# Metropolitan Trade Networks: Mapping Commodity Flows Across North Carolina

Ayemhenre Isikhuemhen, UNC Charlotte
Dr. Erik Saule, Department of Computer Science

Introduction

❖ Trade represented as network with oriented edges from providers to receivers of goods.

❖ Social network graphs map node relationships, potential to visualize trade networks by representing flows between metro areas.

❖ This study asses using social network analysis for commodity flows and regional trade dynamics between aforementioned areas.
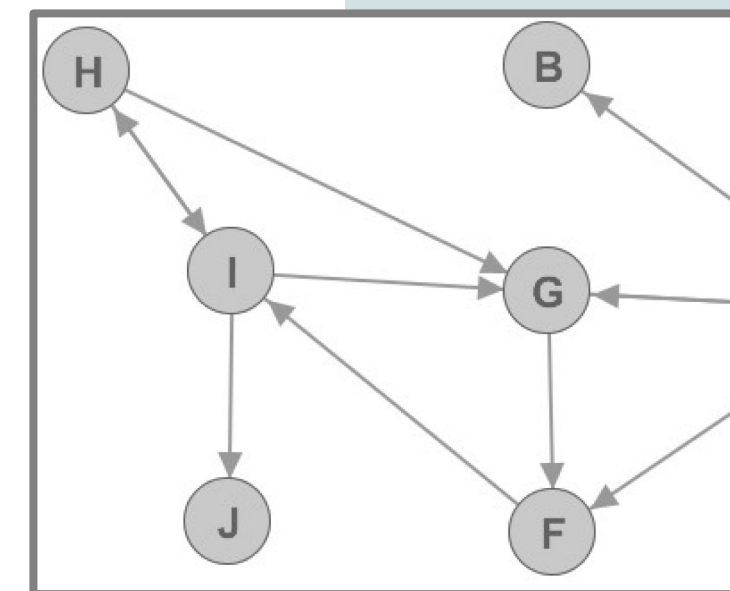
Example of Social Network

Objectives

❖ Create a social network program and models inter-metro trade dynamics.

❖ Evaluate commodity relationships metropolitan areas in North Carolina.

Collected Data

❖ We can monitor trade interactions by Metropolitan area using data from the 2017 Commodity Flow Survey conducted by the US Census Bureau.

| CSV MetaData Dictionary[1]			
SHIPMT_ID	Shipment identifier	MODE	Mode of transportation of the shipment
ORIG_STATE	FIPS state code of shipment origin	SHIPMT_VALUE	Value of the shipment in dollars
ORIG_MA	Metro area of shipment origin	SHIPMT_WGHT	Weight of the shipment in pounds
ORIG_CFS_AREA	CFS Area of shipment origin	SHIPMT_DIST_GC	Great circle distance between shipment origin and destination
DEST_STATE	FIPS state code of shipment destination	SHIPMT_DIST_ROUTED	Routed distance between shipment origin and destination
DEST_MA	Metro area of shipment destination	TEMP_CNTL_YN	Temperature controlled shipment - Yes or No
DEST_CFS_AREA	CFS Area of shipment destination	EXPORT_YN	Export shipment - Yes or No
NAICS	Industry classification of shipper	EXPORT_CNTRY	Export shipment - Yes or No
QUARTER	Quarter of 2017 in which the shipment occurred	HAZMAT	Hazardous material (HAZMAT) code
SCTG	2-digit SCTG commodity code of the shipment	WGT_FACTOR	Shipment tabulation weighting factor.

Map of 2017 CFS Areas
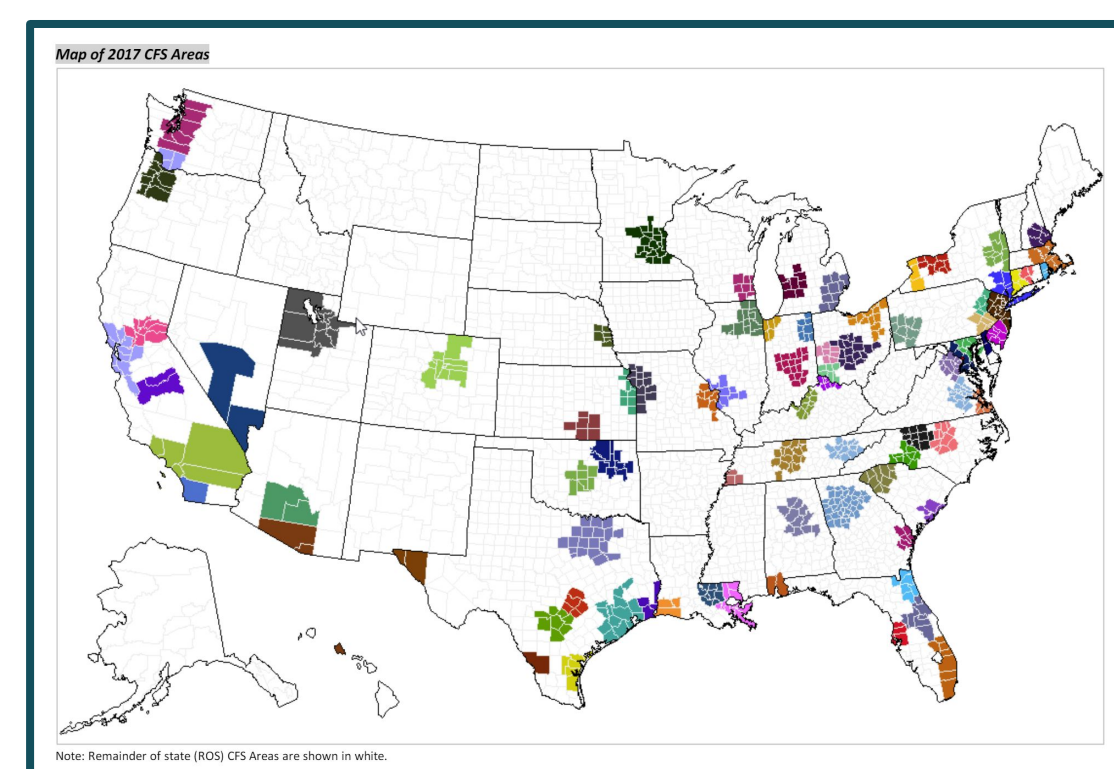
❖ ORIG_CFS_AREA/DEST_CFS_AREA determine commodity origin and destination, forming the social network's foundation.

Method

1. Collect commodity flow data depicting, metropolitain location and exchange logistics..

2. A program will parsed through data to generate a social network graph.

3. The generated graphs will then be adjusted to meet analysis requirements for evaluation and feedback.

Results

❖ Directed graph represents NC nodes, edges for commodity exchanges

❖ Dense connections between vertices challenge readability, reveal NC trade partners|

❖ Concord-Charlotte, Raleigh-Durham exhibit similar exchanges, while Greensboro-Winston-Salem, rural NC are more aligned
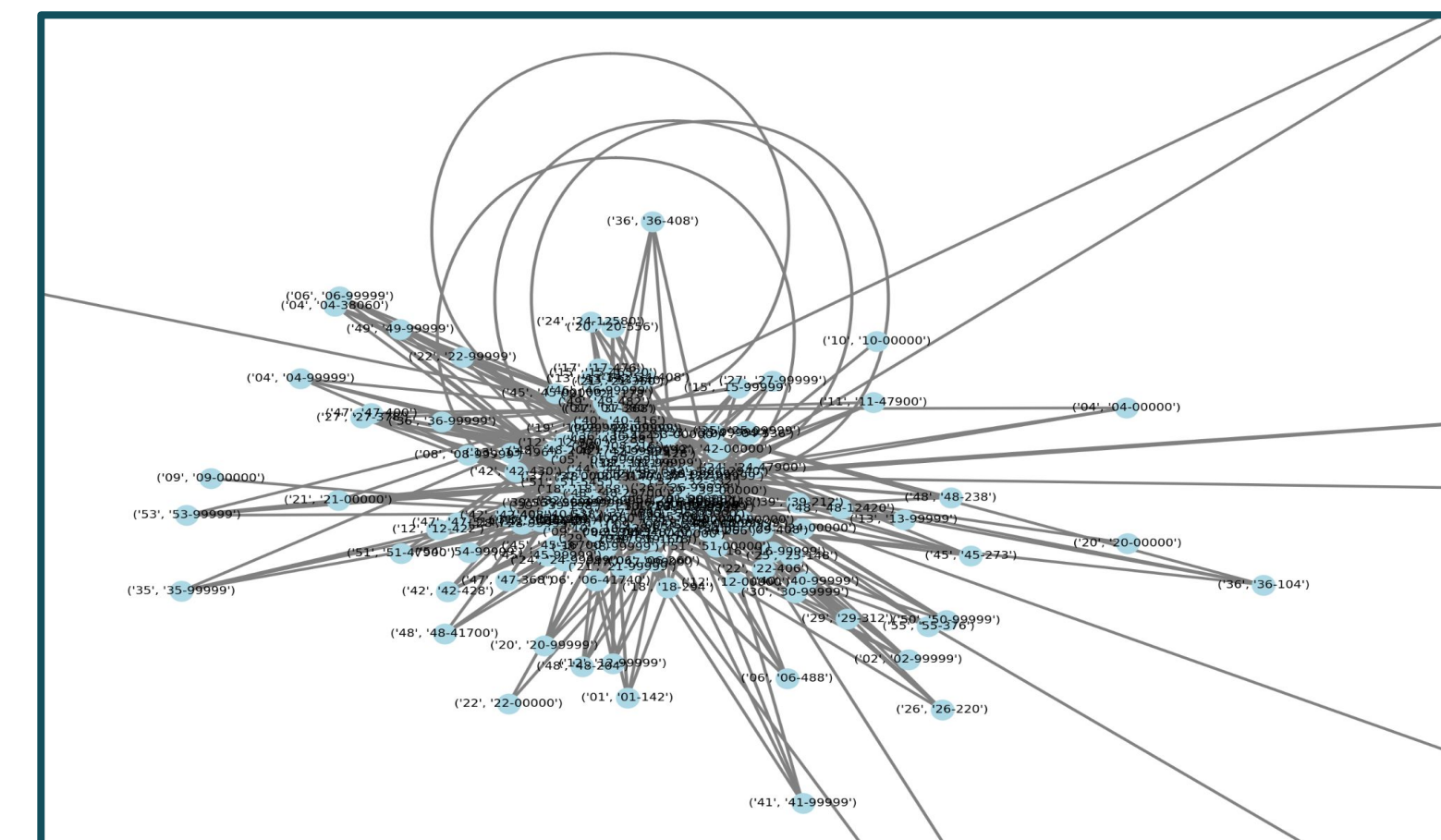

❖ Constructing weighted graph depicting metro areas' "closeness" beneficial for evaluating relationships

❖ Graph offers clearer structure showing exchange relationships

❖ Highlights NC's significant trade with neighboring Northeastern states **(e.g. Maine)** and Southwestern states **(e.g. Kentucky, Oklahoma, Utah)**
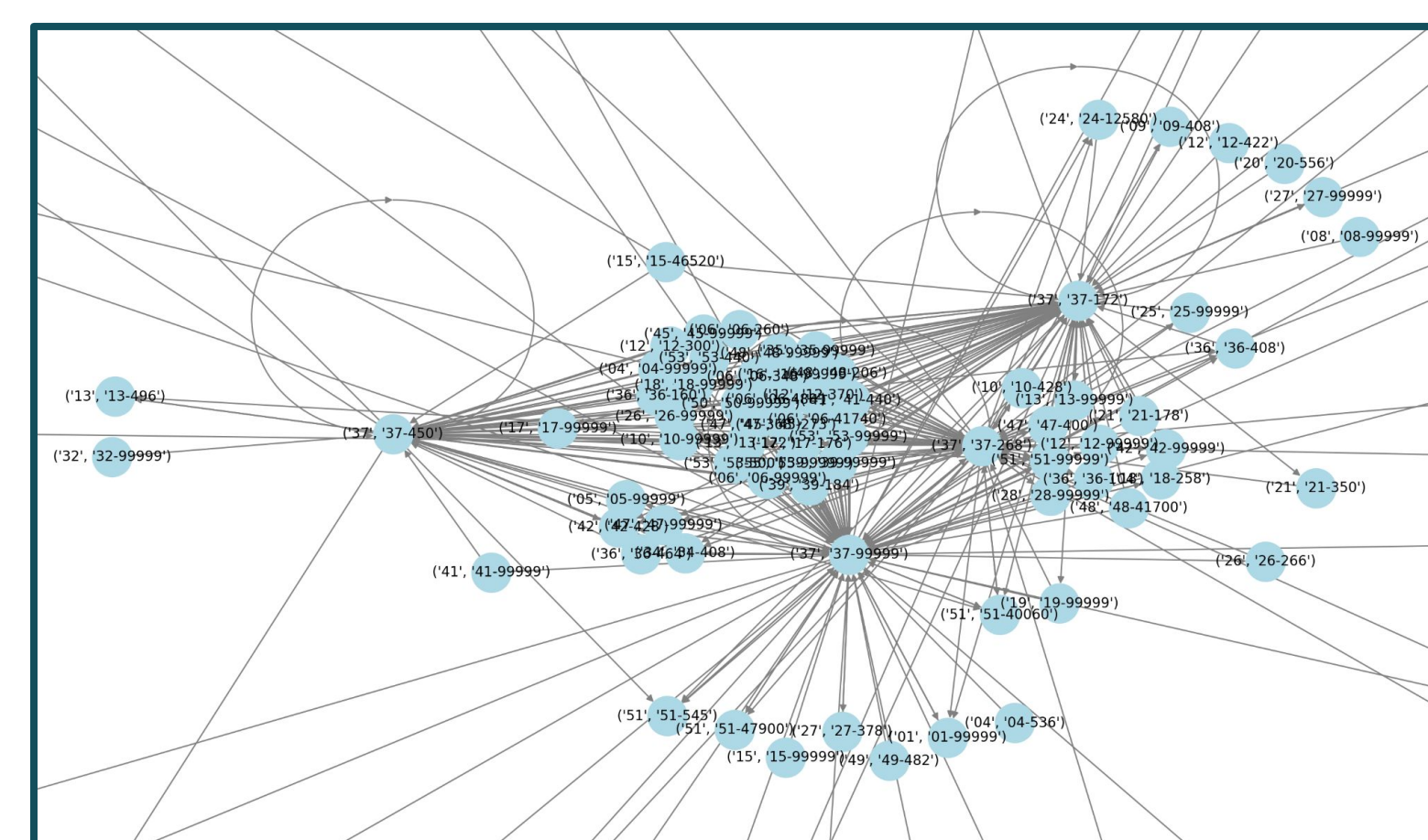
❖ Cereal products are largely rural-produced, exported to rural and dense metro areas

Social Network of all Commodity flows within North Carolina, and exchange partners
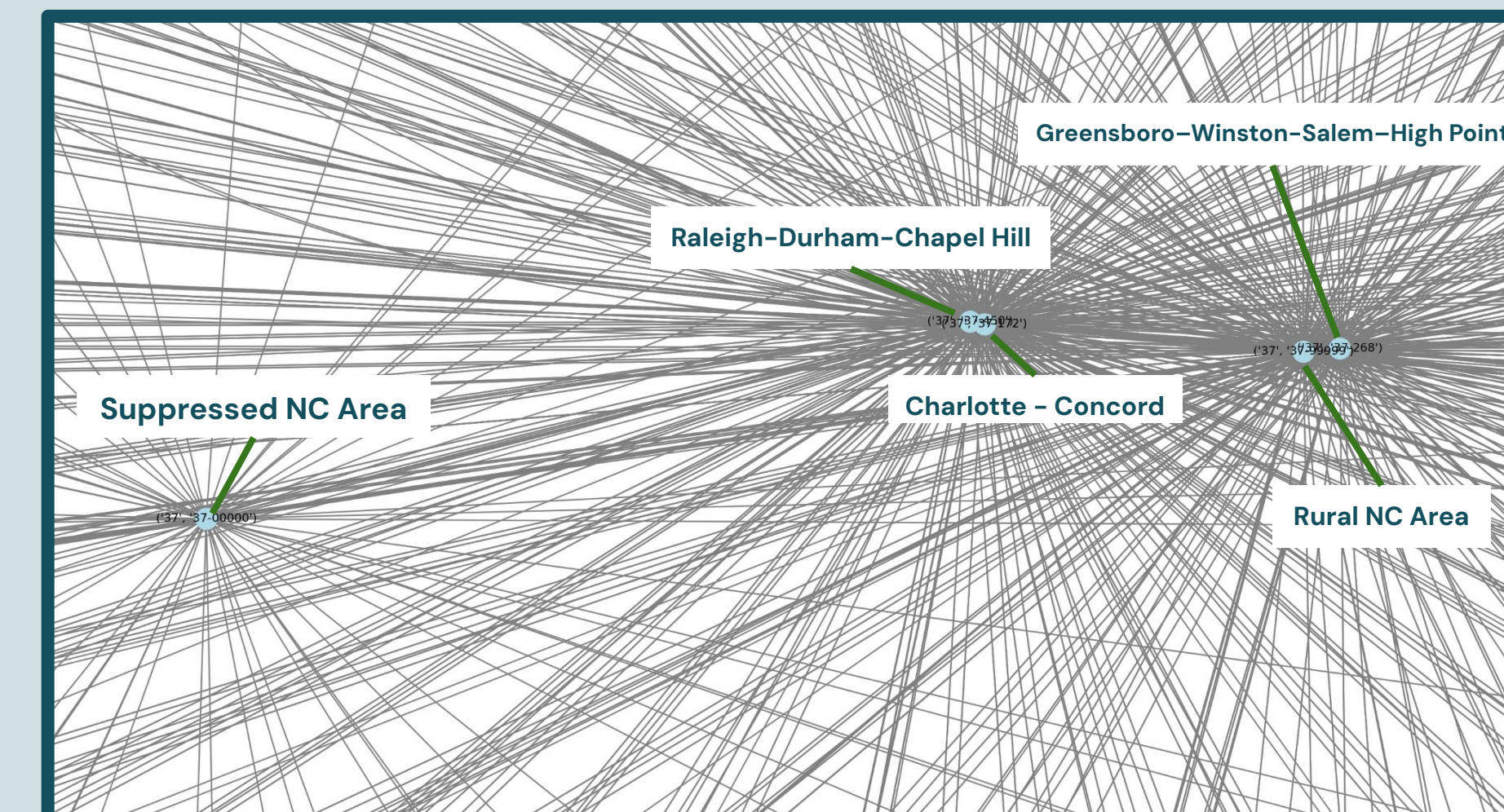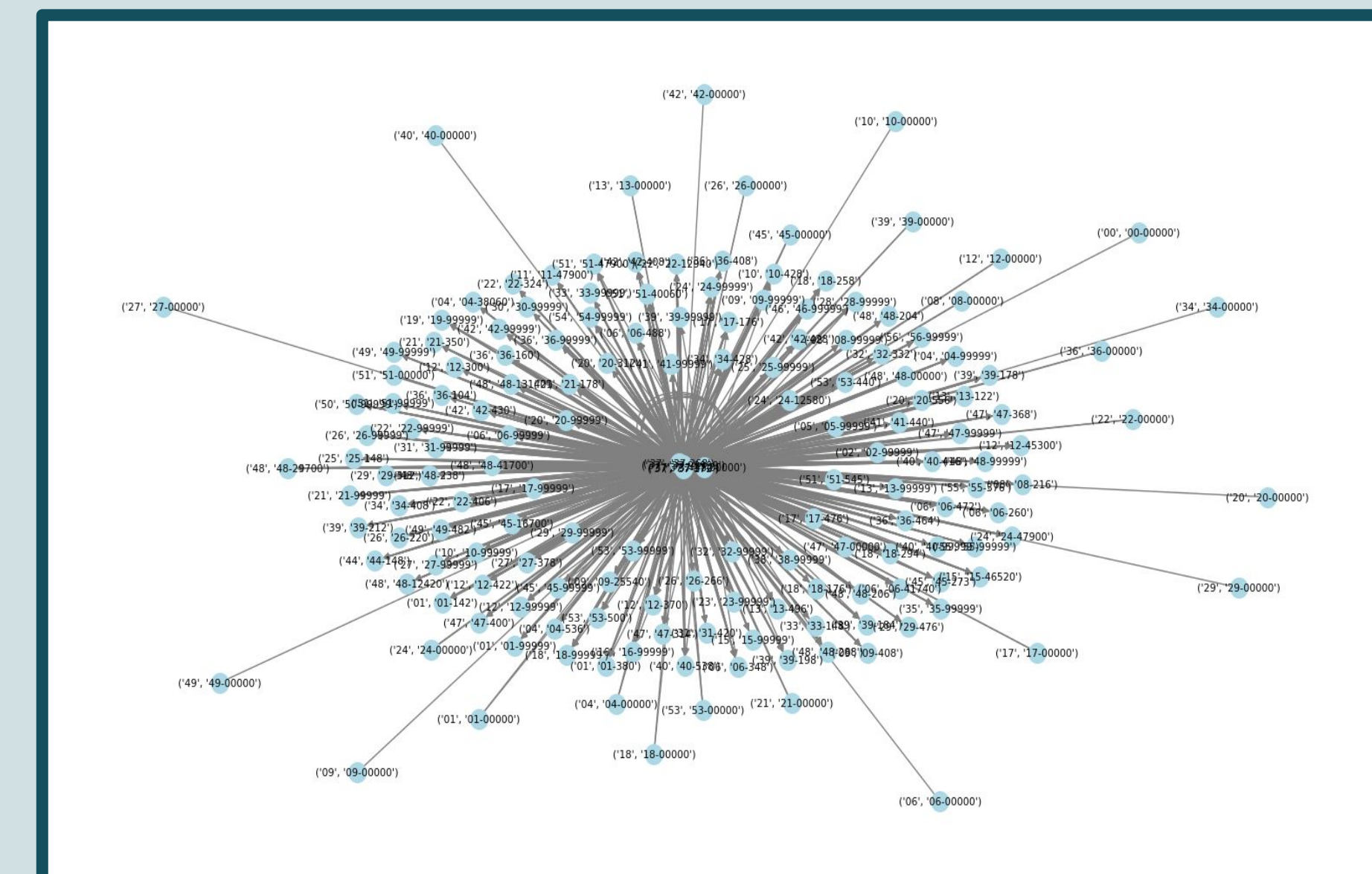
Conclusion

❖ Network analysis unveils meaningful trends in NC commodity exchange

❖ Indicates metro area exchange similarities and trade relationship intensity

❖ Shows commodity production/distribution flows

❖ Enhanced visualization tools needed for communicating complex dynamics

References

Kostić, S. M., Simić, M. I., & Kostić, M. V. (2020, July 9). *Social network analysis and churn prediction in telecommunications using graph theory.* MDPI. https://www.mdpi.com/1099-4300/22/7/753

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