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What Will Be Popular Next? Predicting Hotspots in Two-Mode Social Networks

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Abstract

In social networks, social foci are physical or virtual entities around which social individuals organize joint activities, for example, places and products (physical form) or opinions and services (virtual form). Forecasting which social foci will diffuse to more social individuals is important for managerial functions such as marketing and public management operations. Considering diffusive social adoptions, prior studies on user adoptive behavior in social networks have focused on single-item adoption in homogeneous networks. We advance this body of research by modeling scenarios with multi-item adoption and learning the relative propagation of social foci in concurrent social diffusions for online social networking platforms. To be specific, we distinguish two types of social nodes in our two-mode social network model: social foci and social actors. Based on social network theories, we identify and operationalize factors that drive social adoption within the two-mode social network. We also capture the interdependencies between social actors and social foci using a bilateral recursive process, specifically, a mutual reinforcement process that converges to an analytical form. Thus, we develop a gradient learning method based on mutual reinforcement process (GLMR) that targets the optimal parameter configuration for pairwise ranking of social diffusions. Further, we demonstrate analytical properties of the proposed method such as guaranteed convergence and the convergence rate. In the evaluation, we benchmark the proposed method against prevalent methods, and we demonstrate its superior performance using three real-world data sets that cover adoption of both physical and virtual entities in online social networking platforms.