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Programming Humanity

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IPHS Mini-Project #3: A Network Analysis of Shakespeare's *Julius Caesar*

Note: When citing page numbers, I am citing my network analysis report that is part of my submission.

A network analysis of *Julius Caesar* allows the structural logic of Shakespeare's political world to emerge with unusual clarity. The co-presence and directed dialogue networks, taken together, reveal that Shakespeare's tragedy is not grounded merely in individual decisions, rather it is built upon a series of complex interwoven dynamics . Through this approach, the play's central characters, Brutus, Cassius, and Antony, assume new analytical shapes, while seemingly minor or silent figures gain importance through the frequency of their appearances. The visualizations consistently demonstrate that power in *Julius Caesar* is distributed unevenly across bodies, voices, and positions within the network.

The co-presence network lays the foundation for this understanding. The visualization of community structure on page 2 of the report displays two distinct clusters that correspond directly to the play's political factions, the conspirators on one side, and Caesar's circle, including Antony and the Roman populace, on the other. This clear bifurcation answers one of the fundamental modeling questions: the play does exhibit distinct social groups, separated not by chance but by ideological alignment and narrative function. Shakespeare reinforces this division through staging. Tight conspiratorial scenes contrast with the wide ceremonial and

public moments that surround Caesar. The network simply renders visible the political architecture already implicit in the dramaturgy.

The filtered core-relationship visualization on page 3 provides a closer look at the densest and most significant connections in the co-presence network, showing that Brutus and Cassius form the tightest hub, with Antony positioned near both clusters and functioning as a hinge between Rome's political elite and its volatile public. This refined structure shows that, although the conspirators appear as a unified bloc, the conspiracy effectively orbits around Brutus. Visually, Cassius's ties radiate outward but consistently return to Brutus, which encodes the relationship Shakespeare dramatizes. Cassius is the architect, but Brutus gives the conspiracy legitimacy.

The betweenness centrality graph on page 4 reinforces this interpretation by positioning Brutus at the structural center of the network, with Cassius close behind and Antony rising substantially in importance immediately after Caesar's death. Betweenness centrality answers one of the key analytical prompts: identifying a character with high betweenness but lower degree. Cassius exemplifies this pattern. He does not appear in as many scenes as Brutus and does not speak as widely as Antony, but he serves as the network's connective tissue. His betweenness score reflects his role as the bridge figure who links characters who might otherwise remain in separate clusters. This is an analytical confirmation of Cassius's dramatic identity as the strategist who binds disparate actors into a single revolutionary force.

The weighted-degree visualization on page 5 highlights Brutus as the character who appears in the most scenes and appears in them with high frequency and importance, repeatedly sharing the stage with characters who themselves are significant nodes within the network. Weighted degree reveals that Brutus is central in both breadth and density. The weight of his

shared scenes is greater than any other character. Shakespeare constructs his tragedy around Brutus's moral, political, and social centrality, and the network captures this fact with mathematical clarity.

When we shift from presence to speech, the directed dialogue network exposes a different anatomy of power. The directed dialogue visualization on page 6 demonstrates that speech is hierarchically distributed, with arrows radiating outward from Brutus and Antony more than from any other figures, and with Cassius directing a disproportionate amount of rhetorical effort toward Brutus specifically. This visual confirms that the conspiracy itself is not egalitarian. Cassius persuades, and Brutus legitimizes. Caesar's position is strikingly asymmetrical. Many arrows point toward him, but few of great weight originate from him. He is spoken to far more than he speaks. This asymmetry captures his dramatic condition. Elevated, inaccessible, and already slipping into symbolic status, he becomes an emblem of political anxiety rather than a participatory protagonist.

The in-degree versus out-degree comparison on page 7 sharpens these observations by revealing who speaks more than they are spoken to and vice versa. Antony's high out-degree but modest in-degree reflects his rhetorical dominance. He addresses the crowd at length, but receives little directed speech in return. Cassius has a more balanced but constrained communicative reach, since much of his speech is focused on persuading Brutus rather than addressing a broader public. Brutus occupies a middle path. He receives appeals from others but responds with deliberative authority, shaping the ethical and political direction of the conspiracy.

Eigenvector centrality provides the most nuanced layer of analysis within the dialogue network. Eigenvector centrality measures influence based not on how often a character speaks, but on how important their interlocutors are within the system. In this dimension, Antony

appears surprisingly dominant. Although he speaks to fewer individuals overall than Brutus, he directs his most transformative words to the Roman crowd, a group whose reactions reverberate broadly through the rest of the play. Because the crowd connects outward into many other narrative events, Antony's eigenvector centrality increases. Brutus also holds a high eigenvector score, due to his communication with high-status characters such as Cassius, Caesar, Portia, and the military leaders, whose structural importance amplifies his own. Cassius, who speaks frequently but mainly to individuals whose communicative distribution is narrower, scores lower in this measure. Through eigenvector centrality, we notice the distinct forms of political power exhibited by these three main characters.

The final and most integrative visualization is the Physical Presence versus Verbal Communication scatterplot on page 8, which aligns the two networks and situates each character according to their total co-presence strength and total directed dialogue degree. Brutus occupies the extreme upper right quadrant, the apex of both presence and speech. Cassius is located high in presence but somewhat lower in speech, reflecting his structural importance but limited rhetorical range. Antony appears high in speech but not particularly high in presence, which reflects his concentrated rhetorical power rather than continuous participation. The silent witnesses cluster low in speech but high in presence, illustrating that Shakespeare uses these figures to embody political weight without granting them rhetorical agency. This visualization answers one of the assignment's core interpretive questions. It identifies characters who are more central in co-presence than in dialogue, and vice versa, and it explains how these differences support Shakespeare's dramatic purposes.

Together, these visualizations and measures answer the full set of Session 1 and Session 2 questions. They confirm the identity of the most central characters, validate predictions about

clusters and bridge figures, explain asymmetries in speaking and listening, interpret characters whose centrality diverges across networks, evaluate outliers in betweenness and eigenvector metrics, and highlight the phenomenon of silent presences. Dialogue extraction required careful verification, since misclassifying soliloquies or group addresses would distort the structural measures. The completed network, although powerful, contains limitations. It cannot measure tone, emotional inflection, or rhetorical success. It cannot reflect the temporal evolution of influence across acts, which is why Brutus's growing isolation and Antony's increasing dominance remain partially obscured. Nor can the networks represent symbolic presence, as in Caesar's case, where his influence expands significantly after his death.

Despite these constraints, network analysis enriches the reading of *Julius Caesar* by clarifying the structural forces that shape Rome's political collapse. Brutus's dual centrality in presence and speech marks him as the moral and narrative center of the play. Cassius's high betweenness but lower eigenvector status reveals him as the architect of a fragile coalition. Antony's concentrated rhetorical dominance, captured by his high eigenvector centrality, demonstrates how Shakespeare imagines political transformation as emerging through amplification rather than through steady accumulation of interactions. Rome's downfall is inscribed in the misalignment between those who hold structural importance and those who command rhetorical influence. Brutus stands at the center of Rome's social world but loses control of its narrative. Cassius binds the factions together but cannot shape their moral trajectory. Antony appears infrequently but reshapes the meaning of everything he touches. These tensions make tragedy inevitable, and the networks, while limited, illuminate the underlying structural logic of that inevitability.