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Past-aware game-theoretic centrality in complex contagion

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We introduce past-aware game-theoretic centrality, a class of centrality measures that captures the collaborative contribution of nodes in a network, accounting for both uncertain and certain collaborators. A general framework for computing standard game-theoretic centrality is extended to the past-aware case. As an application, we develop a new heuristic for different versions of the influence maximization problem in complex contagion, which models processes requiring reinforcement from multiple neighbors to spread. A computationally efficient explicit formula for the corresponding past-aware centrality score is derived, leading to scalable algorithms for identifying the most influential nodes, which in most cases outperform the standard greedy approach in both efficiency and solution quality.

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