

## **Finding Saddles in Innovation Adoption Curves: An HPC-Supported Simulation-Optimization Approach**

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Models of innovation diffusion typically assume a single-peaked, bell-shaped adoption curve. As empirical studies indicate that this curve in several real-world instances features two peaks, forming a saddle, we strive to better understand which market characteristics further the emergence of this pattern. Such insight is of managerial relevance, for example, when planning the market introduction of new products or services.

Procedurally, we developed an agent-based simulation building on the well-established Bass model and chasm theory. In our approach, agents are embedded in a homophily-driven social network and they have individual traits regarding their innovativeness and their susceptibility to social influence. Then, we ran extensive simulation experiments combined with Bayesian optimization to explore a high-dimensional parameter space to identify market structures that generate saddle curves, and to analyze how agents' traits, the level of heterogeneity in the population, and certain network settings shape the diffusion process and the resulting adoption curve. To this end, we used the HPC cluster at the Paderborn Center for Parallel Computing (PC2).

In our contribution to the NHR Conference '26, we describe our research setting and show intermediate results.