Understanding Government Contracts With Network Analysis

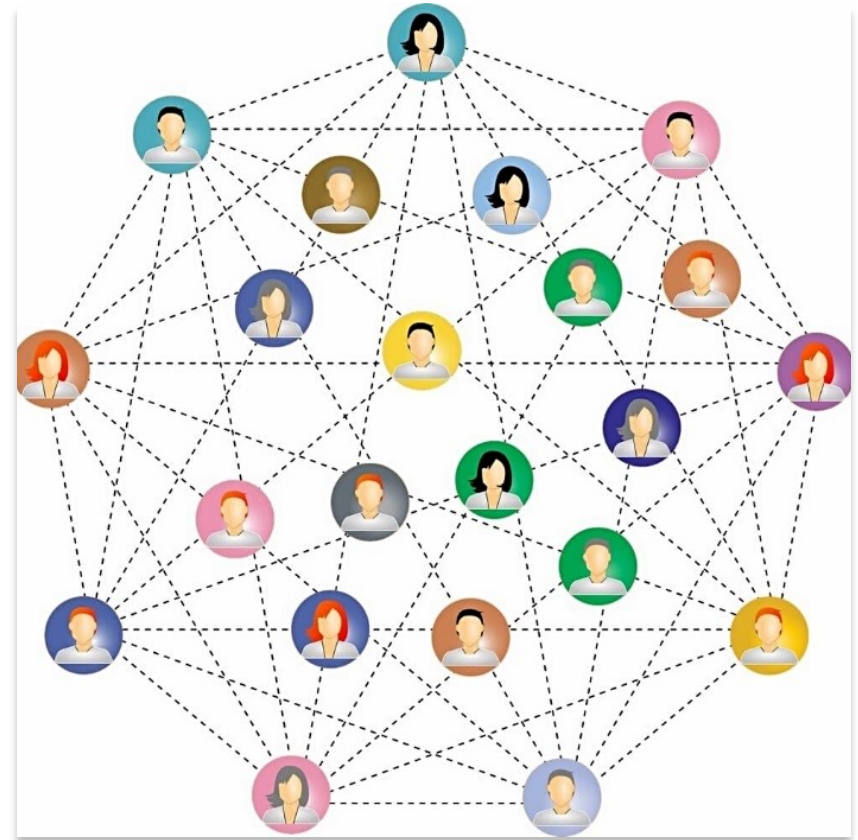Lotenna Nwobbi

August 12, 2021

Introduction

- Hometown: Thiells, NY (Rockland County)

- Alma Mater: Harvey Mudd College
    - B.S. in Mathematics with a concentration in Computer and Environmental Sciences

- Hobbies: Dance, Tennis, Short Stories

- Relevant Past Experience: Graph theory research at Hobart and William Smith Colleges (Summer 2019)

Overview of Network Analysis

- Network analysis (NA) is a branch of analysis techniques that allows one to explore relationships between interconnected agents or parties

- A **network** is a tool that applies the language of graph theory to outline connections between parties/agents

  - **Node** – typically circles, they represent parties/agents

  - **Edge** – lines connect nodes to each other based on their interactions

Example of a Network where Nodes Represent People
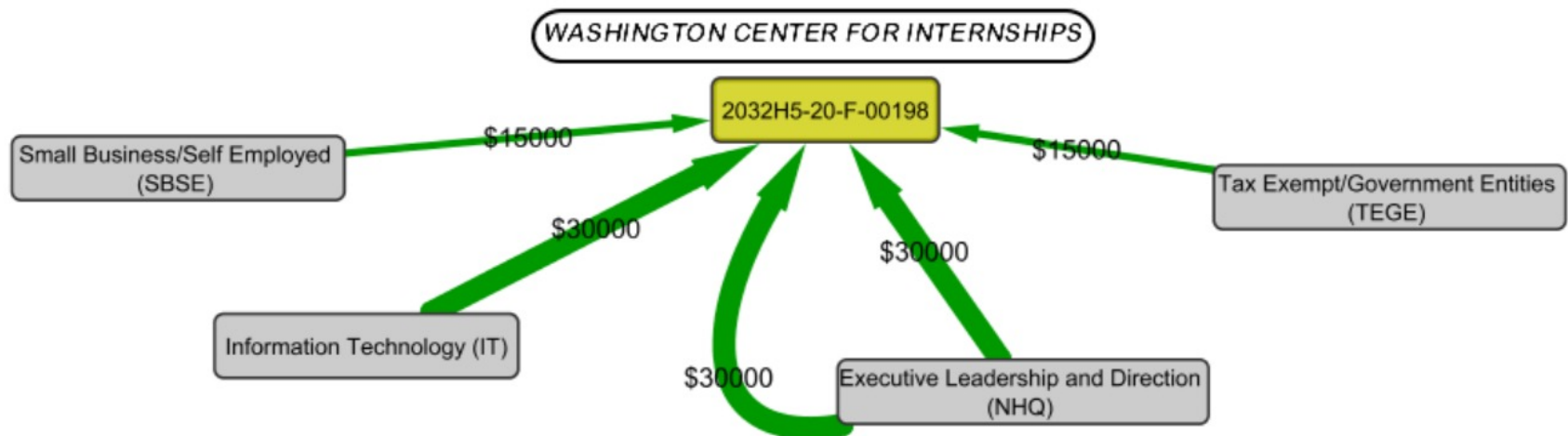
Visualizing Government Contracts

Network analysis helps in understanding government contracts by translating spreadsheet rows and columns into interactive nodes and edges.

Example Applications:

- Category Management

- One-to-many relationships

One-to-Many Relationships

• One contract can be associated with several modifications

• A single contract is often associated with several shopping carts

• Separate BODs can be combined onto a single contract

WASHINGTON CENTER FOR INTERNSHIPS

2032H5-20-F-00198

Small Business/Self Employed (SBSE) — $15000

Information Technology (IT) — $30000

$30000

$30000

Executive Leadership and Direction (NHQ)

Tax Exempt/Government Entities (TEGE) — $15000

Carts from Multiple BODs Combined Onto Same "Washington Center For Internships" Contract
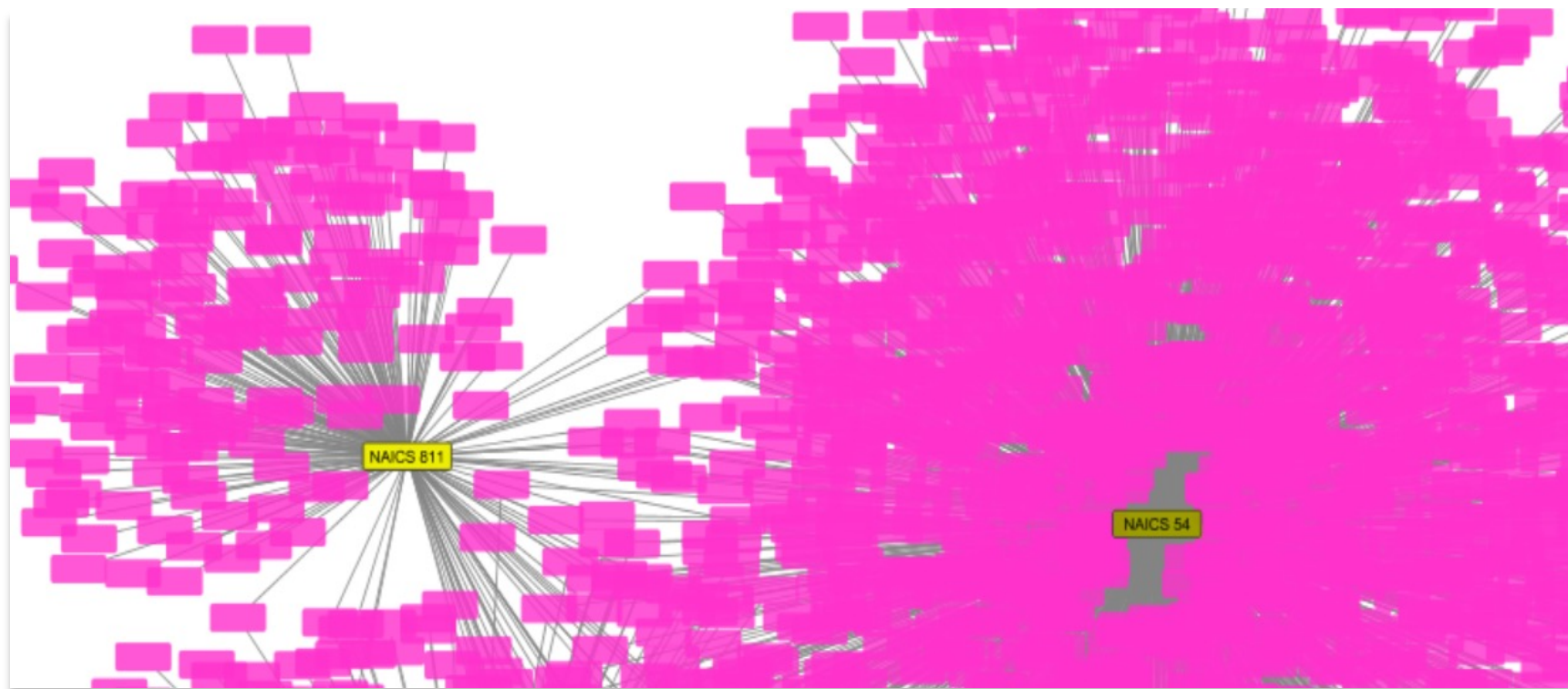
Analyzing Government Contracts

More hands-on approaches to network analysis incorporate assessments of graph **topography** (structure) and node similarity

Example Applications:

- Affiliations/fraudulent activity between vendors

- Risk of organizational conflicts of interest (OCIs)

- Contractors providing audit **and** non-audit services

Contractors Providing Audit and Non-Audit Services

Network of Treasury Vendors (pink rectangular nodes) Connected to Their Contracts' NAICS Code

Contractors Providing Audit and Non-Audit Services

- Use of contractors to perform audit and/or other financial services must comply with the GAO independence standards

- Checking compliance involves searching the network for any vendors that are **adjacent** to two conflicting NAICS codes.

Network Search For Vendors With Conflicting Contracts

Acknowledgements

- My supervisor and co-author, David Gill

- Analytics, Research, and Technology (ART) Division

- Statistical Analysis Branch (SAB)

- IRS Fellow coordinator Andrew Beckwith, and my NextGen buddy Akua Colley

- The team at Coding it Forward for organizing the Civic Digital Fellowship