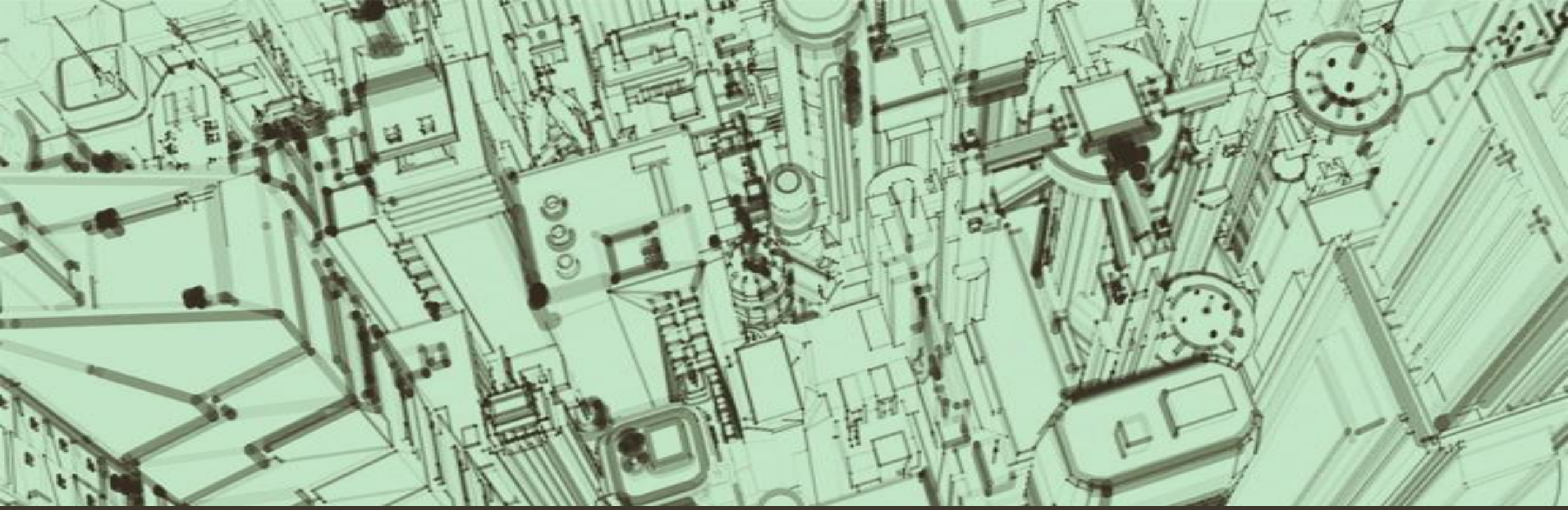
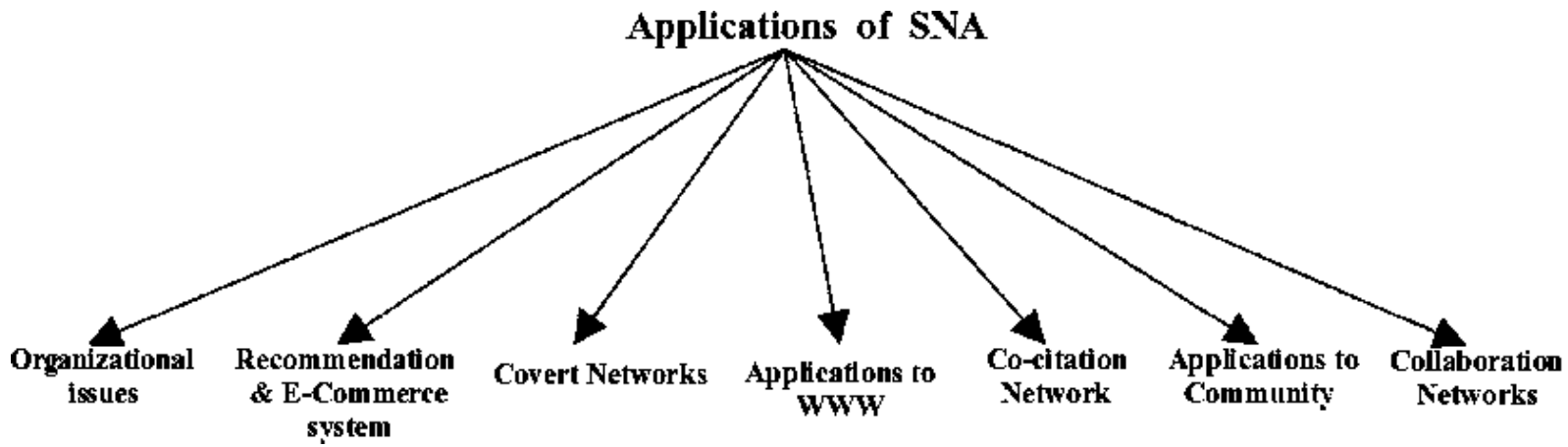


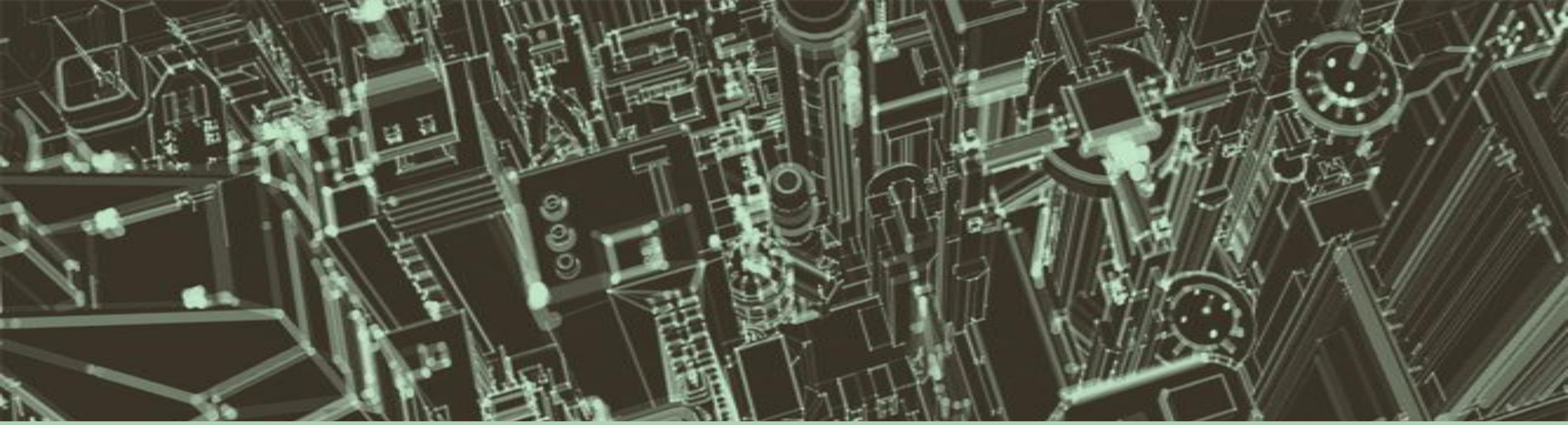
Applications of Social Networks

Introduction

- Covert Networks
- Community Welfare
- Collaboration Networks
- Co-Citation Networks

Focus is on these four!!





1. Covert Networks

What are Covert Networks?

- The covert networks are **hidden -** the actors of such network **does not disclose their information** to the external world.
- Covert groups have **cellular networks structure** which is different from hierarchical organizations.
- Ex. **The terrorist and criminal networks**.
- SNA has been successfully applied to such domains to **understand covert cell operations** and their organization.
- Thereby, you can **combat terrorism**.

SNA -Terrorist cells and database

- SNA has been used to **understand** the **communication** and **structure of terrorist cells**.
- SNA is applied on terrorism database for
  - predicting node and links
  - Discovering interesting patterns and actors involved in an event.
- In this context, SNA discovers
  - who is central within organizations
  - which individuals-removal would most effectively disrupt the network
  - what roles individuals are playing
  - Which relationships are vital to monitor.

SNA – Predict Terrorism

- Another vital **application of SNA** for terrorist database is to **predict terrorism activities**.
- **Terrorist organizations** have **special structures** on
  - Recruitment
  - Evolution
  - Ideas diffusion in network.
- Studies have shown that **these** types of **networks** can be **well understood** by **mapping them**.

One example = 9/11 attack

- The **Valdis Krebs** [9] has used **social network analysis** to **map the terrorist network** that attacked **on 9/11**.
- In spite of unavailability of complete and proper knowledge of all actors and connections in between them, his analysis has disclosed network which is almost near to real network.

Sources of data – to build terrorist database ??

1) The data to build and complete such networks is gathered from **publicly available resources** such as **news papers**
2) Now a days **Web resources** such as **blogs, emails** etc. are also used for hidden communication.
3) Hence, **various data mining** and social network analysis techniques are employed to **extract necessary information** to detect terror.

Problem of Connecting Dots

- SNA considers terrorists networks analysis as a problem of connecting dots.
- Connecting multiple pairs of dots exposes the total network.
- Centrality is the most important and widely used measure in SNA.
- The various other factors are:
  - Betweenness centrality
  - Degree centrality measures
  - Cohesion factors
  - Closeness

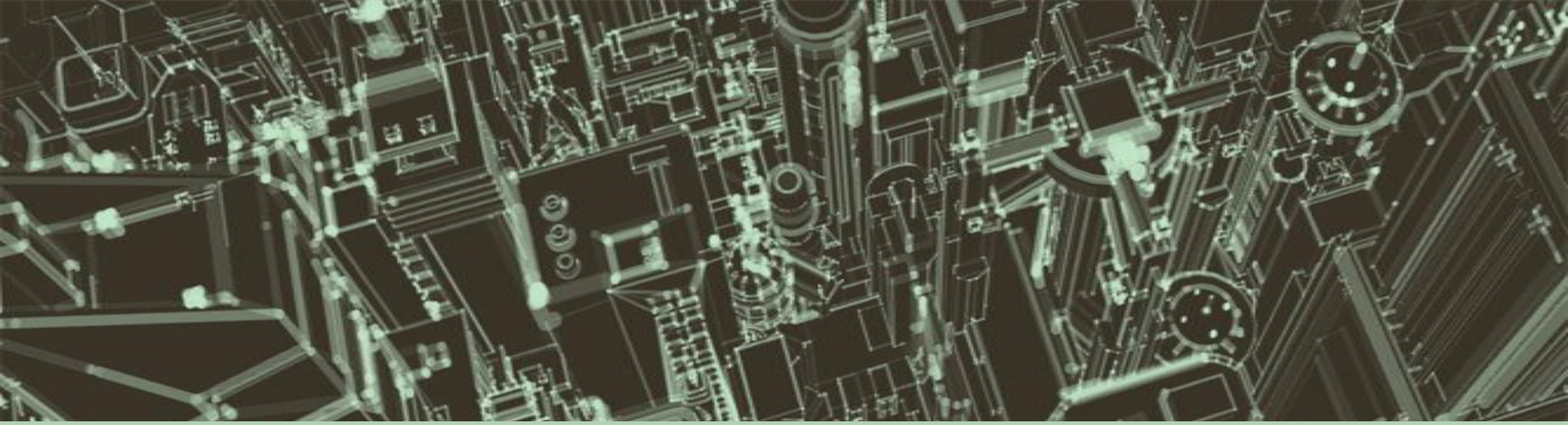
Steps involved in TNA

a. **Identify key players** in terrorist network using the problem of connecting dots.

b. Identify the **actors linked to these key players** – By doing so, the whole network is found out.

c. The **regular day-to-day activities** of the key players are **monitored**.

d. Use Structural cohesion to find **connectors among group of actors** - This measure is used to **identify sub-groups in an organization** having similar features skills and involvement in particular event.



2. Community Welfare

1. Spread of Disease

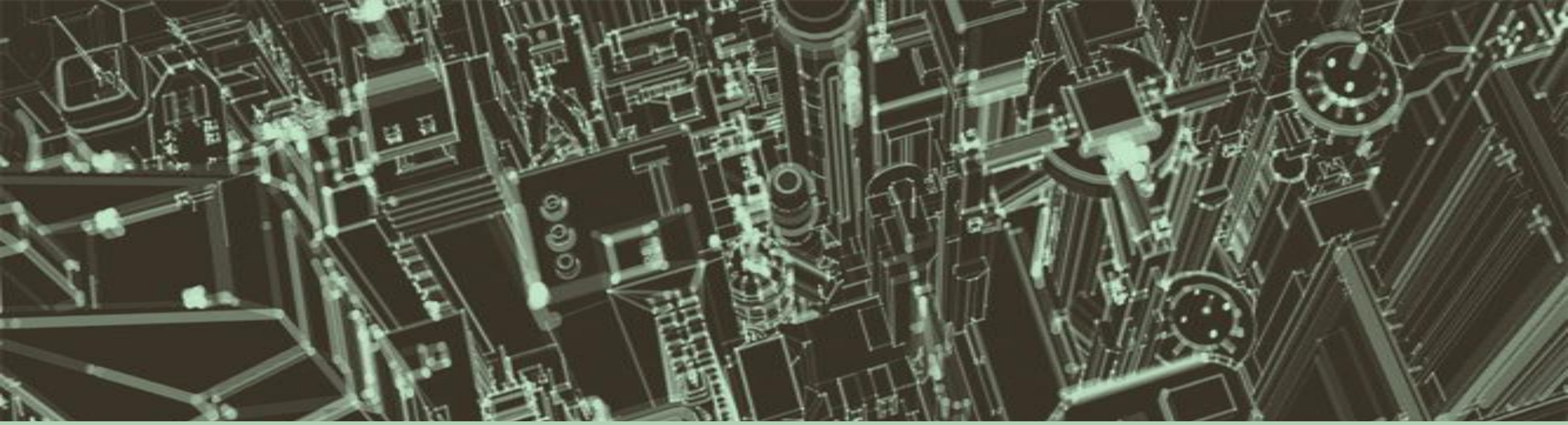
- The SNA techniques can also be used to improve the **community welfare**.
- SNA is used to analyze different types of relations such as
  - Communication patterns Physical contacts Sexual relationship etc.
- The **SNA** may **reveal** the **patterns of human contact** which may lead to **spread of disease** such as HIV in population.
- It has been employed in **epidemiology** and has shown considerable results for community improvement.
- **Another** interesting **application** is to use SNA to **examine and observe farm animal network** to identify **patterns of disease spread** from one animal to another.

2. Monitor Suspected People Behavior

- **Mass surveillance** practice is undertaken by some organizations and governments to **monitor the behavior of suspected people** of population.
- This is done with the **purpose** of **protecting people from criminals**, terrorists or political subversives to maintain social control.
- In US, the Total Information Awareness program of the Information Awareness Office **designed numerous technologies** to be used to **perform mass surveillance** which made **use of SNA tools.**

3. Strengthening Community resilience

- **Social Networks** which are made for **strengthening community resilience against disasters** (natural or human-made) can **reveal vulnerabilities** within a network [13].
- These networks are analyzed using SNA tools to **study the changes** that occur during disaster and further to **improve disaster preparedness** strategies.
- **Knowledge Sharing:** The **SNA tools** have also been used to **assess the communities of practices - This information** can further be used to **improve knowledge sharing** in community.



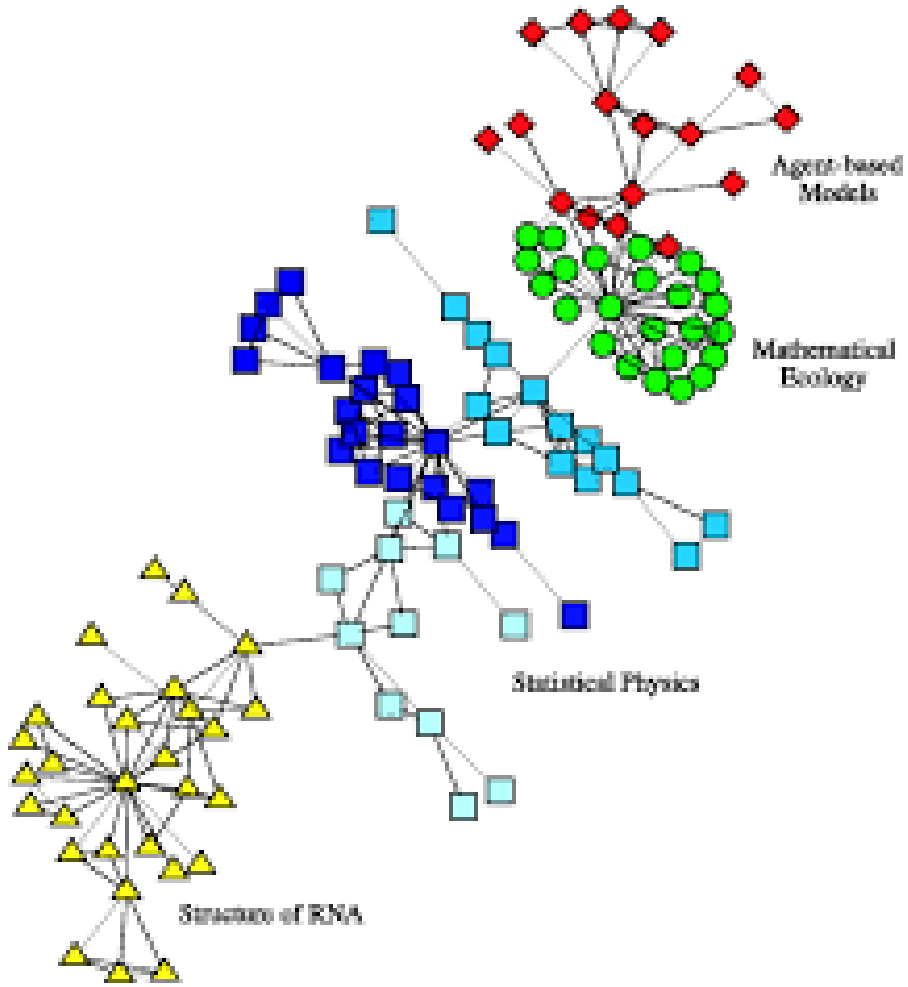
3. Collaboration Networks

What are Collaboration Networks?

- **Collaboration network** consists **groups of persons working together** to perform particular activity
- Studying human collaboration is an important topic in sociology.
- The various types of collaboration networks are:
  1. Co-authorship networks
  2. Movie actor network
  3. Knowledge collaboration network

1. Co-authorship Networks

- **Co-authorship** of a paper can be thought of as **documenting a collaboration between two or more authors**, and these collaborations form a “co-authorship network”



Advantages of Co-Authorship Networks

1. **B**etter way to **improve** the **interdisciplinary research** is by **identifying such current interactions** and engaging involved institutions and researchers for future research.
2. **R**eveals the **ego networks of** prominent **key-players** in the network.
3. **U**nderstand the **influence of individual researchers**.
4. **S**tudy **dynamics** in **patterns of interactions** between educational entities or communities.
5. **Strategic planning** of research and development.
6. **S**cope of research discipline at particular location so that further new inventions in same can be promoted.

Examples of Co-authorship Networks

- Wikipedia article authors
- Network of the pacific Asia Conference on Information Systems
- Network of European Conference on Information Systems (ECIS) etc.

Required Datasets

- The required datasets for co-authorship network analysis is mostly extracted from sources
  - Scientific journals
  - Bibliographic records
  - Digital libraries.

Measures

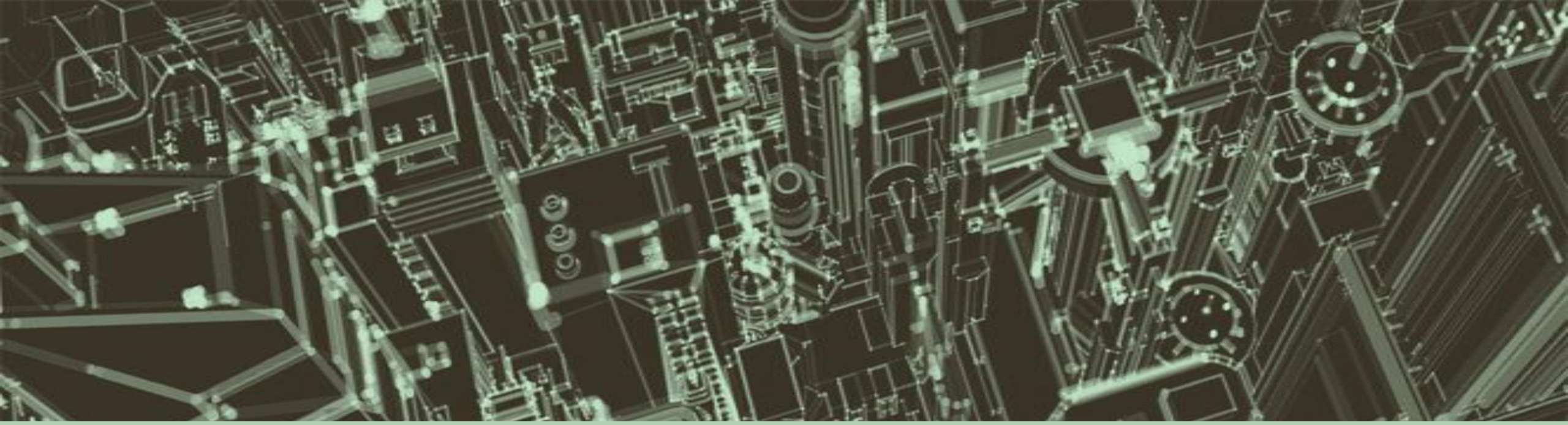
- The **important SNA measures** used **for co-authorship network** includes - **cohesion, network density and centrality.**
- The **cohesion** is used to **identify the subgroups** within network with respect to each research subject.
- The **node similarity** measure in this context **represents extend of similar subject skills**.

2. Movie Actor Network

- **Movie actor network** is analyzed to **study the interaction** amongst themselves, to **discover closely related actors**.
- It is **built based** on **Internet movie database** (www.imdb.com) consisting of all movies and their casts.
- In this network,
  - **Nodes** represents the **actors**
  - **Ties** represent two connected **nodes acted together in some movie**.

3. Knowledge Collaboration Network

- The **information** about **Open Source Software** needs to be **distributed** amongst community or users - because not all members have required knowledge or skills for such software usage and development.
- Hence, **success** of such software highly depends on **distribution of knowledge** using **tools** such as emails, discussion forums, web blogs etc.



4. Co – Citation Networks

What is co-citation?

- **Co-citation** is used as a **measure of similarity** between **two objects**.
- Co-citation analysis helps to understand the status and structure of scientific research.
- The **Co-citation network** can be viewed as a **bipartite graph** showing **linkage between two different groups of documents**.
- Basic **two approaches of co-citation** are
  - Author co-citation
  - Document co-citation

Example 1 – Research network

- In the field of **methodological evaluation**, **co-citation analysis** has been employed to **search for invisible colleges**.
- This **reveals the research network consisting of different institutions** linked to each other informally by having indicators to each others documents/papers.
- This can be used to **get group of institutes having similar ongoing research**.
- This may help to **promote further research** in respective area in those institutions.

Example 2 – Finding Journal Importance

- **SNA** has been also studied as an **approach to understand journals importance** or prestige.
- It also helps to **figure out how** does any **journal - influence or get influenced by - the other journals/papers** in same or different discipline.
- The **node similarity** measure is used **to find similarity between two articles** or publications.
- **Nodes** represent **papers**.
- **Existence of link** shows that **two articles were cited in other articles**.