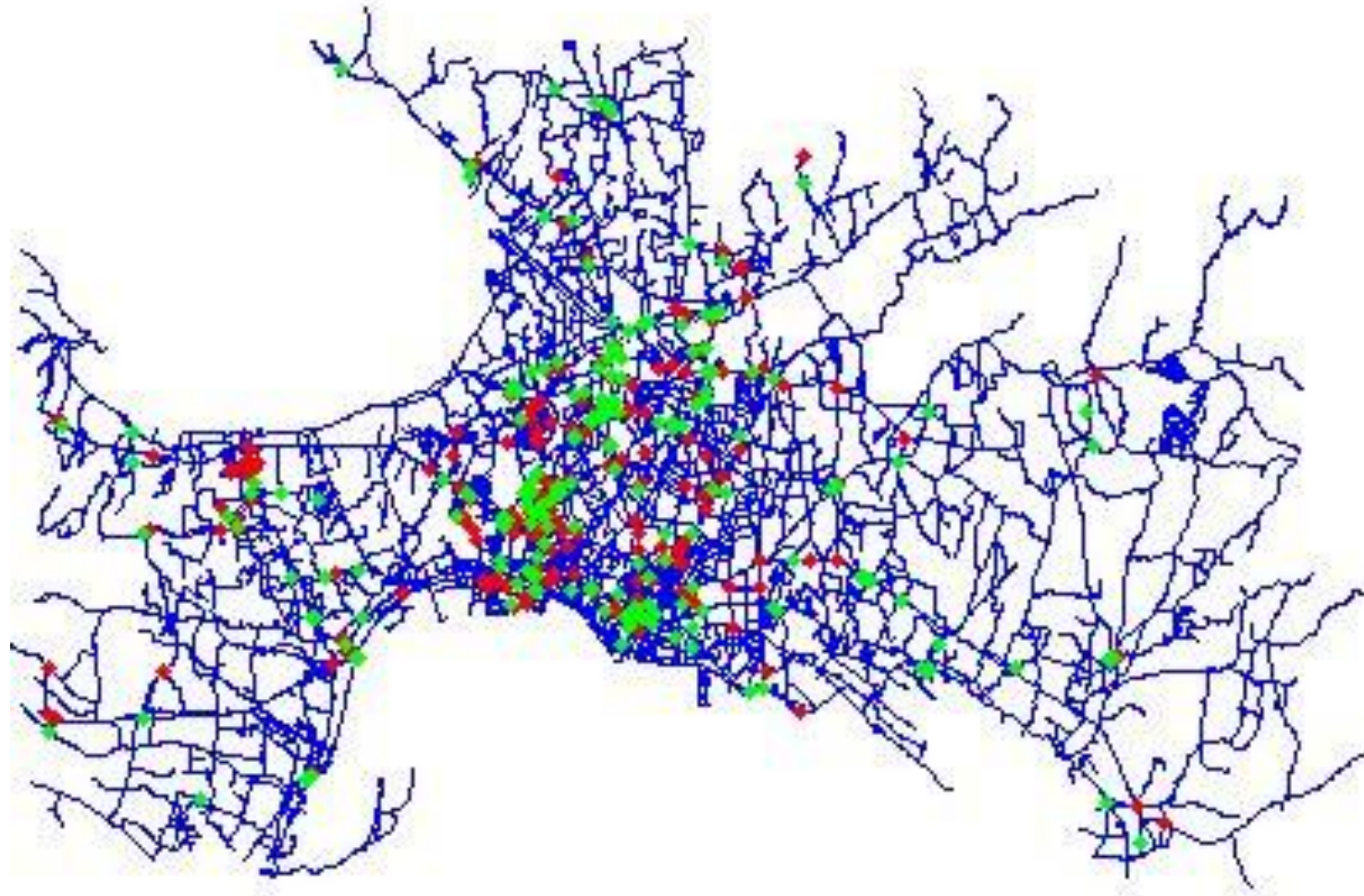
Out-links



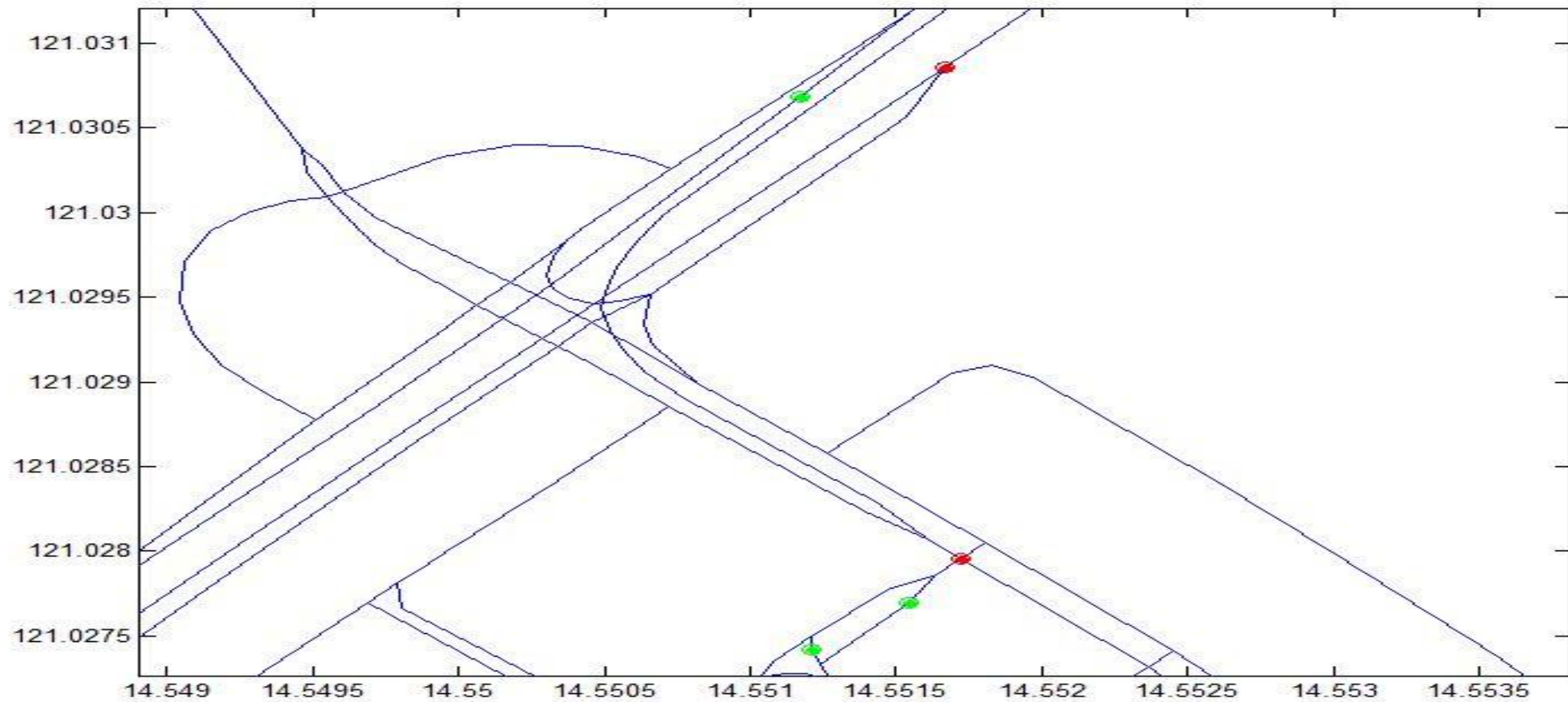
In-Links



High and Low Ranked Nodes



High and Low Ranked Nodes: Details



Conclusions

- Most important areas of hubs in schools, business districts, airports, and other public places
- Least important areas of hubs in one-way roads and remote streets in provinces
- Basis
 - Topology
 - Number of links per node (out-link > in-link)
- More important nodes in intersections and T-junctions, less important nodes in corner and one-way roads

Future Works

- PageRank with road reconstruction
- Capacity and flow analysis
- Application to different networks
 - Provided with local knowledge
- NodeRank (PageRank hybrid by Lianxiong, et.al.)