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Report of Criminal Network Profiling: Insights and Predictions

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Report Title: Criminal Network Profiling: Insights and Predictions

1. Criminal Network Analysis:

Criminal Network Analysis is a branch of social network analysis that focuses on understanding and studying the relationships, interactions, and associations among individuals involved in criminal activities or illicit networks. This field applies network analysis techniques to identify and analyze the structure, dynamics, and behavior of criminal networks. Here is an explanation of criminal network analysis:

2. Definition:

- **Criminal Networks:** Criminal networks are social structures composed of individuals or entities involved in various forms of illegal activities, such as organized crime, drug trafficking, money laundering, terrorism, fraud, and more.
- **Criminal Network Analysis:** It refers to the process of investigating, modeling, and analyzing the connections, collaborations, and interactions among individuals, groups, or organizations participating in criminal enterprises.
- **Key Concepts:**
 - ❖ **Nodes:** Nodes represent individual actors, such as criminals, organizations, or entities involved in illegal activities.
 - ❖ **Edges:** Edges denote relationships or associations between nodes, representing connections, collaborations, or interactions.
 - ❖ **Network Structure:** Criminal networks can have different structural properties, such as centralized, decentralized, modular, or hierarchical structures.

3. Data Sources (Dataset):

Criminal Network Analysis relies on data sources such as law enforcement records, surveillance data, court documents, witness testimonies, and social media interactions.

- **Dataset Link:**
<https://docs.google.com/document/d/1uLf9sWXmxKDdJaz9cMTXQHRHlfBS2qy1Sm1J7UTKWik/edit>
- **Description:**

The dataset represents a network of individuals involved in various criminal activities. Each individual is assigned a unique identifier (ID) and is characterized by their name, associates, and committed crimes. Here is a breakdown of the key components of the dataset:

- **Individuals:**
 1. Each individual is represented by a dictionary with a unique ID.
 2. The "name" attribute denotes the individual's name.
 3. The "associates" attribute is a list of IDs representing other individuals associated with the person.
 4. The "crimes" attribute is a list of criminal activities in which the individual is involved.
- **Associates:**

The "associates" attribute establishes connections between individuals. If individual A has B in their associates, there is a connection between A and B.
- **Crimes:**

The "crimes" attribute lists the criminal activities associated with each individual. Criminal activities include offenses such as drug trafficking, money laundering, racketeering, robbery, assault, forgery, cybercrime, hacking, identity theft, and fraud.
- **Example:**

For instance, individual with ID 1, named "John Doe," is associated with individuals 2, 3, 4, and 5. John Doe is involved in drug trafficking, money laundering, and racketeering.

4. Use Cases (Applications):

- **Law Enforcement:** Criminal network analysis is used by law enforcement agencies to target key individuals and disrupt criminal organizations.
- **Counterterrorism:** Analyze the structure of terrorist networks to prevent attacks and capture terrorists.
- **Intelligence Agencies:** Investigate espionage and covert operations conducted by foreign entities.
- **Social Services:** Address issues such as human trafficking and organized criminal activities that impact vulnerable populations.

5. Visualization of the Criminal Network:

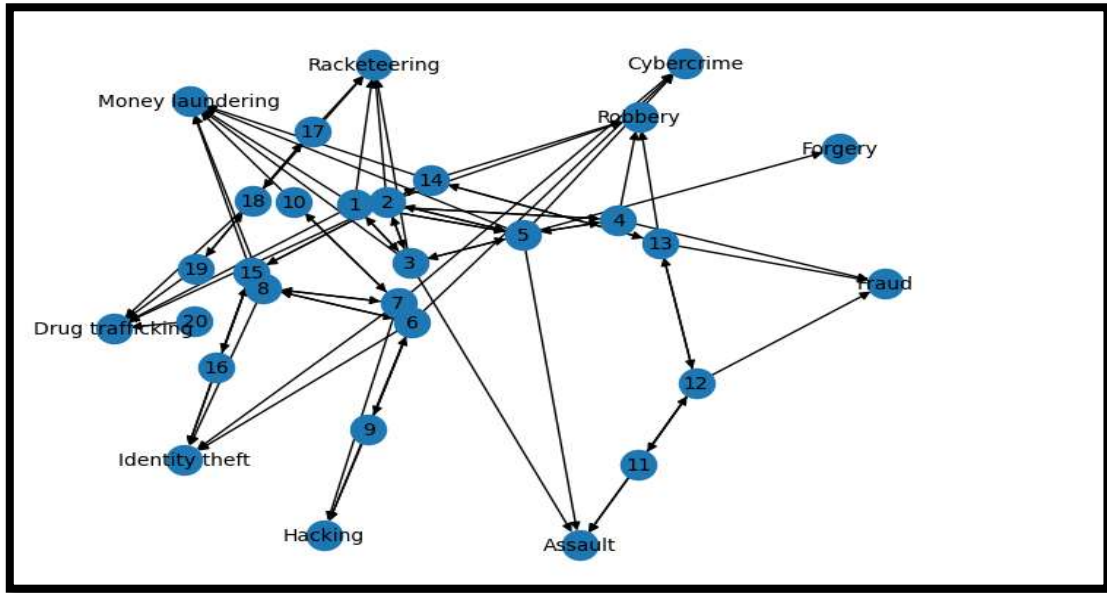


Figure 1: Visualization of the Criminal Network (a)

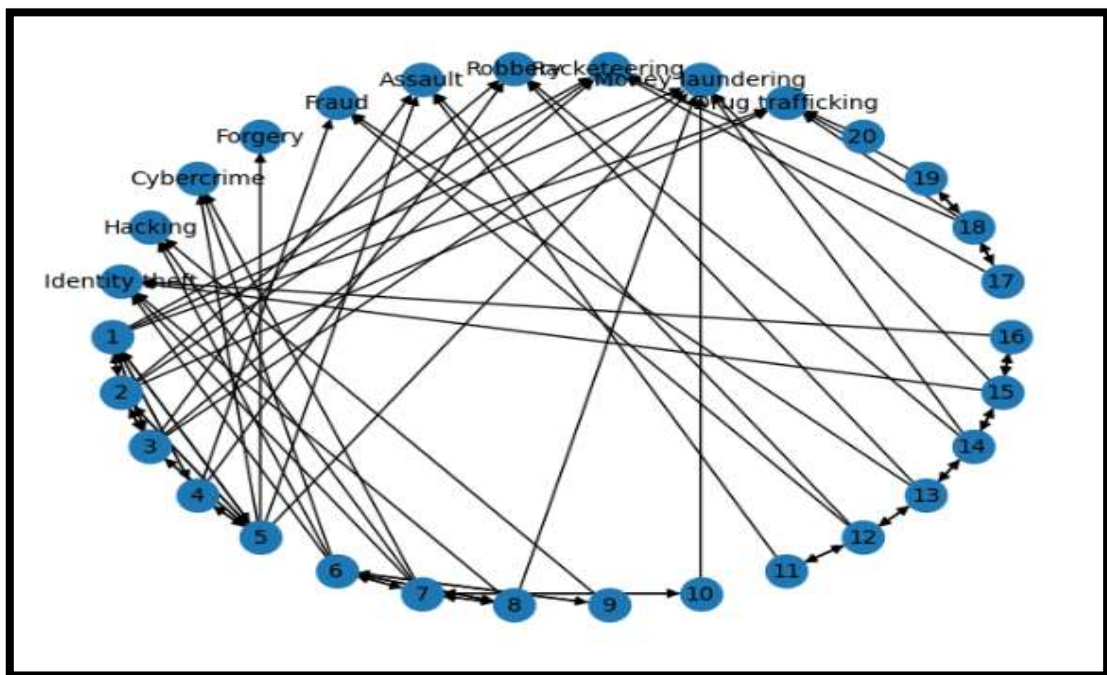


Figure 2: Visualization of the Criminal Network (b)

6. Network Measures and Results:

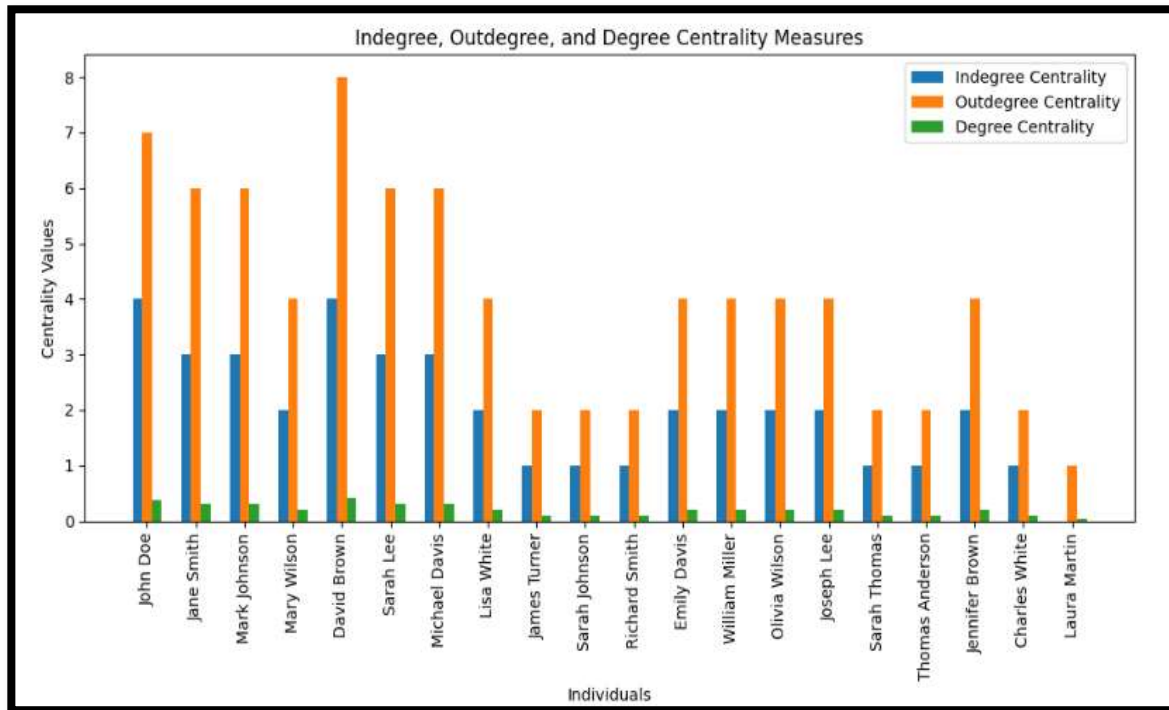


Figure 3: Network Measures of Criminal Network (a)

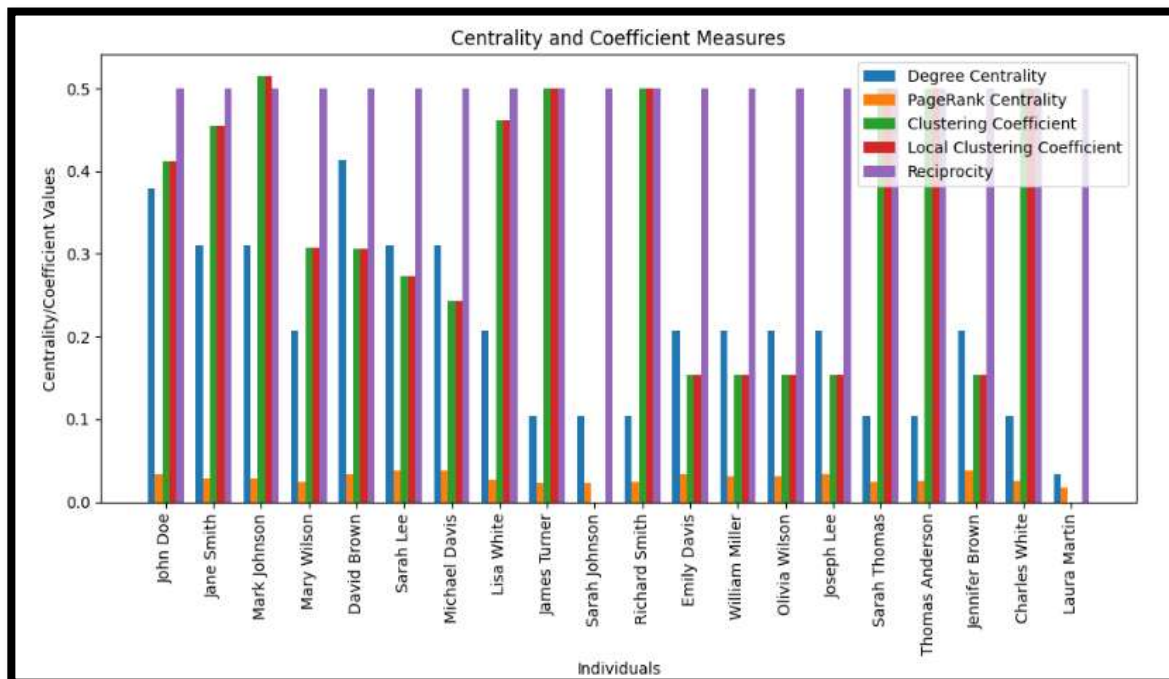


Figure 4: Network Measures of Criminal Network (b)

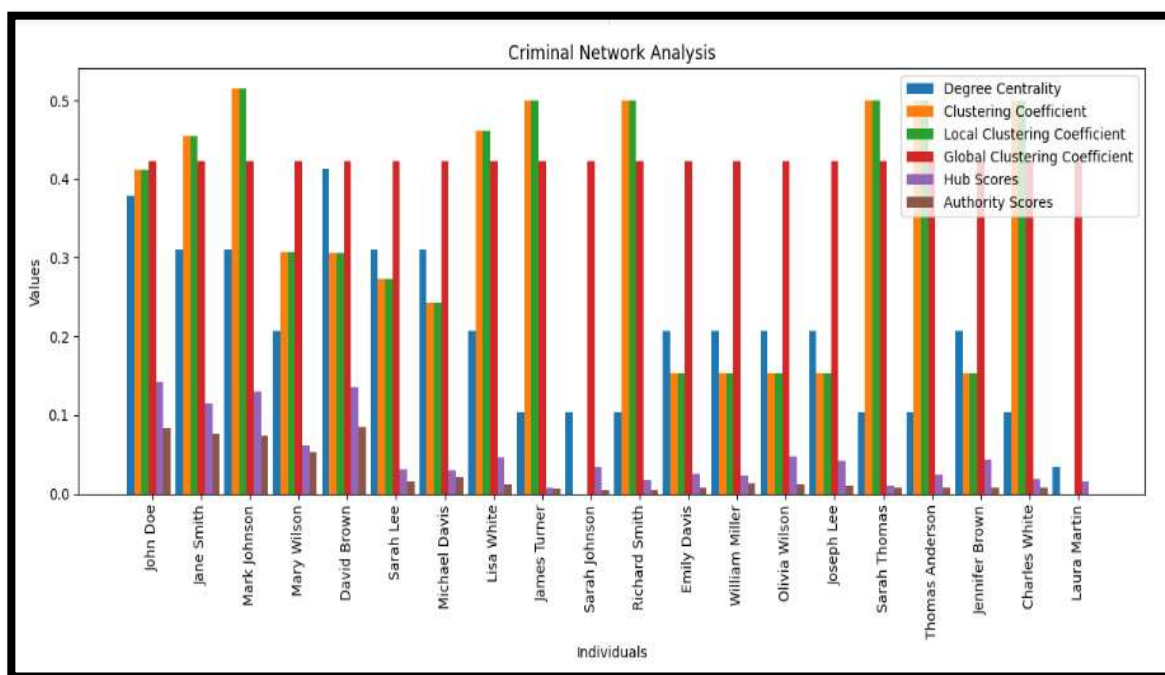


Figure 5: Network Measures of Criminal Network(c)

7. Machine Learning for Predictive Analysis:

- Features are extracted for each individual, including the number of associates.
- The dataset is split into training and testing sets. Logistic Regression, Random Forest, Decision Tree, Naive Bayes, and Support Vector Machine (SVM) models are applied to predict whether an individual is involved in money laundering.
- Model performance metrics such as accuracy, precision, recall, and F1-score are calculated and compared.

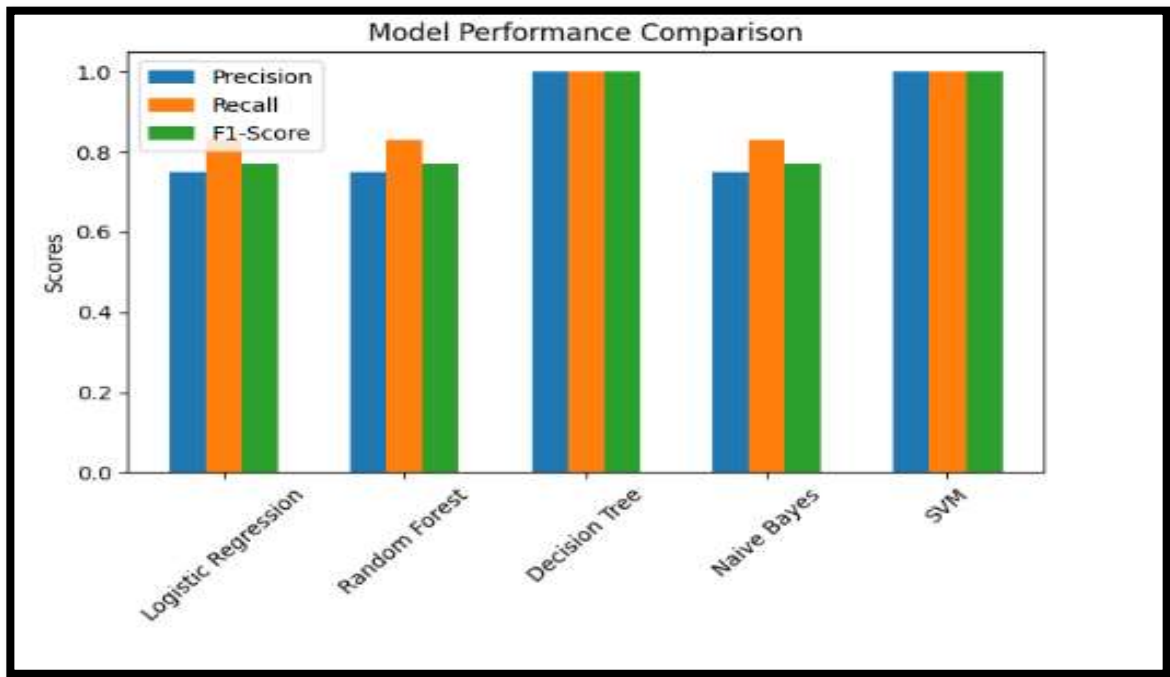


Figure 6: Results of Machine Learning Model

8. Conclusion

- The project concludes with a comprehensive report on the insights gained from the descriptive analysis, centrality measures, and predictive modeling.
- Key findings about influential individuals, network structure, and predictive accuracy are highlighted.
- Recommendations for law enforcement or relevant authorities may be provided based on the analysis.