Co-commenting Network of Restaurants
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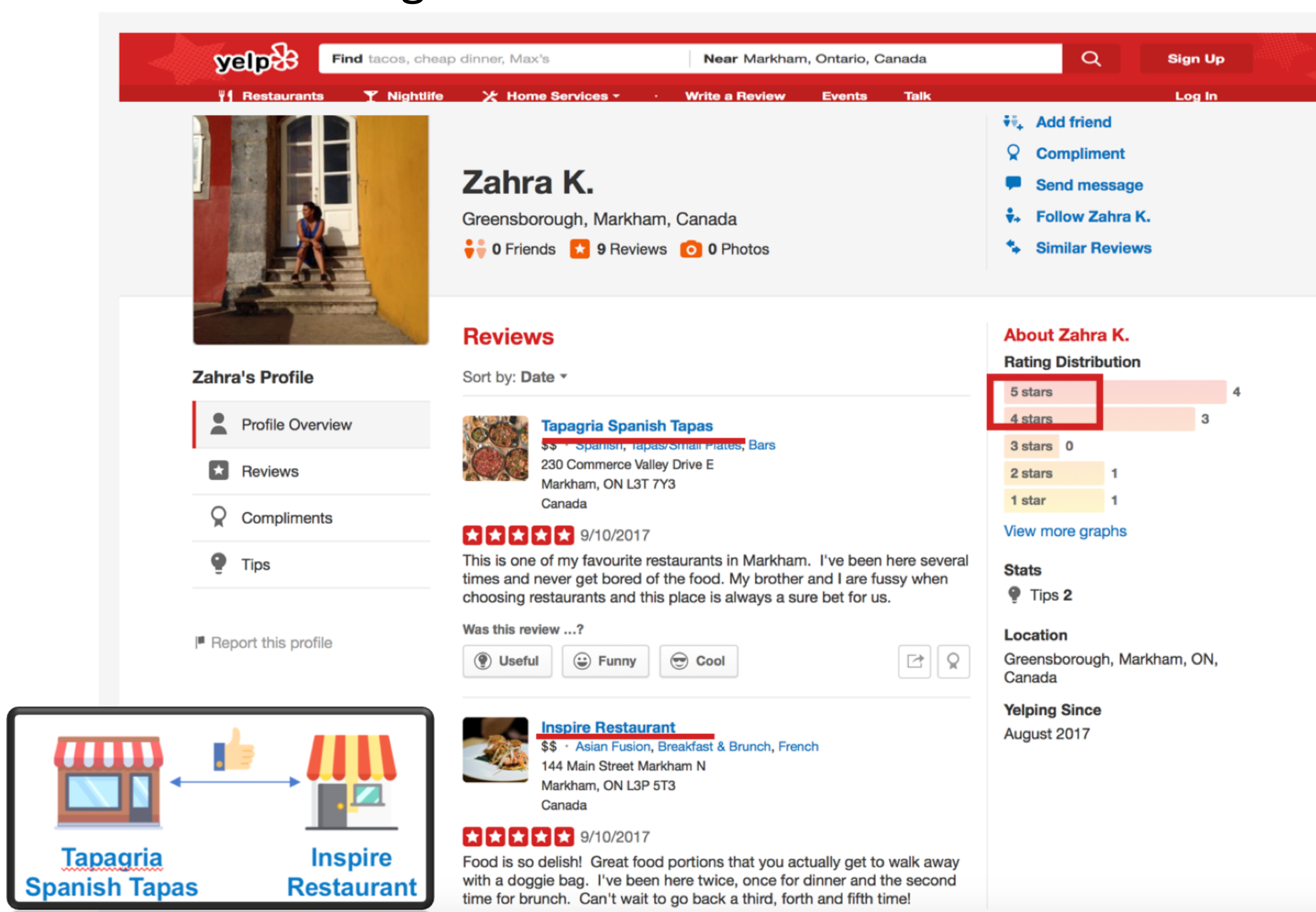## Instructor: Feng Mai

Introduction
- Although Yelp does not serve as a typical social network supplier, it still can be built as a network which can be formed by business. If one user rated two different restaurants, then we consider these two restaurants have been connected.
- City: Markham

Objective
- Find widely-accepted restaurants
- Analyze local restaurants features
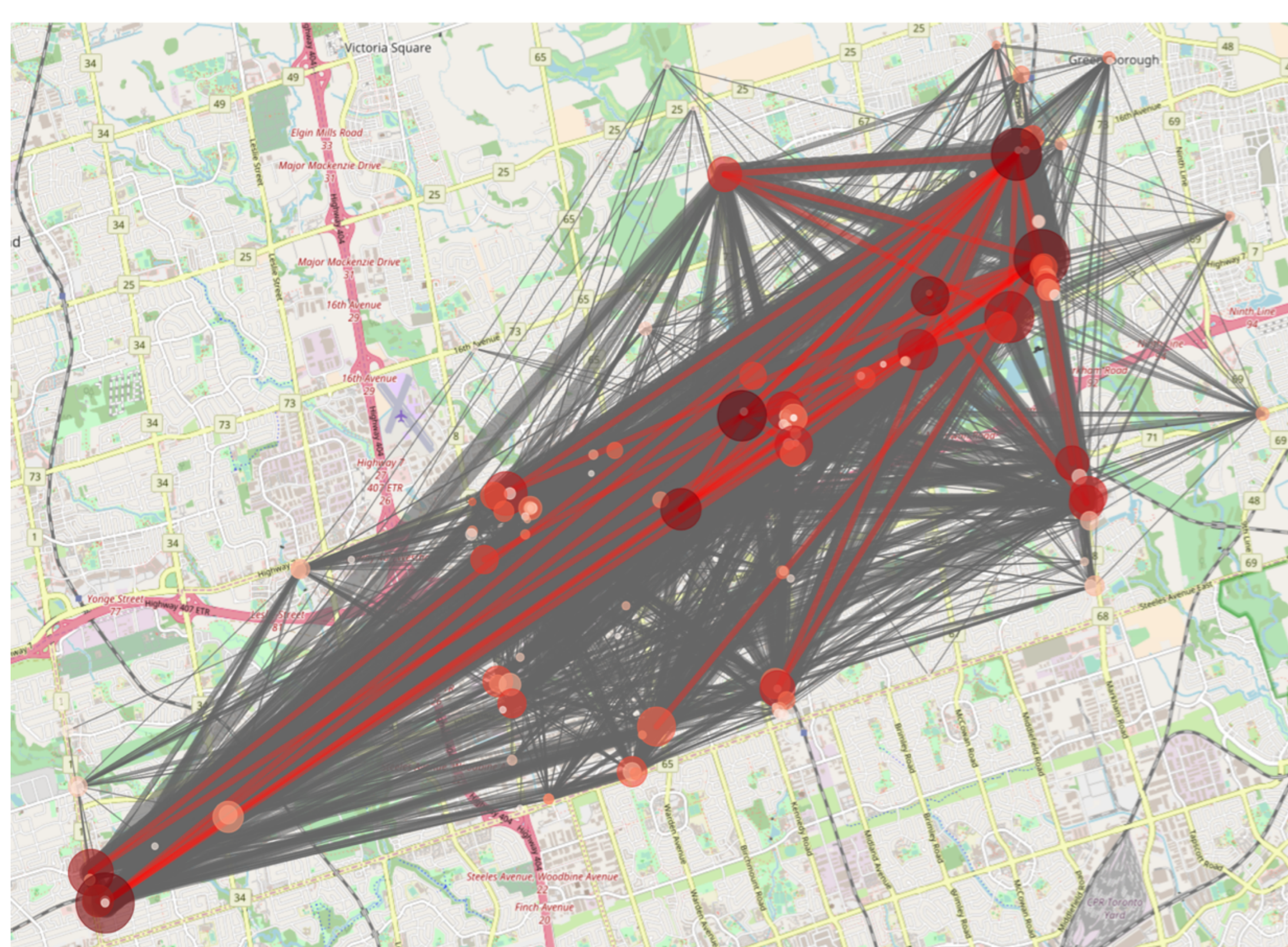
Network building
- Co-occurrence network: paired presence
- Co-commenting network

- Restaurants are connected if they got appreciative comments by the same person.

- One component
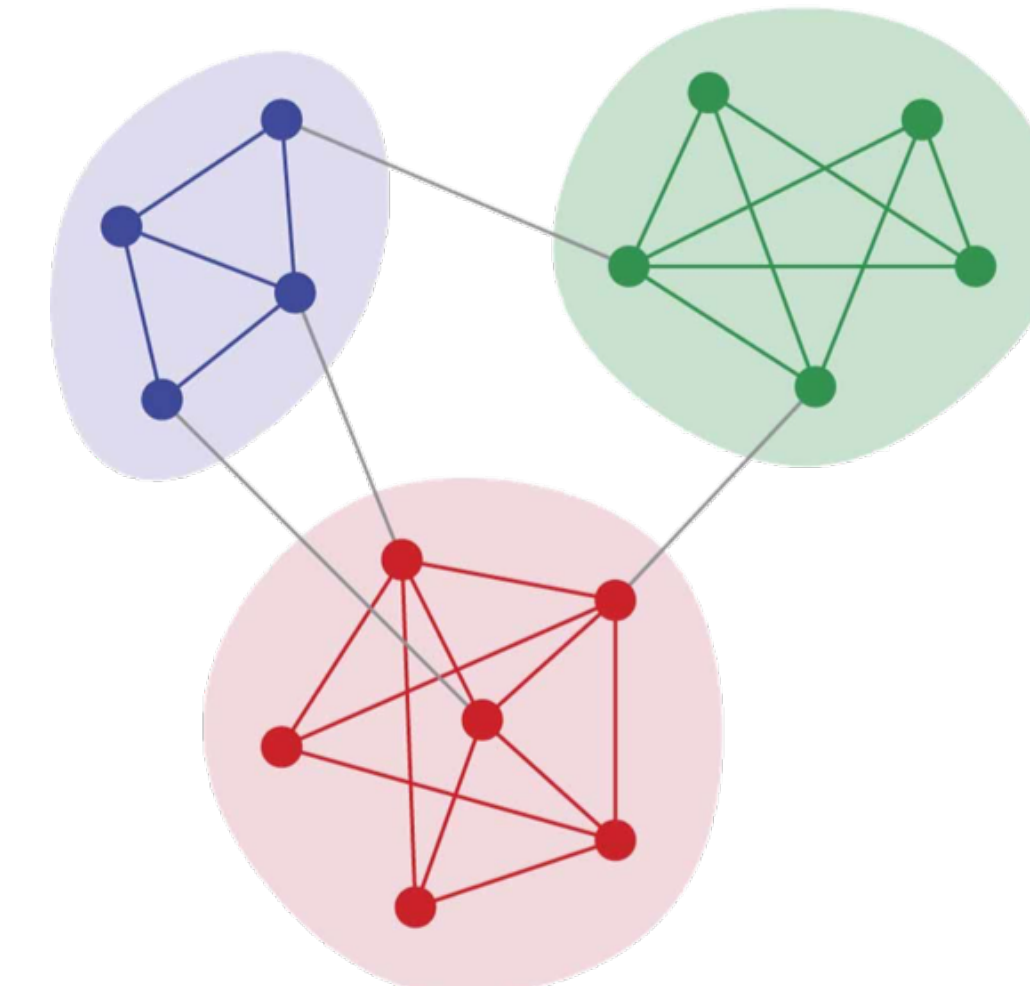- Average Clustering Coefficient: 0.6488

- Highly-connected network and no significant clusters
- Spatial Distribution

- Node color: degree
- Node size: the number of reviews
- Edge width: weight
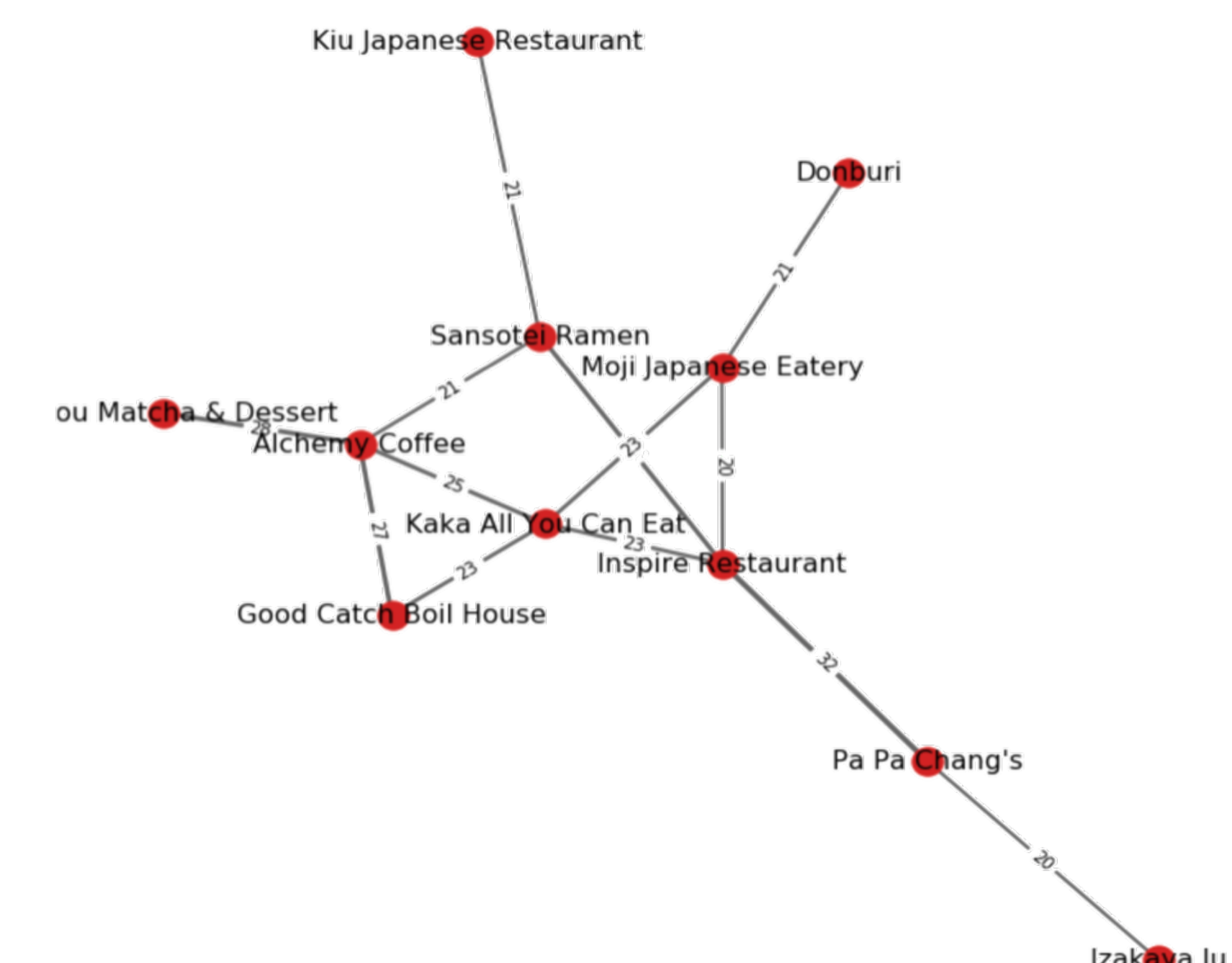- Highlight: edge weight is over 50

Community Detection
- Detection Algorithm: Girvan-Newman

- Modularity: denser in-group connections and sparser the inter-group connections.
- Maximize the modularity
- Reduce the network size by removing edge's weight below 5 which gets modularity equals to 0.172
- Reduce the network size by removing edge's weight below 20 which gets modularity equals to 0.328
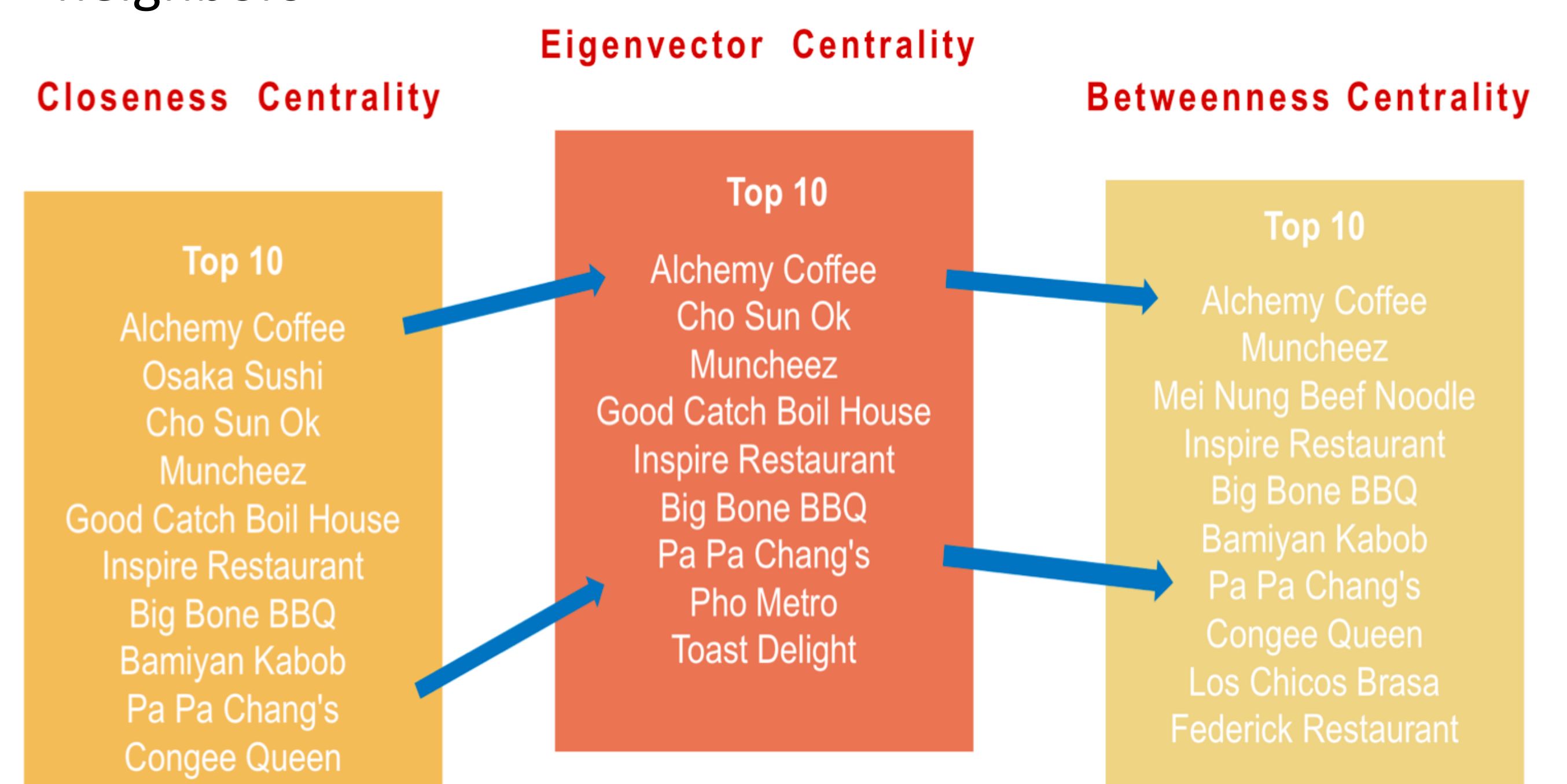- People dining choices won't present significant clusters.

Strong ties

- Asian food
  - around 45% population in Markham is Asian
- Long history

Centrality Ranking
- Closeness Centrality: the shortest paths between all nodes
- Betweenness Centrality: the shortest path between other nodes
- Eigenvector Centrality: the sum of the centralities of its neighbors

Eigenvector Centrality

Closeness Centrality

Betweenness Centrality

Closeness Centrality	Eigenvector Centrality	Betweenness Centrality
Top 10	**Top 10**	**Top 10**
Alchemy Coffee	Alchemy Coffee	Alchemy Coffee
Osaka Sushi	Cho Sun Ok	Muncheez
Cho Sun Ok	Muncheez	Mei Nung Beef Noodle
Muncheez	Good Catch Boil House	Inspire Restaurant
Good Catch Boil House	Inspire Restaurant	Big Bone BBQ
Inspire Restaurant	Big Bone BBQ	Bamiyan Kabob
Big Bone BBQ	Pa Pa Chang's	Pa Pa Chang's
Bamiyan Kabob	Pho Metro	Congee Queen
Pa Pa Chang's	Toast Delight	Los Chicos Brasa
Congee Queen		Federick Restaurant

- Ranking of different centrality metrics does not change much.
- Some restaurants appear in all three ranking.
- Some above-listed restaurants are also in the yelp official best 10 restaurants.