**Social Network:**

* Social networks are the networks that depict the relations between people in the form of a graph for different kinds of analysis.
* Itis a collection of individuals (or “nodes”) and the relationships (or “edges”) between them.
* The graph to store the relationships of people is known as Sociogram. All the graph points and lines are stored in the matrix data structure called Sociomatrix.
* NetworkX is a popular Python library for working with graphs and networks. It provides a wide range of graph algorithms and functions for creating, manipulating, and analyzing networks.

**Types of Social Networks Analysis:**

**1. Ego Network Analysis**

* Ego network Analysis is the one that finds the relationship among people. It Focuses on relationships involving a particular individual or a sample group from the population.
* This sampling is done randomly to analyze the relationship. The attributes involved in this ego network analysis are a person’s size, diversity, etc.

**Methodology**:

* Conducted through surveys asking individuals about their interactions and the nature of their relationships.
* Does not map relationships between all members of the sample but focuses on connections around specific individuals (ego).

**Applications**:

1. Efficient information propagation.
2. Understanding social links and relationships for sensemaking.
3. Resource accessibility and connection optimization.
4. *I*dentifying communities and group formations.
5. Analyzing social support and individual ties.

**Statistical Testing**: Hypotheses are tested using statistical methods to measure the density and structure of these networks.

**2. Complete Network Analysis**

* Complete network analysis is the analysis that is used in all network analyses. It analyses the relationship among the sample of people chosen from the large population.
* Subgroup analysis, centrality measure, and equivalence analysis are based on the complete network analysis.
* This analysis measure helps the organization or the company to make any decision with the help of their relationship.
* Testing the sample will show the relationship in the whole network since the sample is taken from a single set of domains.

**Applications**:

1. Provides insights into the entire network’s structure.
2. Helps organizations or companies make informed decisions by understanding relationships within the network.

**Sampling**: The sample represents the population, allowing analysis of the broader network through targeted subsets.

**Social Network Analysis:**

* Social Network Analysis (SNA) is the process of exploring or examining the social structure by using graph theory.
* It is used to analyzing these networks to understand patterns of interaction and communication among individuals.
* It is used for measuring and analyzing the structural properties of the network.
* It helps to measure relationships and flows between groups, organizations, and other connected entities.

**Development of Social Network Analysis:**

**Early Foundations (1930s–1950s)**

**1. Anthropology and Sociology:**

* Early foundations of Social Network Analysis (SNA) emerged from the work of anthropologists and sociologists studying social structures and relationships within communities.

Key Figures:

* A.R. Radcliffe-Brown: Emphasized the study of social relationships to understand societal structures.
* Jacob Moreno: Pioneered the field by introducing methods to analyze interpersonal relationships. He focused on understanding communication patterns and group dynamics.

**2. Graph Theory:**

* Graph theory, developed by mathematicians like Euler and Harary, provided a mathematical framework to represent and analyze relationships using graphs.
* These foundational tools became essential for mapping and studying social networks.

**Formalization of SNA (1950s–1970s)**

**1. John Barnes:**

* Introduced the term **"social network"** during his study of social ties in Norwegian villages.
* Highlighted how individuals are connected through relationships, forming complex networks.

**2. Milgram's Small-World Study:**

* Psychologist **Stanley Milgram** conducted an experiment showing that people are connected through an average of **six steps or connections** ("six degrees of separation").
* Demonstrated how closely people are linked globally, even in large networks.

**3. Centrality Measures:**

* **Degree Centrality**: Counts how many direct connections a person has (more connections = more important).
* **Closeness Centrality**: Measures how close a person is to everyone else in the network (faster to reach others = higher importance).
* **Betweenness Centrality**: Identifies individuals who act as bridges or connectors between different groups.

**Computational Era (1980s–1990s):**

**1. Software:**

* Tools like **UCINET** and **Pajek** made it possible to analyze large and complex networks using computers.
* It Enabled researchers to visualize and compute metrics for networks that were previously too large to study manually.

**2. Granovetter's Strength of Weak Ties:**

* Showed that **weak ties** (connections with Associates rather than close friends) are crucial for spreading information and opportunities.
* Weak ties act as bridges between different social groups, helping to connect diverse parts of a network.

**3. Broader Applications**: Social Network Analysis expanded to various fields:

1. **Epidemiology**: Understanding how diseases spread through populations.
2. **Organizational Studies**: Analyzing workplace communication and improving collaboration.
3. **Communication Networks**: Mapping information flow and connectivity in telecommunication and online systems.

**Digital and Big Data Era (2000s–Present):**

**1. Online Social Networks:**

**Platforms**: The rise of platforms like **Facebook**, **Twitter**, and **LinkedIn** provided enormous datasets for network analysis.

**Focus Areas**:

1. **Community Detection**: Identifying tightly connected groups within networks.
2. **Influence Tracking**: Measuring how ideas or trends spread through influential users.
3. **Information Diffusion**: Studying how content (e.g., news, memes) spreads across networks.

**2. Multilayer Networks:**  The study of multilayer networks, where relationships exist across different dimensions, has become a topic of interest. This allows a more nuanced understanding of complex social systems.

**3. Applications:**

1. **Public Health**: Tracking disease outbreaks and optimizing vaccination strategies.
2. **Politics**: Analyzing voter influence and campaign strategies.
3. **Business**: Identifying key influencers in marketing and improving organizational efficiency.
4. **Technology**: Enhancing network security and optimizing communication systems.

**4. Advanced Tools:**

**Visualization and AI**: Modern tools use advanced algorithms and artificial intelligence to analyze and visualize extremely complex networks, making it easier to understand and interpret large-scale connections.

**Key Concepts and Measures in Network Analysis**

1. **Nodes**: Represent entities in the network (e.g., individuals, cities).
2. **Edges (Links/Ties)**: Represent relationships or connections between nodes (e.g., friendships, roads).
3. **Graph**: A mathematical representation of a network with nodes and edges, which can be **directed** (one-way relationships) or **undirected** (mutual relationships).
4. **Weighted Edges**: Edges with weights to indicate the strength or intensity of relationships.
5. **Degree**: Number of connections for a node; in directed graphs, split into **in-degree** (incoming) and **out-degree** (outgoing).

**Advantages:**

1. **Understand Relationships**: It helps you see how people are connected.
2. **Find Key People**: It shows who the important people are in a group.
3. **Improve Communication**: It can help make communication better.
4. **Boost Collaboration**: It helps people work together more effectively.

**Disadvantages:**

1. **Privacy Issues**: It can raise concerns about personal data.
2. **Complexity**: It can be hard to analyze large networks.
3. **Data Quality**: The results depend on how good the data is.
4. **Ethical Concerns**: There can be issues with how the data is used.