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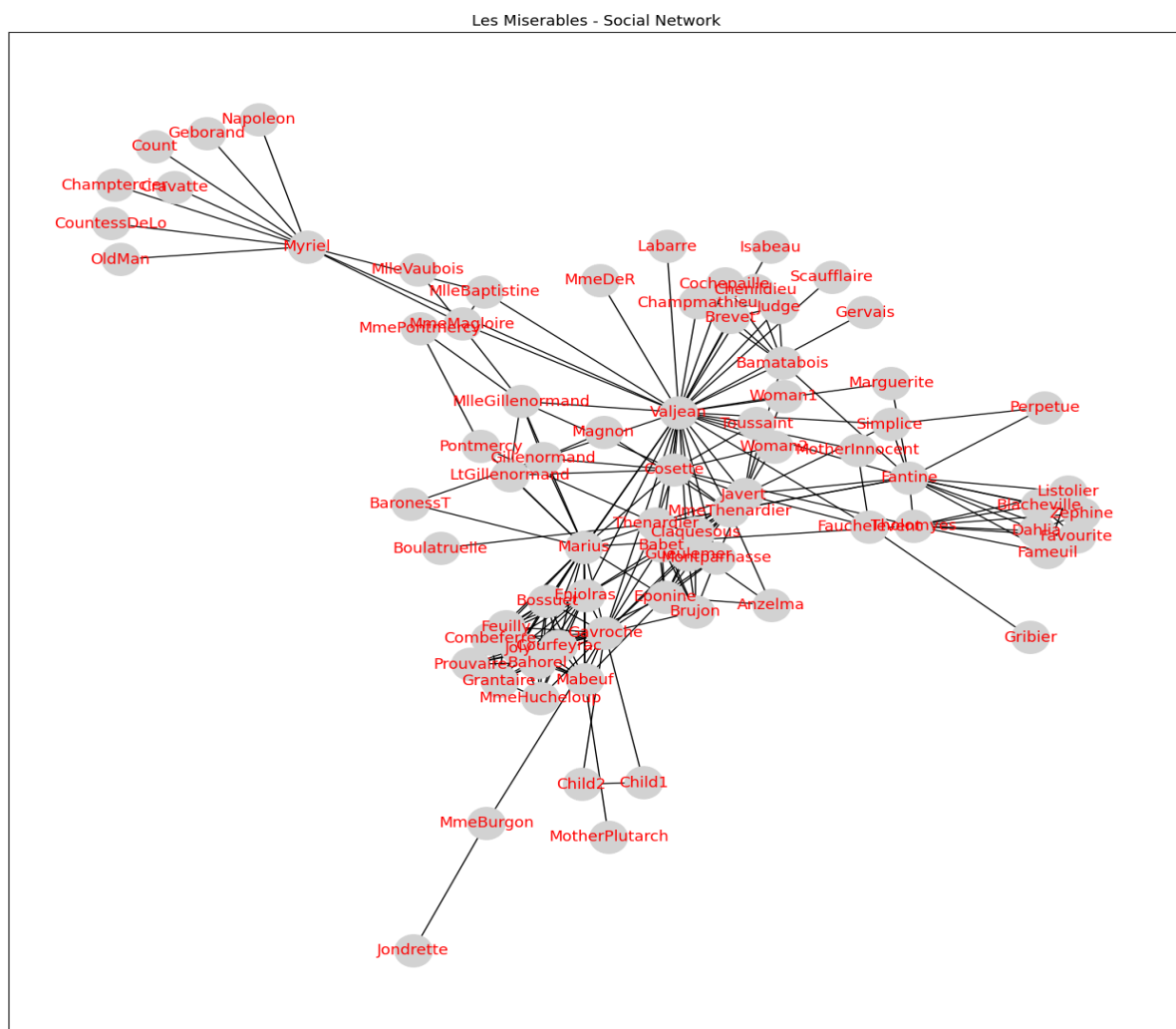
Les Misérables, a novel by Victor Hugo, follows the story of Jean Valjean, an ex-convict who seeks redemption while facing relentless pursuit by the determined Inspector Javert. Set in 19th-century France, the narrative weaves through social injustice, poverty, and the fight for freedom, especially during the Paris Uprising of 1832. Alongside Valjean's journey, the novel explores the lives of other struggling characters, depicting the transformative power of love, sacrifice, and forgiveness.

Textbook Source: Chapter 3

Social Network Analysis {40 points}

Using the provided *lesmiserables.gml* file, do the following:

1. Visualize the graph. {20 points}



2. What can you observe from the visualization? What are the THREE most interesting relationships (visually) and why? {20 points}

The social network visualization of “Les Miserables” provides key insights into the structure of character relationships, highlighting central figures, clustered communities, and peripheral connections. By mapping these interactions, the visualization helps illustrate the novel’s complex social fabric and the way different characters influence one another. The network can be analyzed in terms of centrality, clustering, and influence, offering a deeper understanding of how interactions shape the novel’s narrative, revealing both direct and indirect relationships that impact character arcs and key events.

One notable observation is the presence of highly central characters who serve as key hubs in the network. Figures such as Jean Valjean, Cosette, and Javert likely occupy the most connected positions, reflecting their prominence in the story and their frequent interactions with multiple characters. These central nodes create a dense web of relationships, reinforcing their narrative importance by acting as bridges between different groups. In contrast, minor characters appear on the periphery with fewer connections, signifying their limited influence within the plot. The visualization also reveals distinct clusters of characters, suggesting that certain groups interact more frequently among themselves. For instance, the revolutionaries, the Thenardiers, and Fantine’s acquaintances form separate sub-networks, illustrating the division of social circles within the novel. These clusters help depict the social dynamics of “Les Miserables”, with some groups remaining insular while others serve as key transition points between different parts of the story.

Three particularly interesting relationships stand out in the visualization. First, the connection between Jean Valjean and Javert is among the most significant, as their relentless pursuit and moral opposition drive much of the novel’s tension. Their direct link in the network is expected to be strong, with many indirect connections through other characters who either aid or obstruct their conflict. This central rivalry influences multiple plot developments and connects them to a broad set of interactions across different groups. Second, the relationship between Marius and Cosette is notable as it bridges two different clusters: Marius’s revolutionary associates and Cosette’s world, primarily shaped by Valjean. This connection represents the merging of love and political struggle within the novel, as Marius must navigate both his devotion to Cosette and his loyalty to the revolutionaries. Finally, the relationship between Gavroche and the revolutionaries, including Enjolras and Grantaire, highlights his role as a bridge between the lower-class struggles and the ideals of the uprising. His position in the network underscores how different social groups are interconnected through key individuals, demonstrating how even a seemingly minor character can play a crucial role in linking disparate factions within the narrative.

In conclusion, this social network analysis of “Les Miserables” reveals the novel’s intricate character relationships, emphasizing the importance of central figures, the formation of social clusters, and the crucial bridges between different groups. By examining these relationships through the lens of network analysis, we gain a clearer perspective on the novel’s social structure and the ways in which different characters contribute to its broader themes of justice, love, and revolution.

Graph Characteristics {60 points}

1. For each of the three persons identified in the previous question, provide the following metrics: {48 points}

- Degree Centrality
- Eigenvector Centrality
- PageRank
- Betweenness

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➤ Degree Centrality:
Valjean: 0.47368421052631576
Cosette: 0.14473684210526316
Javert: 0.22368421052631576

Eigenvector Centrality:
Valjean: 0.2676181759885394
Cosette: 0.11103702398134035
Javert: 0.18422516321025706

PageRank:
Valjean: 0.07543374445332475
Cosette: 0.020610995118411402
Javert: 0.03030259712717036

Betweenness:
Valjean: 0.5699890527836184
Cosette: 0.023796253454148188
Javert: 0.05433155966478436
```

2. **Based on the above metrics, do you believe the three characters you picked are indeed the most central? Is there a character you missed in the visualization that perhaps is a more central figure? If so, whom? {12 points}**

Based on the centrality metrics provided, Jean Valjean is indeed the most central character in the network, which aligns with expectations given his pivotal role in *Les Misérables*. His degree centrality (0.47) confirms that he has the most direct connections, while his betweenness centrality (0.57) indicates that he plays a crucial role in connecting different parts of the network. His PageRank score (0.075) also reinforces his importance in terms of influence within the social structure.

Javert and Cosette are also central figures, but their scores suggest they may not be the second and third most connected characters. Javert has a higher betweenness (0.054) than Cosette (0.023), indicating that he serves as more of a bridge between different groups, despite having a lower degree centrality (0.22) than Cosette (0.14). However, Cosette's PageRank (0.020) is higher than Javert's (0.003), implying she holds more overall influence in the network despite not being as structurally important for connectivity.

One possible omission from the original analysis is Marius, who is likely to be another highly central character. Given his romantic connection to Cosette and his strong involvement with the revolutionaries, Marius may score higher in degree centrality and PageRank than Cosette or Javert. Additionally, characters like Enjolras (leader of the revolutionaries) or Thenardier (who interacts with multiple groups) might also have higher-than-expected centrality metrics.