A. Data and Description

a. Dataset: socfb-Auburn71 (Facebook100 Collection)
b. Source: https://networkrepository.com/socfb-Auburn71.php
c. Nodes (N): 18,448
d. Edges (M): 973918
e. Definition: Edges are Undirected and Unweighted. An edge represents a mutual "Friendship" on Facebook.
f. Foundational Measure (Full Graph):
    i. Density: 0.005724 (Sparse global network)
    ii. Average degree: 105.5852 (Very high connectivity)
    iii. Average clustering coefficient: 0.2228 (Indicates distinct social groups)
g. Measures for K=95
    i. Average degree: 155.232
    ii. Density: 0.1537
    iii. Average clustering coefficient: 0.417

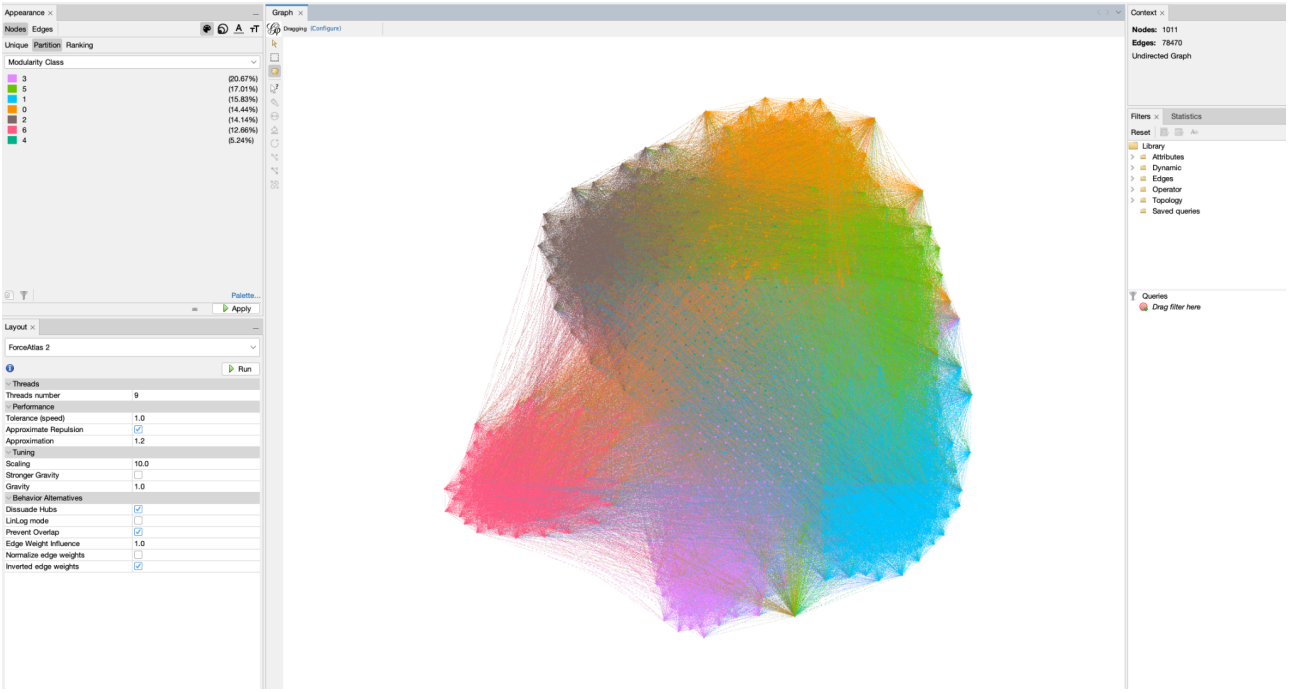

Fig 1: Graph Visualization: setting K=95

We focused our analysis on the **k=95** k-core decomposition to address the significant computational and visual challenges posed by the full socfb-Auburn71 dataset. With nearly 1 million edges and an average degree of 105, the complete network suffers from extreme density—often referred to as the 'hairball effect', which obscures distinct community boundaries and renders complex metrics like Betweenness Centrality computationally prohibitive. By filtering the network to only include nodes with at least 95 connections, we successfully isolated the social backbone of the university, reducing the graph to a manageable 1,011 high-influence actors. This approach effectively removes peripheral noise, allowing for a clearer interpretation of community

structures and more efficient simulation of spreading processes among the network's most active participants.

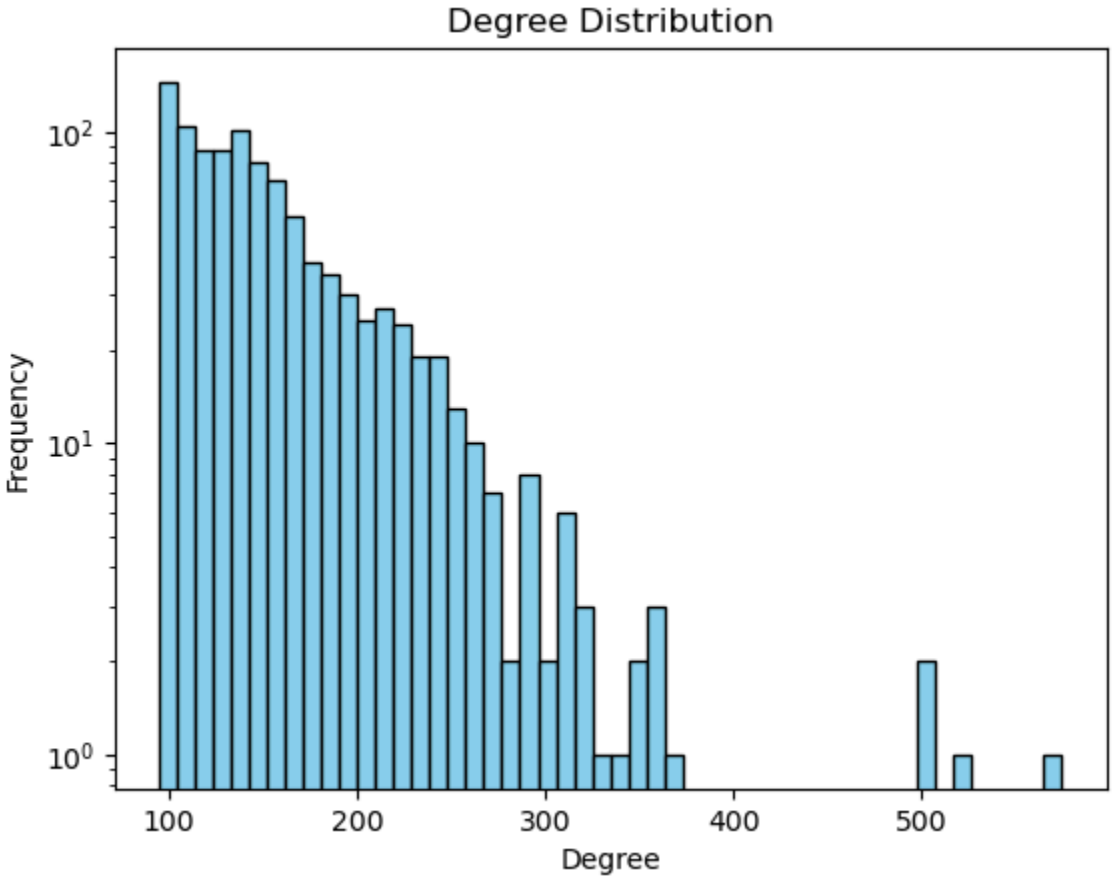

Fig 2: Degree Distribution

B. Measure of Structural Importance K=95

Top 5 Nodes by Degree	Top 5 Nodes by Betweenness	Top 5 Nodes by Eigenvector
Node **5471**: 0.5683	Node **5471**: 0.0214	Node **5471**: 0.0985
Node **10076**: 0.5119	Node **14496**: 0.0138	Node **10076**: 0.0981
Node **3211**: 0.5010	Node **3211**: 0.0113	Node **3211**: 0.0959
Node **14496**: 0.4931	Node **10076**: 0.0107	Node **14496**: 0.0886
Node **16368**: 0.3673	Node **16368**: 0.0051	Node **16368**: 0.0737

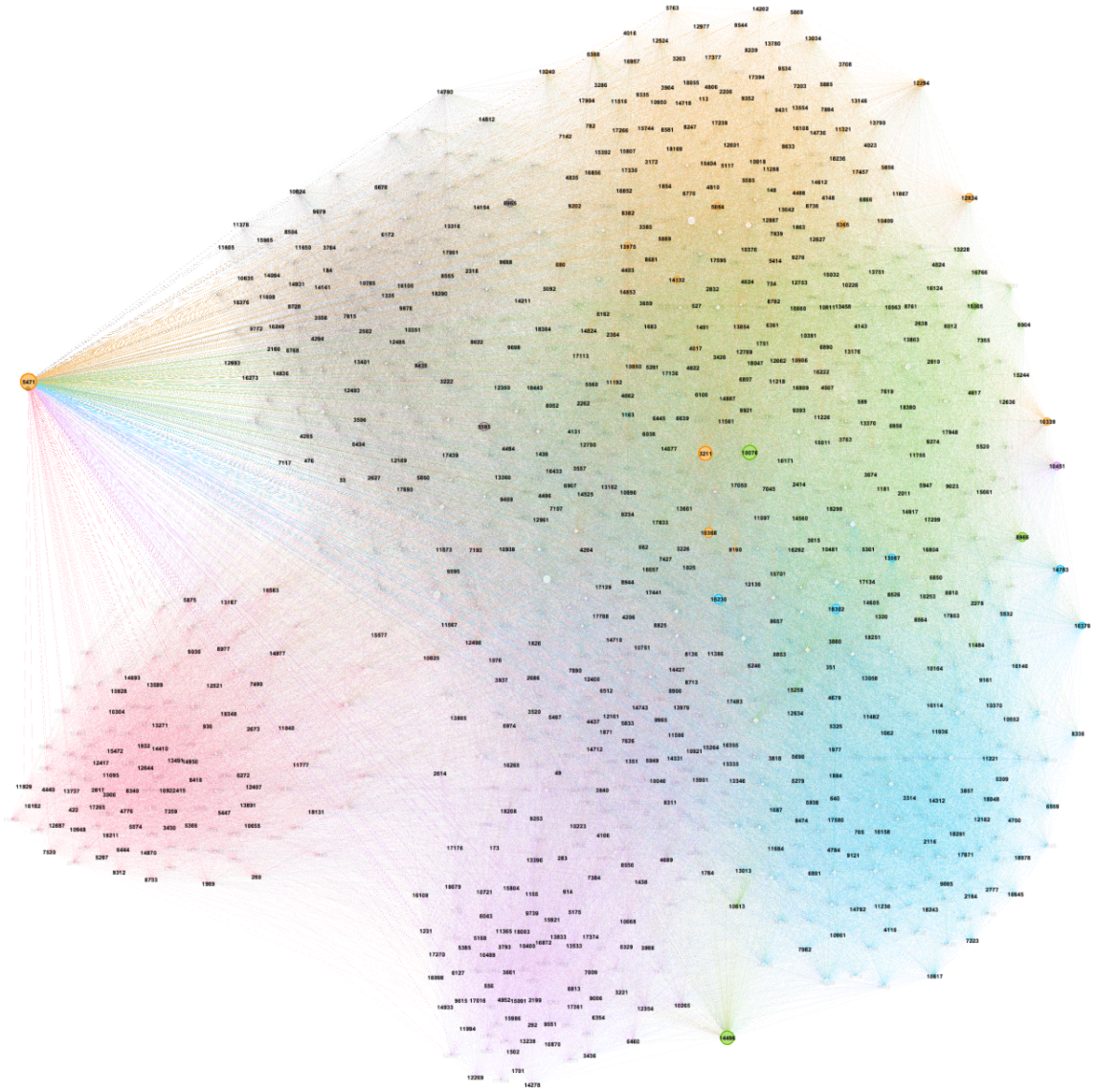

Fig 3: Node 5471 Connectivity

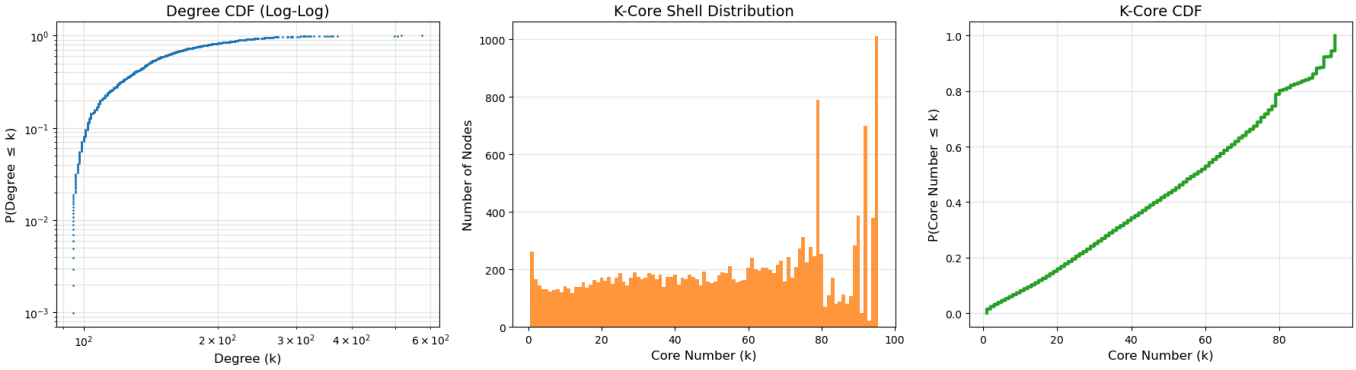

Fig 4: Degree CDF, K-Core Distribution, K-Core CDF

Reference:

1. Traud, A. L., Mucha, P. J., & Porter, M. A. (2012). Social structure of Facebook networks. Physica A: Statistical Mechanics and its Applications, 391(16), 4165-4180.
2. Bastian, M., Heymann, S., Jacomy, M. (2009). Gephi: an open source software for exploring and manipulating networks.