Social Media Virality and the Diffusion of Innovation: A Network-Econometric Approach

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***Abstract*—The rapid expansion of social media platforms has fundamentally transformed the mechanisms through which innovations diffuse across populations. Virality, once considered a stochastic outcome of exposure, has evolved into a structurally mediated, network-driven phenomenon shaped by social interactions and platform algorithms. This study examines social media virality through the theoretical lens of diffusion of innovation, employing a network-econometric framework to capture both individual adoption behavior and systemic propagation effects. By integrating network analysis with econometric modeling, the paper accounts for peer effects, endogenous network formation, and algorithmic amplification mechanisms that influence diffusion dynamics. Social media networks are conceptualized as weighted and dynamic graphs, enabling the analysis of how network characteristics—such as centrality, clustering, and homophily—affect adoption thresholds and diffusion speed. The proposed framework addresses key identification challenges in social interaction models, including simultaneity and correlated unobservables, through structural modeling and instrumental variable strategies. This research contributes to the literature by linking micro-level decision-making to macro-level diffusion patterns and offers implications for innovation strategy, digital platform governance, and causal inference in networked environments.**

The diffusion of innovation has long been a foundational topic in economics, sociology, and management research, traditionally understood as a gradual process driven by information transmission, social influence, and heterogeneous adoption thresholds [1]. Early diffusion models were developed in contexts characterized by relatively stable social networks and limited communication technologies. In contrast, contemporary social media platforms have introduced densely connected, rapidly evolving networks that enable information and behaviors to spread at unprecedented speed and scale [7]. As a result, innovation diffusion in digital environments increasingly reflects complex interactions among network structure, individual decision-making, and algorithmic mediation.

Social media virality exemplifies this transformation. Unlike traditional word-of-mouth diffusion, virality is amplified by platform architectures that prioritize engagement, visibility, and recursive feedback mechanisms [8]. Innovations may experience rapid and disproportionate adoption not solely due to intrinsic quality, but because of structural advantages such as network centrality, influencer endorsement, or algorithmic ranking systems. These dynamics produce nonlinear diffusion patterns, path

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