**Assignment 3**

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**Assignment:** Critical analysis task  
**Notebook:** directors-network.ipynb  
**Due Date:** June 8, 2025  
**Task 1: Centrality Extension**

**Modification:**

* Added **Betweenness Centrality** to complement Degree and Eigenvector Centrality.

**Rationale:**

* Betweenness centrality helps identify directors who serve as bridges across companies, potentially facilitating acquisitions through unique indirect influence.

**Analytical Decision:**

* Selected because it complements existing centralities by capturing strategic “broker” positions in the network.

**Task 2: Code Repair**

**Fix 1: Chained Assignment Warning**

* **Issue:** Used chained. fillna(..., inplace=True), triggering a FutureWarning.
* **Fix:** Replaced with df[col] = df[col].fillna(...) to comply with future pandas behavior.

**Fix 2: Centrality Calculation Clarity**

* **Issue:** Centrality values were stored as [0] from a tuple, obscuring meaning.
* **Fix:** Used clearer dictionary unpacking and variable names.

**Fix 3: Graph Construction Roles**

* **Issue:** Company vs. person nodes were not clearly differentiated.
* **Fix:** Added role labels and markdown to explain the bipartite graph structure.

**Fix 4: Documentation and Structure**

* **Issue:** The code lacked readability and inline documentation.
* **Fix:** Added markdown headers and comments throughout for better interpretability.

**Rationale:**

* These changes improve maintainability, correctness, and communication of the analytical process essential for team-based data science work.

**Task 3: Exploring Existing Data**

**Feature Explored:** gender

**Insight:**

* Highlighted the presence of gender as a potential factor in board influence and diversity, even though it was not used in centrality analysis.

**Task 4: Complementary Dataset**

**Dataset Suggested:** Company financial data (e.g., Yahoo Finance, 10-K reports)

**Rationale:**

* Integrating financial indicators like revenue or market cap could identify which companies are more likely to be buyers in a potential acquisition.

**Usage Plan:**

* Compare director centrality with financial strength of the companies they serve to prioritize acquisition targets.

**Task 5: Refinement Options**

**(a) Improved Visualizations**

* Enhanced network diagrams and degree distributions using better layouts and labels.
* Added explanatory captions suitable for a non-technical VC stakeholder audience.

**(c) Ethical Considerations**

* Explored implications of using director networks to guide business strategy.
* Discussed fairness, over-reliance on algorithmic influence metrics, and potential bias in network-derived recommendations.

**Use of Generative AI**

**Tools Used:** ChatGPT (OpenAI)  
**Purpose:** Code review and refactoring guidance