ISLAMIC ORGANIZATION
FOR FOOD SECURITY

Dr. Suat ATAN

IOFS
System Supervisor
Data Scientist

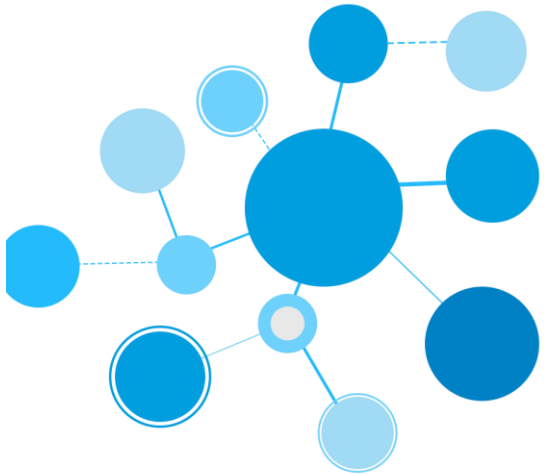
Network Analysis and Visualization Methods for Food Security and Trade

WEBSITE
IOFS.ORG.KZ

PHONE NUMBER
+7 (7172) 99-99-00

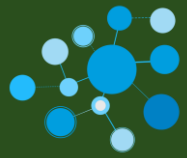
ADDRESS
INFO@IOFS.ORG.KZ

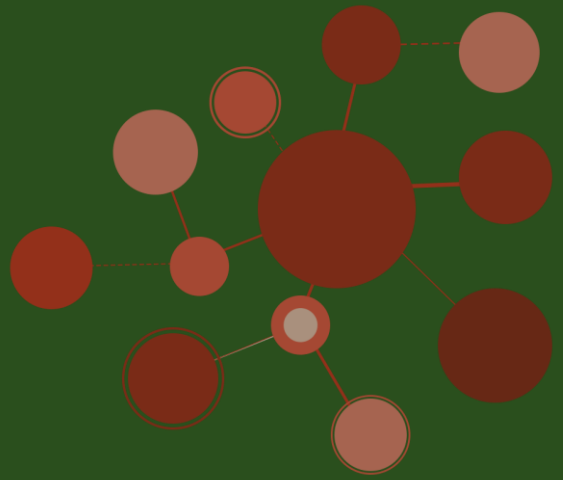
Network Analysis and Visualization Methods for Food Security and Trade



Presentation Plan

- What is network analysis?
- Why network analysis?
- Implementation on OIC commodity trade

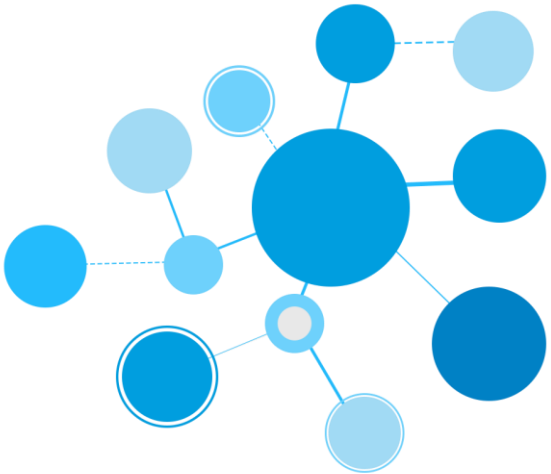




What is network analysis?

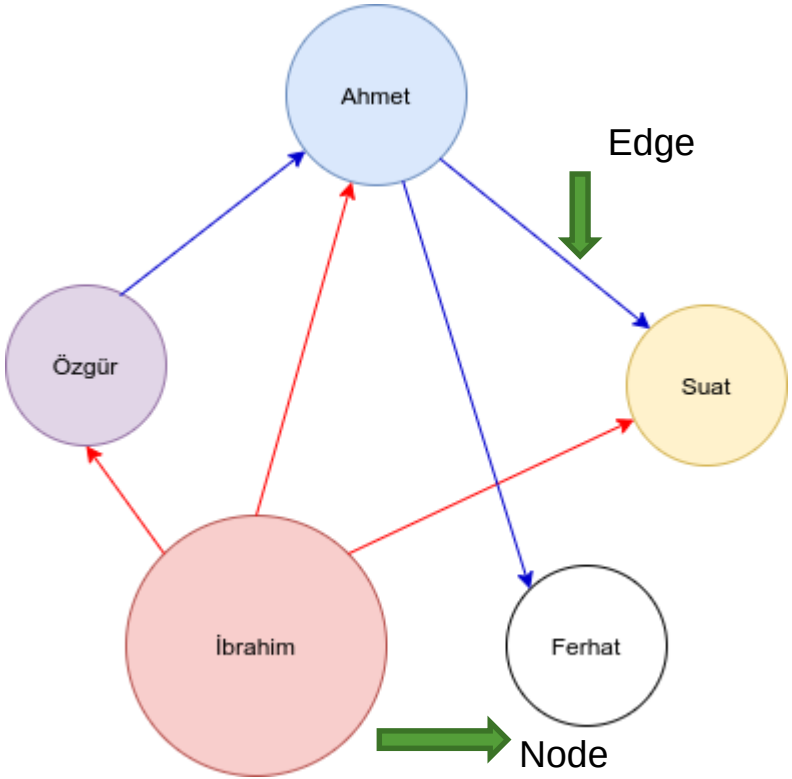
Introduction to Network Analysis

- Network analysis is a powerful tool for studying **relationships** and interactions between **entities**.
- Python provides various libraries, such as **NetworkX** and **Gephi**, to perform network analysis tasks.
- In this presentation, we will explore the implementation of network analysis for international food trade.



Edges and Nodes

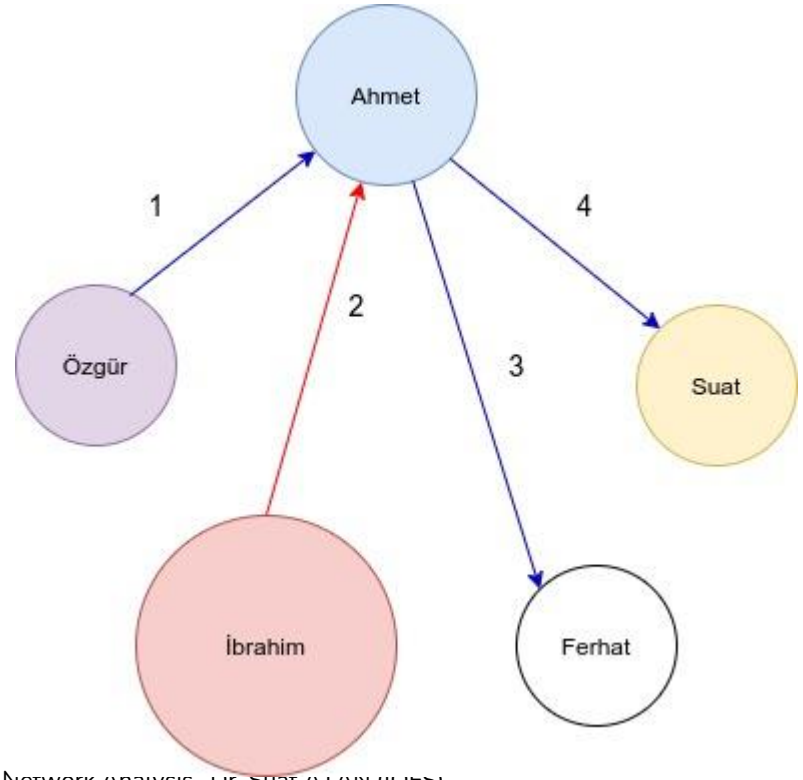
How many e-mail you get or send? İbrahim: 3



Node	Degree
Ahmet	4
Özgür	2
İbrahim	3
Ferhat	1
Suat	2

Nodes can represent countries, products, or other **entities**, while edges represent relationships or interactions.
By analyzing the structure and properties of networks, **we can uncover** valuable insights about complex - systems.

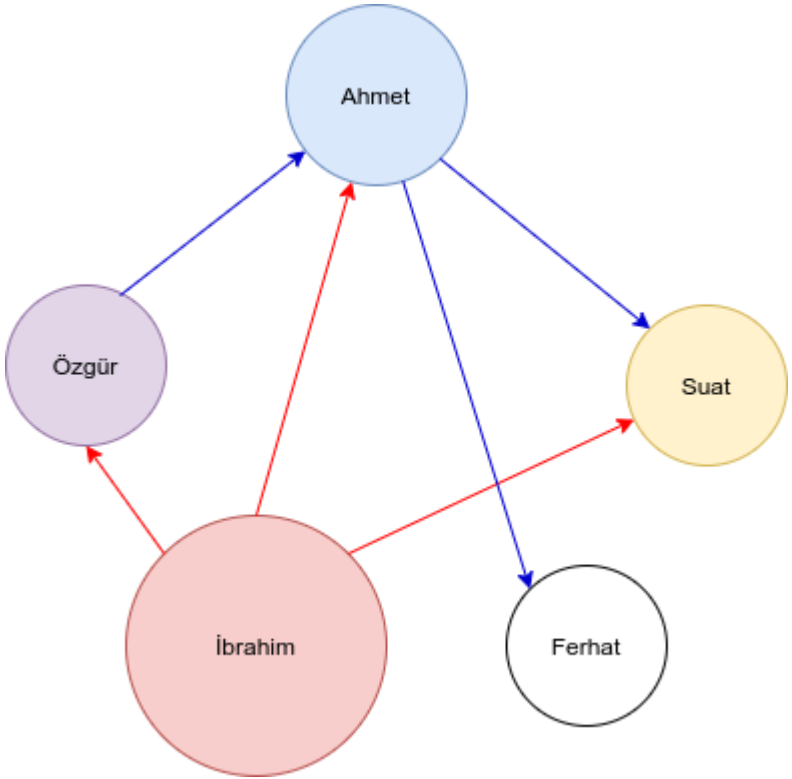
Degree and degree distribution

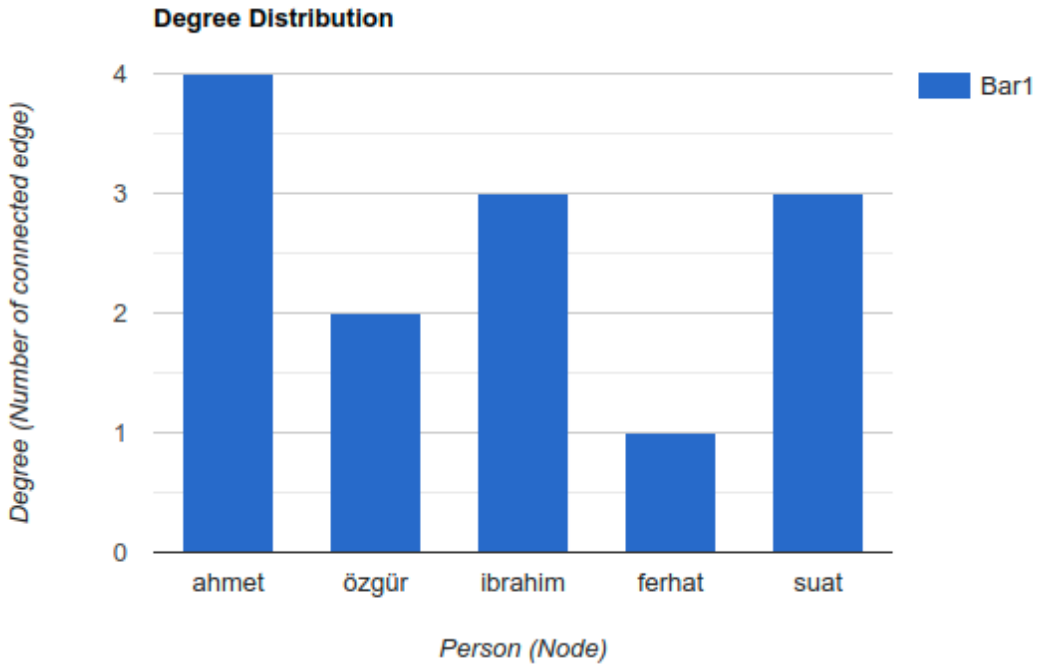


Node	Degree
Ahmet	4
Özgür	2
İbrahim	3
Ferhat	1
Suat	2

Degree: Number of connection

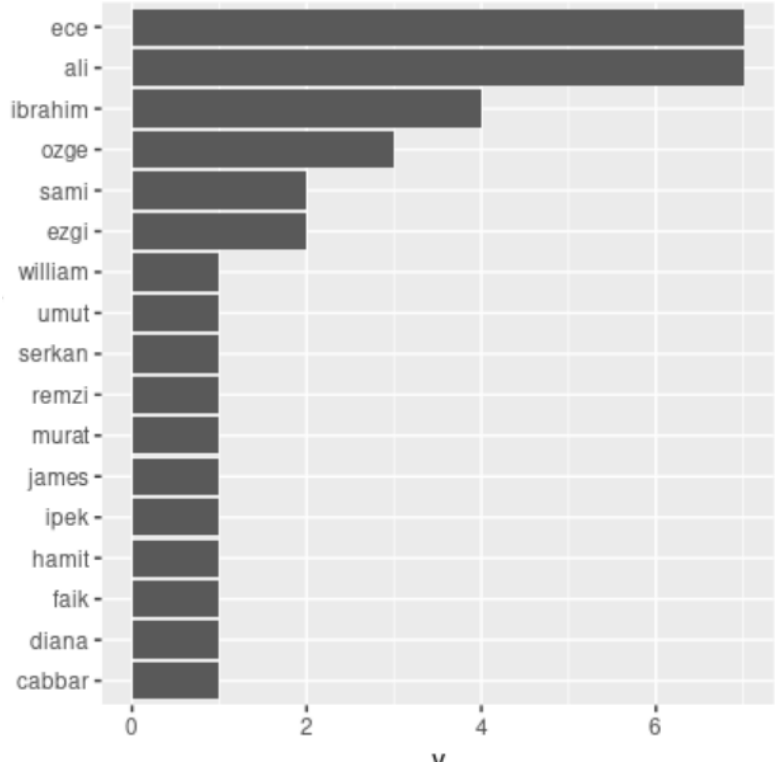
Degree and degree distribution

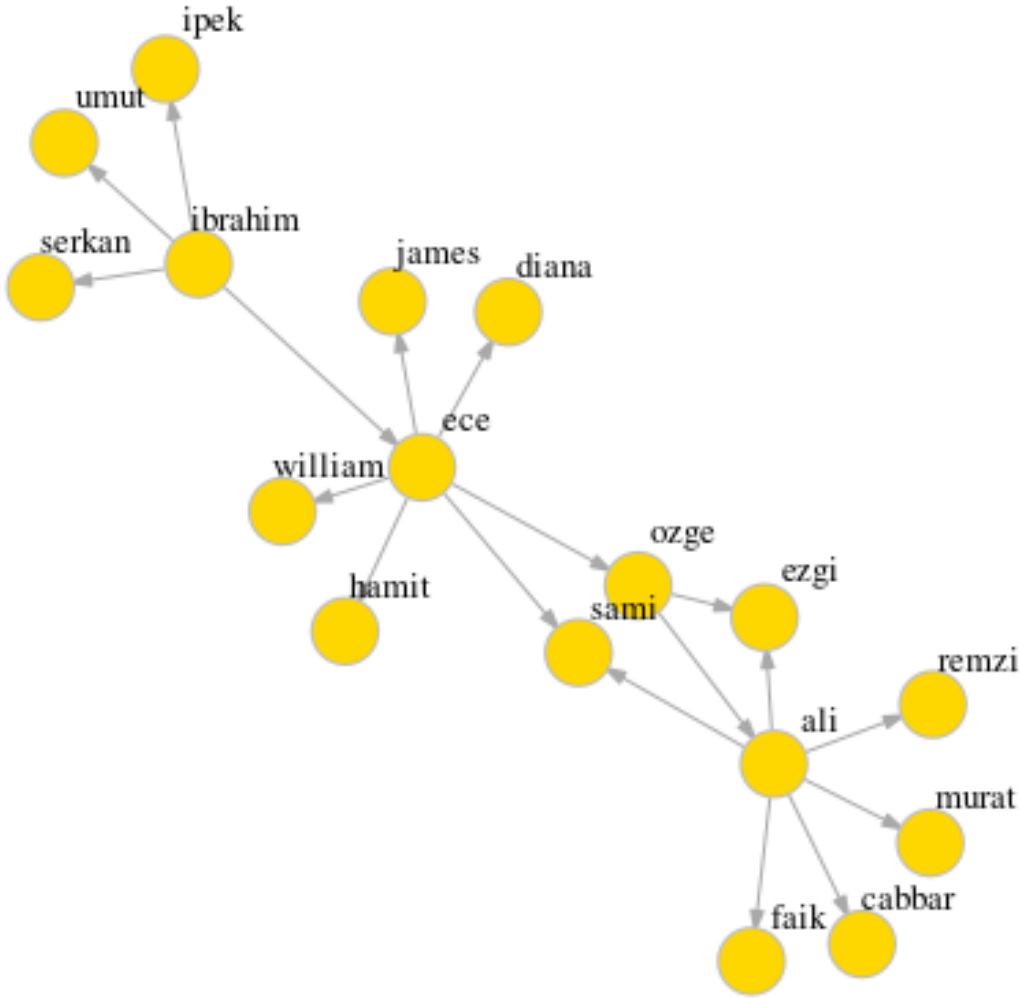




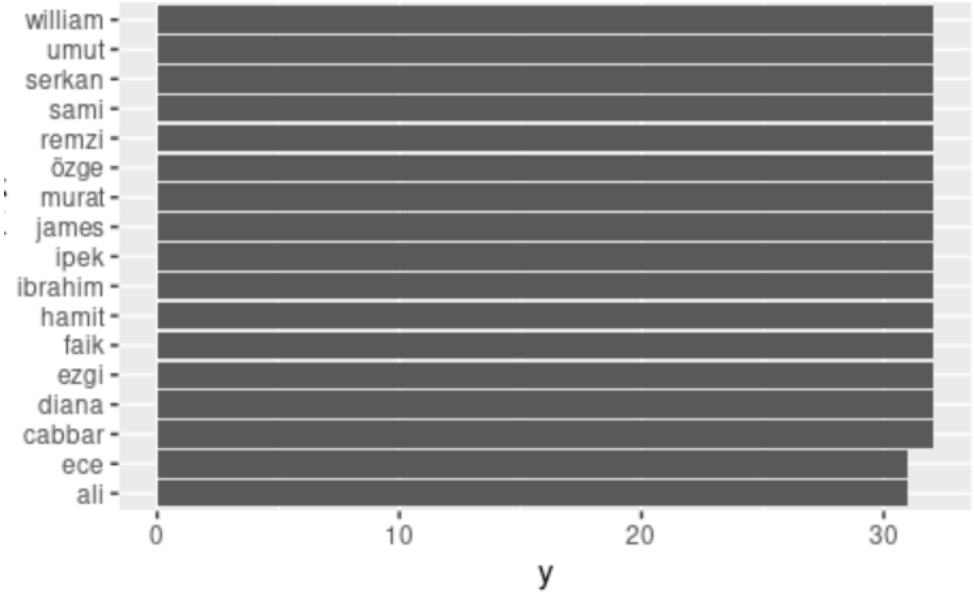
Degree distribution: Tally of degree of all nodes

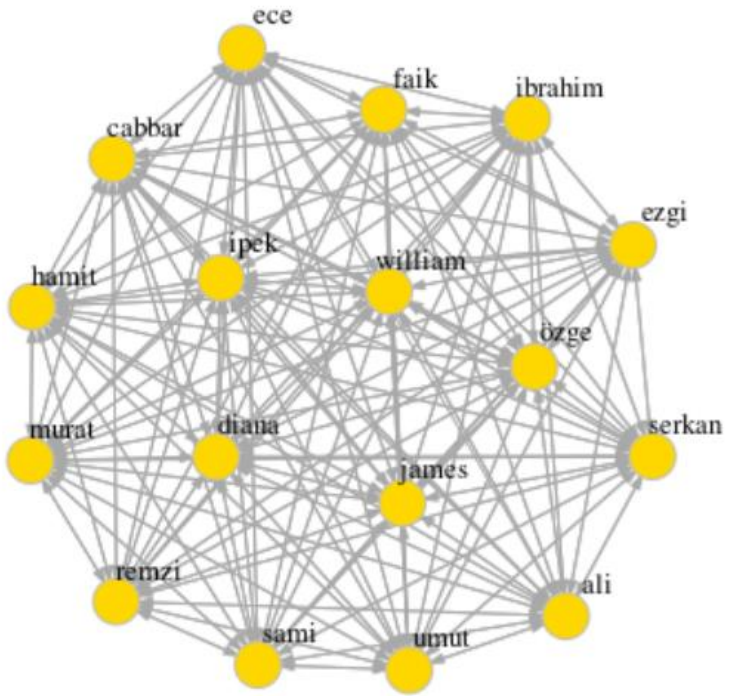
Imbalanced Degree Distribution

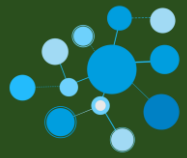


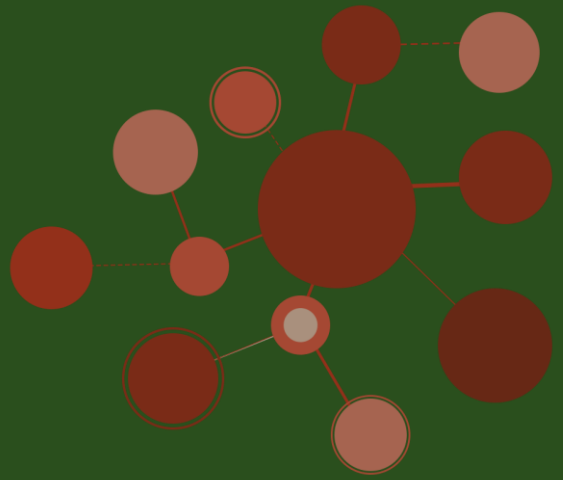


Balanced Degree Distribution

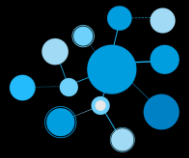








Why network analysis?



Importance of network analysis

Network analysis is a powerful tool for understanding the **structure** and **function** of complex systems.

It allows researchers to identify **patterns and trends in the relationships between the entities** in a network and to understand how these relationships influence the behaviour of the system as a whole.

Network analysis can be used to identify **key players in a network,** understand how information flows through a network, and to identify potential bottlenecks or vulnerabilities in a network.

Potential Usage

- In business, network analysis can be used to identify **key customers, suppliers, and partners**. It can also be used to understand how information flows through an organization and to identify potential bottlenecks.
- In healthcare, network analysis can be used to identify patients **who are at risk for certain diseases**, to track the spread of disease, and to identify potential sources of infection.
- In government, network analysis can be used to understand **how government agencies interact with each other**, to identify potential problems with government programs, and to make better decisions about how to allocate resources.

Example players

Knowledge broker:

- Critical connection to external knowledge
- Needs to be connected internally to be effective

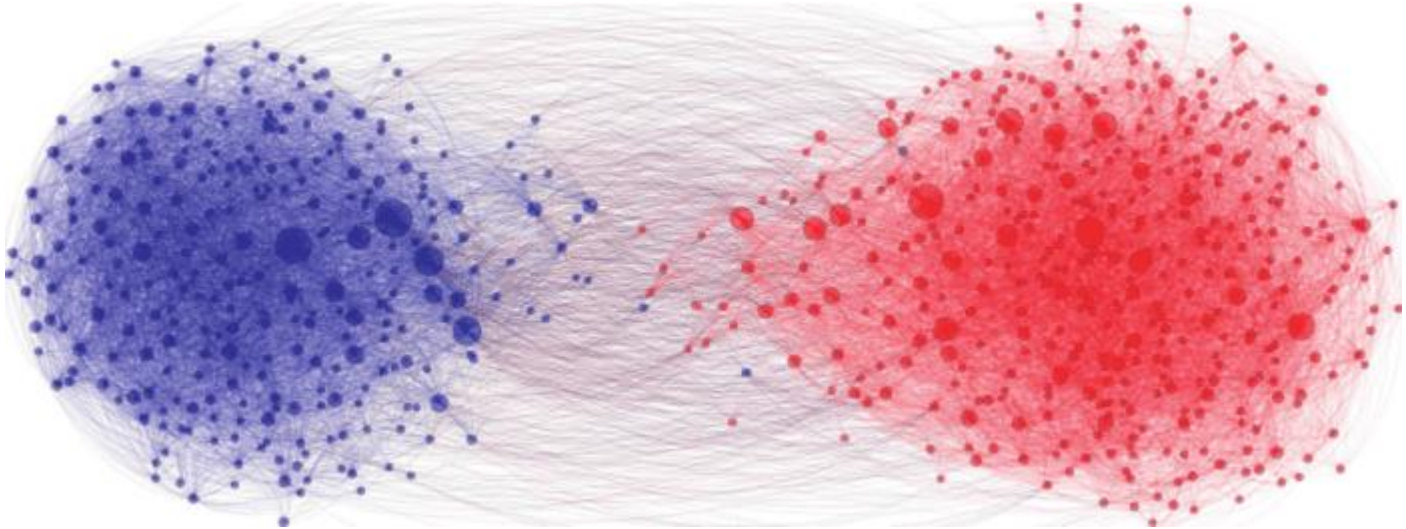
Central:

- Holds network together
- Can become a bottleneck

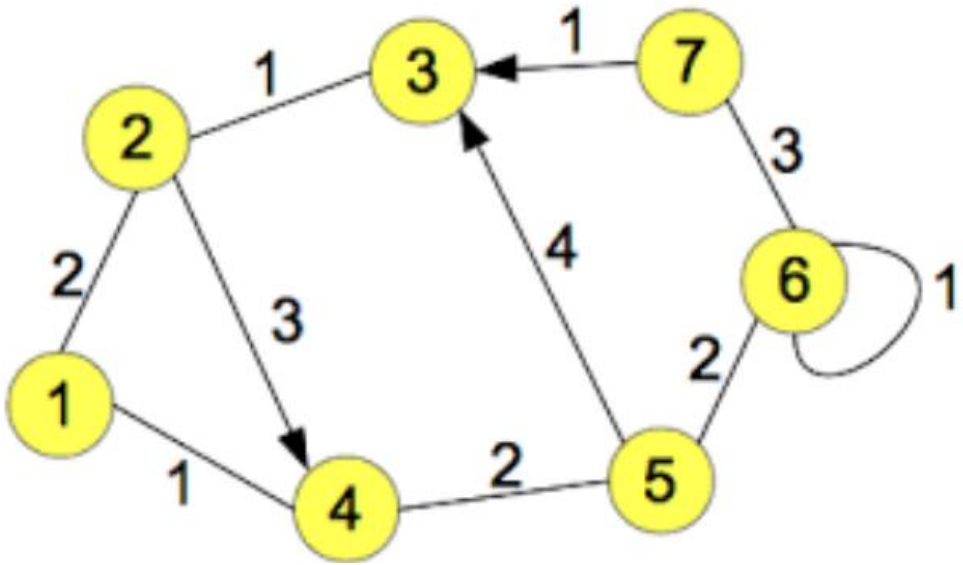
Peripheral:

- Disconnected, at risk of exit
- If talented, this presents a risk

Communities



Weighted Networks



Density

The density of a network is simply the proportion of all possible ties that are actually present.

Number of all possible connections: P
Number of actual connections: A
n: Number of nodes
Density: D

$$P = n(n-1)/2$$

from Research Methods and Design in Sport Management
by Damon P. S. Andrew, Paul Mark Pedersen, Chad D. McEvoy
Human Kinetics, 2019

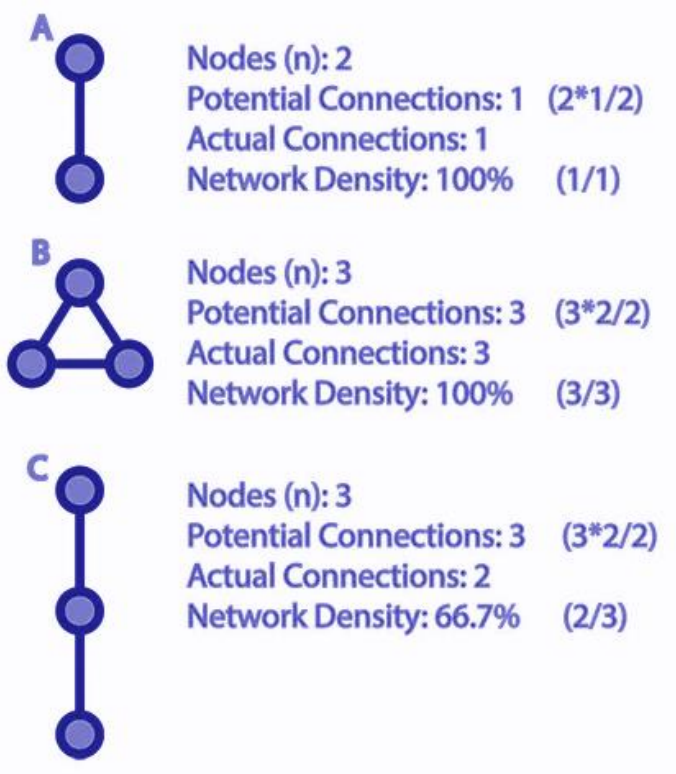
$$D = \frac{P}{A}$$

Density

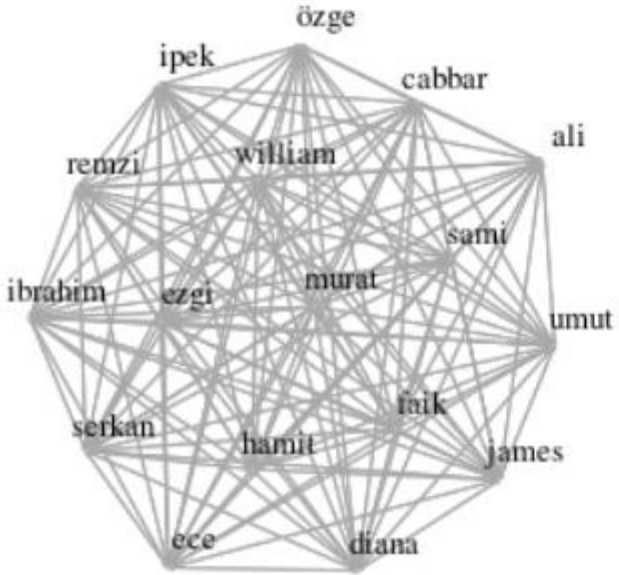
Number of all possible connections: P
Number of actual connections: A
n: Number of nodes
Density: D

$$P = n(n-1)/2$$

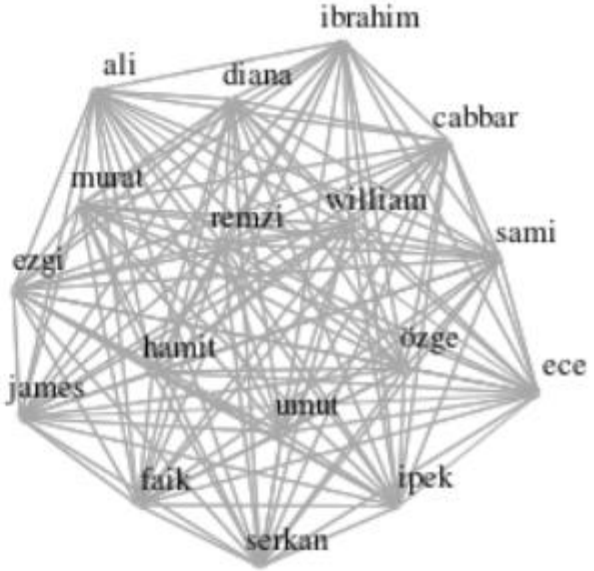
$$D = \frac{P}{A}$$



Comparison of two network by density



01.csv



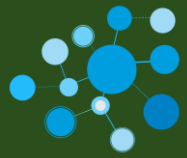
03.csv

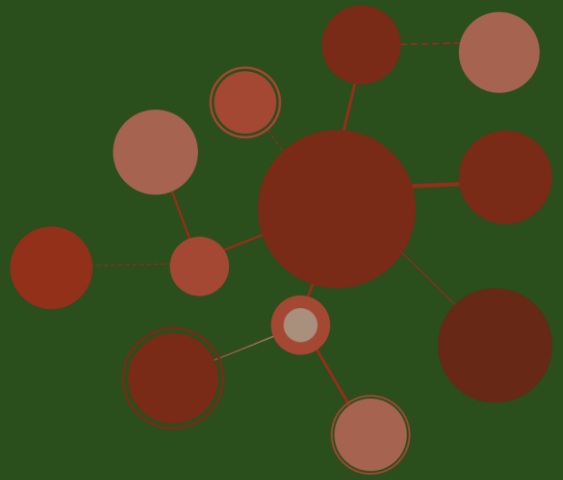
Network Data Resources

Data & Network Collections. Find and interactively VISUALIZE and EXPLORE hundreds of network data

ANIMAL SOCIAL NETWORKS 816	INTERACTION NETWORKS 29	SCIENTIFIC COMPUTING 11
BIOLOGICAL NETWORKS 37	INFRASTRUCTURE NETWORKS 8	SOCIAL NETWORKS 77
BRAIN NETWORKS 116	LABELED NETWORKS 105	FACEBOOK NETWORKS 114
COLLABORATION NETWORKS 19	MASSIVE NETWORK DATA 21	TECHNOLOGICAL NETWORKS 12
CHEMINFORMATICS 646	MISCELLANEOUS NETWORKS 2668	WEB GRAPHS 36
CITATION NETWORKS 4	POWER NETWORKS 8	DYNAMIC NETWORKS 115
ECOLOGY NETWORKS 6	PROXIMITY NETWORKS 13	TEMPORAL REACHABILITY 38
ECONOMIC NETWORKS 16	GENERATED GRAPHS 221	BHOSLIB 36
EMAIL NETWORKS 6	RECOMMENDATION NETWORKS 36	DIMACS 78
GRAPH 500 8	ROAD NETWORKS 15	DIMACS10 84
HETEROGENEOUS NETWORKS 15	RETWEET NETWORKS 34	NON-RELATIONAL ML DATA 211

http://networkrepository.com/





Real World Examples

Network Analysis Application on Finance

Doğuş Üniversitesi Dergisi, 21 (2) 2020, 79-91

Şirket Ağları Üzerinden Sahiplik İlişkilerine Yönelik Stratejilerin Belirlenmesi

Determining Strategies for Ownership Relations by Business Networks

Suat ATAN[(1)], Çiğdem BASKICI[(2)], Yavuz ERCİL[(3)]

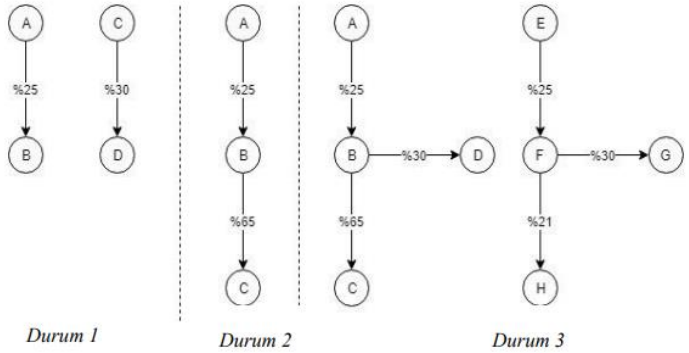
ÖZ: Çalışmada şirketlerin sahiplik ilişkilerine yönelik stratejilerinin ortaya çıkarılması amaçlanmaktadır. Bu doğrultuda Borsa İstanbul'da (BIST) işlem gören 515 şirketin 1 Ocak-31 Aralık 2017 yılına ait pay sahipliği bilgileri kullanılmıştır. Bu bilgiler ışığında şirketlerin doğrudan ve dolaylı sahiplik oranlarının hesaplanabileceği 2228 şirket ve 2058 ilişkiden oluşan bir ağ oluşturulmuştur. Ağ üzerinden yapılan hesaplamalar sonucunda 298 şirketin yalnızca doğrudan sahiplik, 63 şirketin ise hem doğrudan hem de dolaylı sahiplik kurdukları tespit edilmiştir. Doğrudan ve dolaylı sahiplik kuran şirketler içerisinde özellikle Koç Holding'in dolaylı sahiplik oranının doğrudan sahiplik oranından daha yüksek olduğu ortaya çıkmıştır. Net Holding ve Doğan Şirketler Grubu çok belirgin bir biçimde doğrudan sahipliği dolaylı sahipliğe tercih etmektedir.

Anahtar Kelimeler: Şirket stratejisi, Ağ perspektifi, Sahiplik ilişkileri, Piramit yapılar

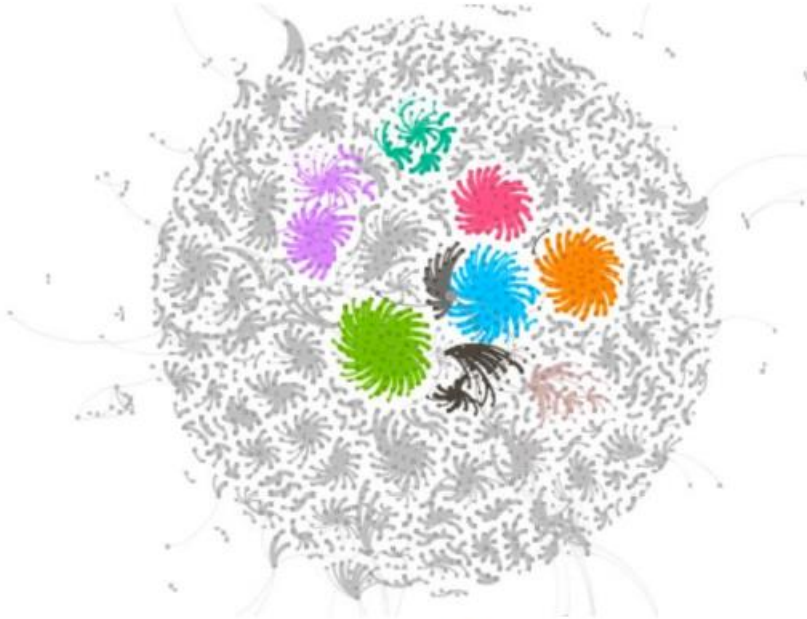
Abstract: *The aim of the study is to reveal business strategies for ownership relations. Accordingly, the shareholding information of 515 companies listing in Borsa İstanbul (BIST) for the period January 1 - December 31, 2017 has been used. In the light of this information, a network of 2228 companies and 2058 relations was established in which direct and indirect ownership rates of companies can be calculated. As a result of the calculations made over the network, it was determined that only 298 companies have direct ownership and 63 companies have both direct and indirect ownership. Indirect ownership ratio of Koç Holding was found to be higher than its direct ownership ratio. Net Holding and Doğan Group prefer distinctly direct ownership rather than indirect ownership.*

Keywords: *Business strategy, Network perspective, Ownership relations, Pyramidal structure*

Ownership / Indirect Ownership

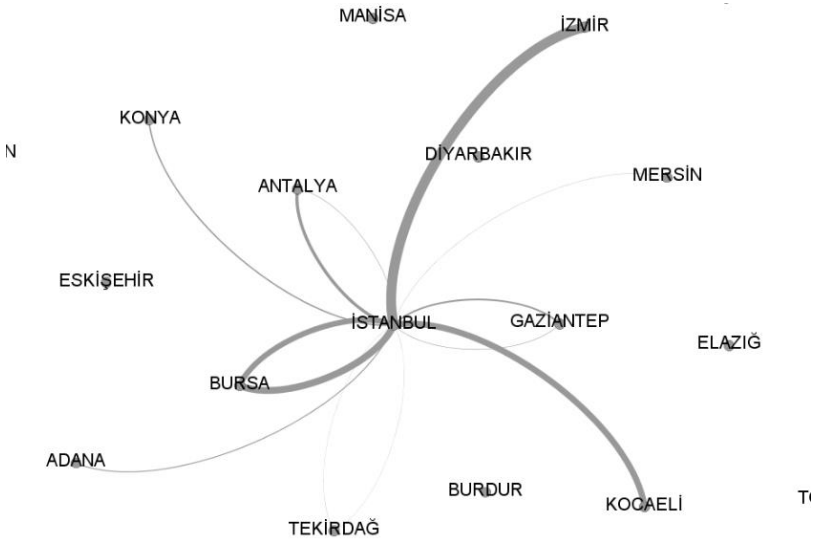


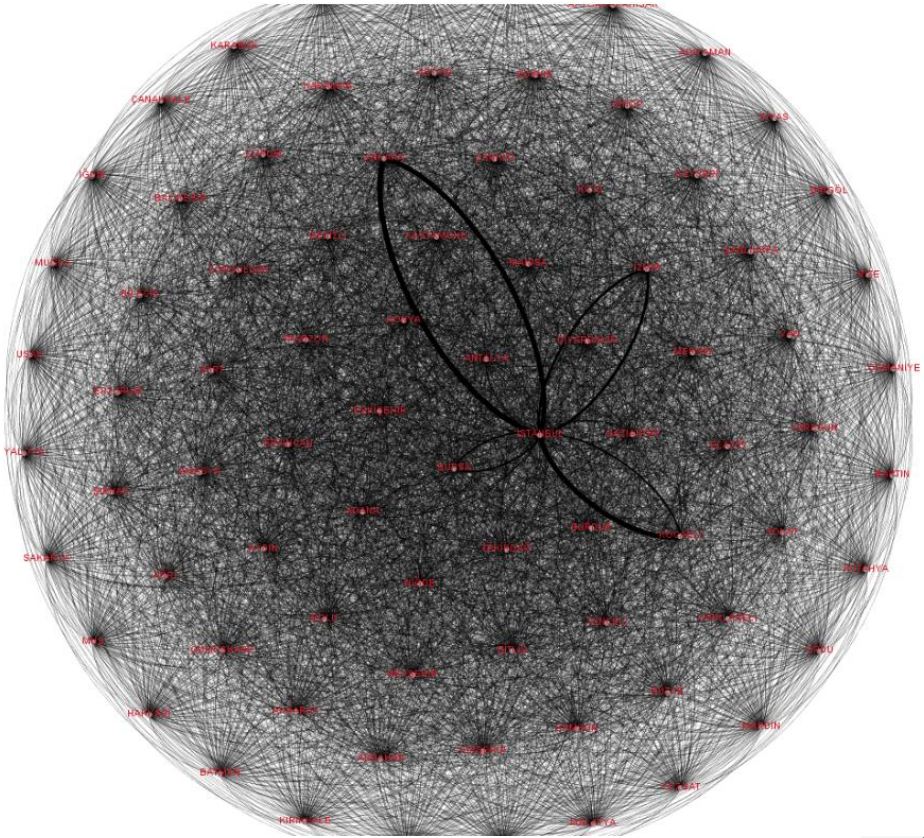
Şekil 1. Doğrudan ve Dolaylı İlişkiler



Şekil 3. Şirketlerin Sahiplik Ağı

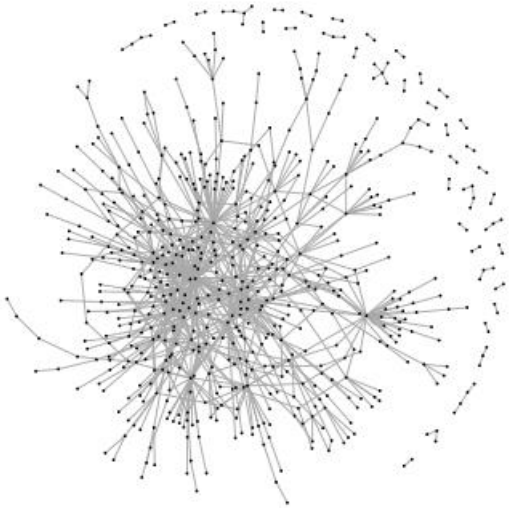
Turkish Internal Trade

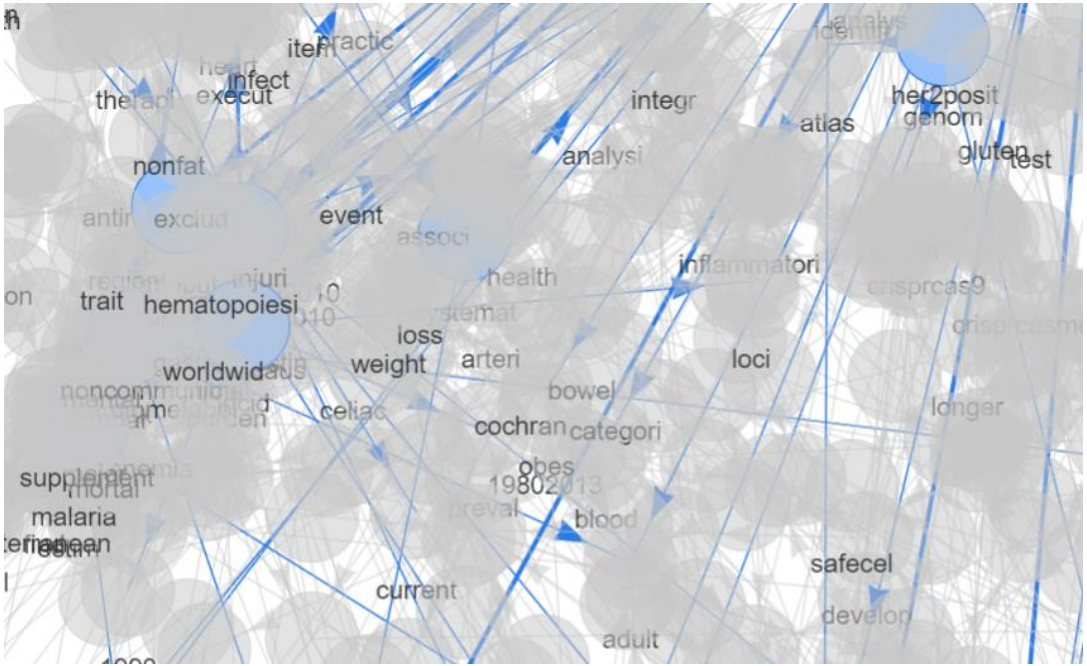




https://rpubs.com/suatatan/tiata-2017

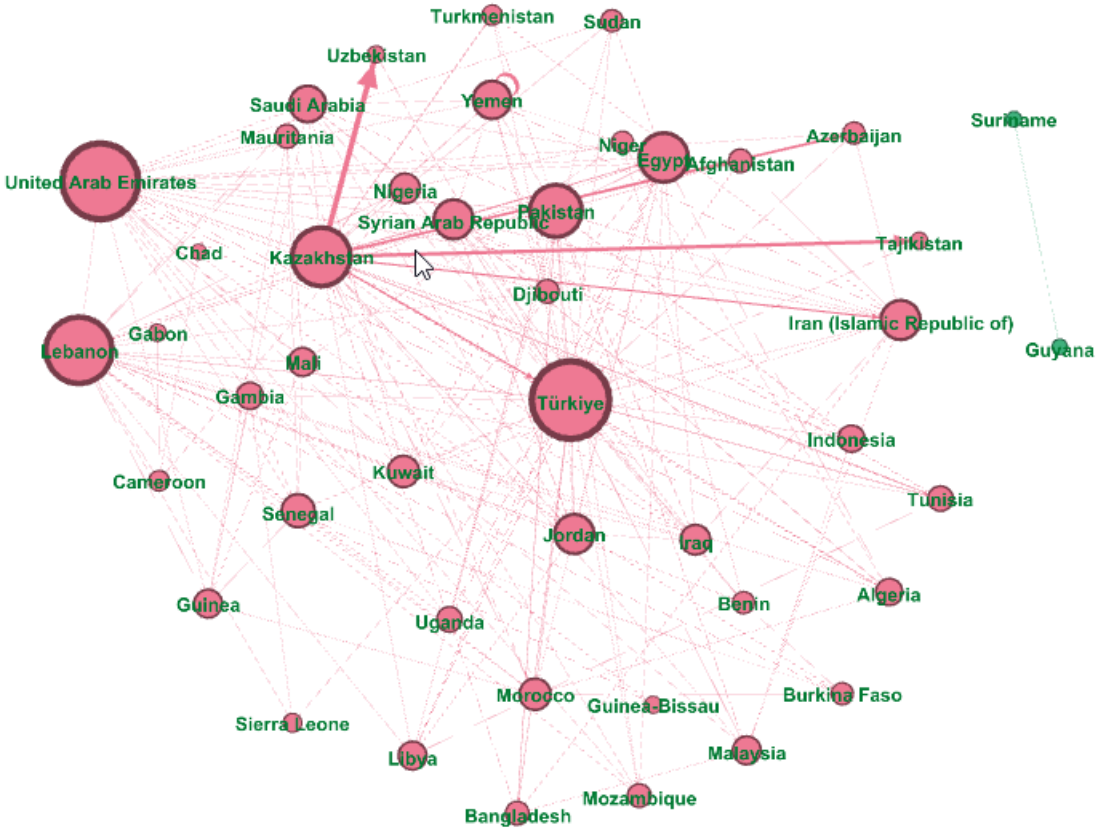
Semantic Networks





https://suatatan.shinyapps.io/healthoscope/

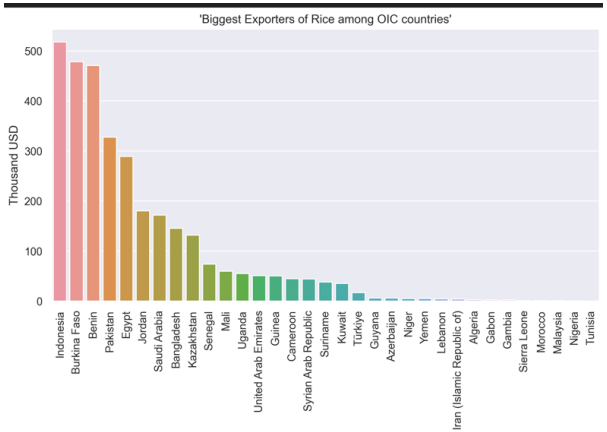
Wheat Export



Source: FAO Data

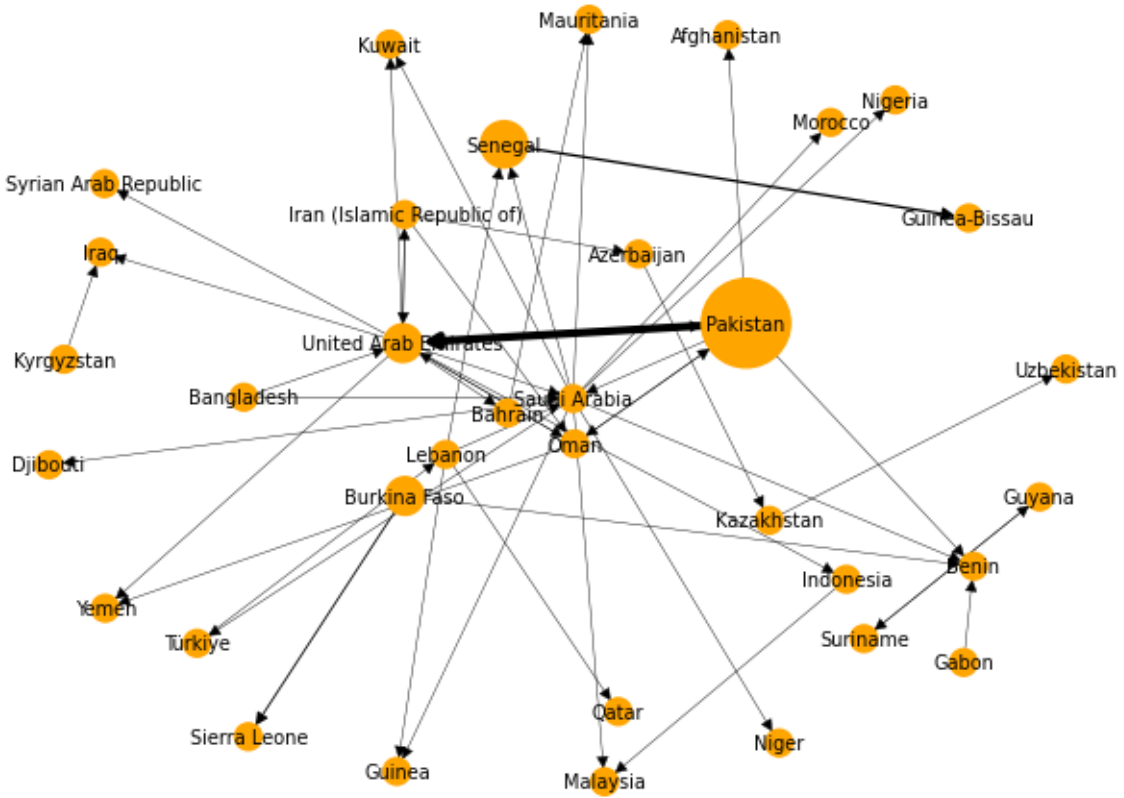
Visualization: NetworkX+Python+ Gephi

Rice Export

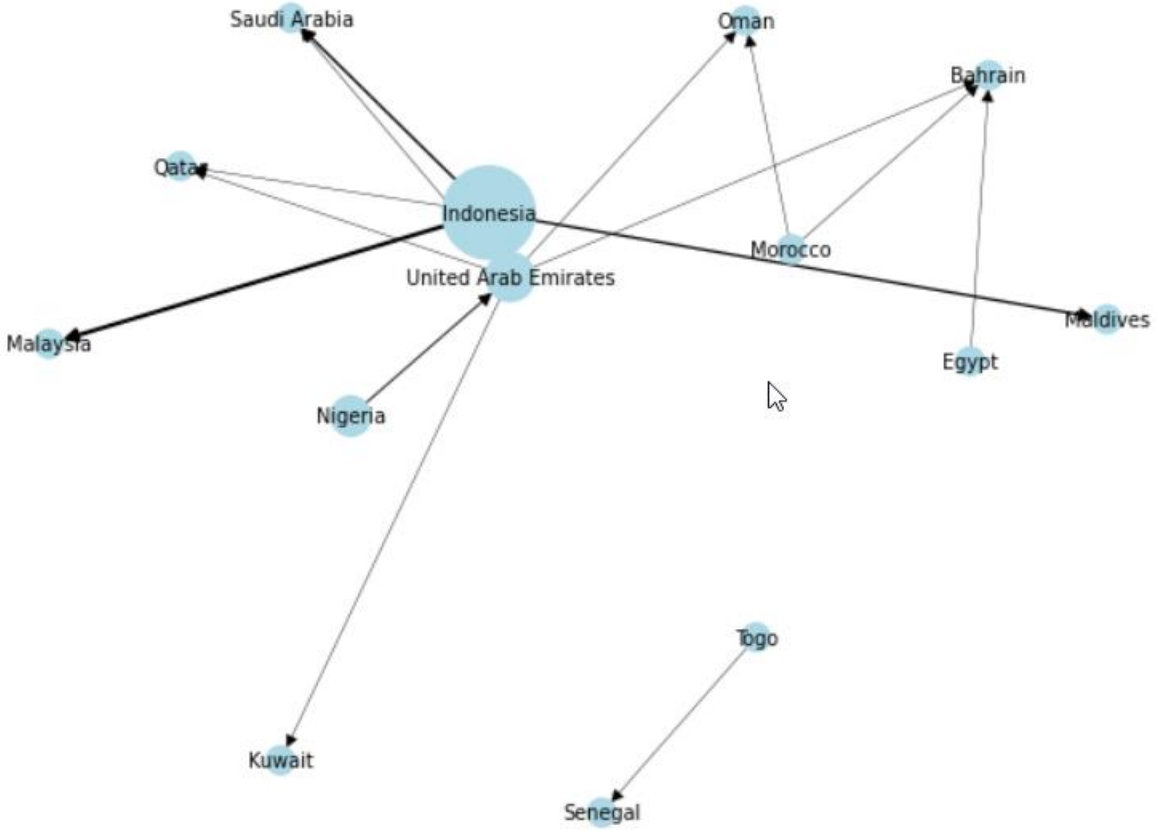


Source: FAO Data

Visualization: NetworkX+Python

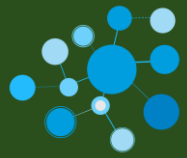


Cassava Export

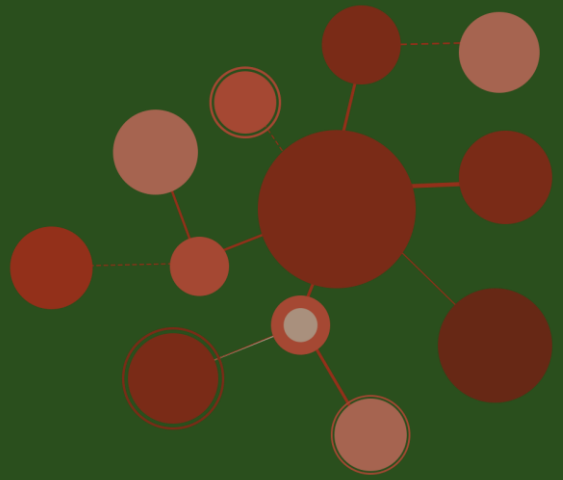


Source: FAO Data

Visualization: NetworkX+Python



Thanks



Dr. Suat ATAN

suat@iofs.org.kz

suatatan.wordpress.com