

Outline of the Seminar Paper

Your Name

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Proposed Structure of the Paper

1. Introduction

- (a) Motivation
- (b) Definition of a Network
- (c) Mathematical Representation (Adjacency Matrix, Graph Definition)
- (d) What Can Be Done with Networks?

2. Network Summary Statistics

- (a) Basic Metrics (Number of Nodes, Edges, Density)
- (b) Degree Distribution
- (c) Centrality Measures (Degree, Edge Betweenness)

3. Similarity Measures for Community Comparison

- (a) Rand Index
- (b) Adjusted Rand Index (ARI)
- (c) Adjusted Mutual Information (AMI)
- (d) Comparison of ARI and AMI

4. Community Detection Methods

- (a) Modularity
- (b) Edge Betweenness (Girvan–Newman)
- (c) Louvain Method
- (d) Leiden Method

5. Data Description

- (a) Data Source (Bacterial and Viral Networks)
- (b) Network Structure (Nodes and Edges Interpretation)
- (c) Preprocessing Steps

6. Experimental Setup

- (a) Implementation (Python, R)
- (b) Hyperparameters (Resolution Parameter)
- (c) Evaluation Criteria (Modularity, ARI, AMI)

7. Results

- (a) Descriptive Comparison of Bac and Vir
- (b) Method Comparison
- (c) Hyperparameter Sensitivity Analysis
- (d) Interpretation of Results

8. Discussion

- (a) Strengths and Limitations
- (b) Biological Interpretation

9. Conclusion

- (a) Summary of Findings
- (b) Outlook and Future Work