**Network Analysis Report: Yeast Detection Dataset**

**1. Introduction**

This report details the steps and findings from analyzing the yeast detection dataset using Gephi. The dataset was visualized using the ForceAtlas2 layout, with various enhancements and statistical analyses conducted to understand the network's structure and properties.

**2. Data Import and Initial Layout**

* **Dataset:** Yeast Detection Dataset
* **Tool Used:** Gephi
* **Layout Applied:** ForceAtlas2

The yeast detection dataset was imported into Gephi, and the ForceAtlas2 layout was applied to position the nodes and edges in a manner that reveals the underlying structure of the network.

**3. Visual Enhancements**

**Node Color Settings:**

* Nodes were colored based on their degree, with a gradient from light to dark representing low to high degree nodes. This helps in visually distinguishing nodes with different connectivity levels.

**Edge Appearance:**

* Edge thickness and color were adjusted to represent the weight of the connections between nodes. Thicker and darker edges indicate stronger connections.

**4. Filtering**

**In-Degree Range Filter:**

* Applied a filter to show nodes with in-degree ranging from 1 to 33. This range was chosen to focus on nodes with a moderate level of connectivity.

**Giant Component Filter:**

* Applied a giant component filter to isolate and analyze the largest connected component of the network. This helps in focusing on the most significant part of the network.

**5. Annotations and Legends**

**Text Annotations:**

* Added annotations to highlight key nodes and clusters within the network. These annotations help in understanding the significance of specific areas of the network.

**Legends:**

* Legends were added to explain the color coding and size distribution of the nodes, as well as the thickness and color of the edges.

**6. Statistical Analysis**

**Size Distribution:**

* Conducted a size distribution analysis to understand the distribution of node sizes within the network. This analysis helps in identifying the prevalence of nodes with different degrees.

**Weighted Degree Report:**

* Generated a weighted degree report to analyze the strength of connections for each node. This metric provides insights into the overall connectivity and influence of nodes within the network.

**7. Results and Findings**

**Degree Distribution:**

* The degree distribution analysis revealed a range of node degrees, with most nodes having a low degree and a few nodes having a high degree, indicating a scale-free network structure.

**Clustering Coefficient:**

* The clustering coefficient analysis showed a tendency for nodes to form tightly knit groups, which is characteristic of many real-world networks.

**Betweenness Centrality:**

* The betweenness centrality analysis highlighted key nodes that act as bridges within the network, facilitating communication between different parts of the network.

**Modularity:**

* The modularity analysis identified several communities within the network, indicating the presence of distinct groups of nodes with higher internal connectivity.

**8. Conclusion**

The analysis of the yeast detection dataset using Gephi provided valuable insights into the structure and properties of the network. The application of the ForceAtlas2 layout, visual enhancements, and statistical analyses helped in understanding the connectivity, clustering, and community structure within the network. The findings from this analysis can be used to further investigate the biological significance of the detected communities and key nodes in the yeast detection dataset.

**Figures and Tables**

