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A two-layer model for opinion spread in hypergraphs as a Markov chain and as the object of machine learning methods

In studies of opinion spread, peer pressure is often modeled through interactions of more than two individuals (higher-order interactions). We introduce a two-layer random hypergraph model, in which households and workplaces form the layers and hyperedges represent individual households and workplaces. Within this structure, individuals may react when their opinion is in the minority within their groups. The process evolves through stochastic steps: individuals can either change their opinion, or quit their workplace and join another one in which their opinion belongs to the majority. The model can be considered as a Markov chain, and its absorbing states are investigated. The effects of the parameters governing opinion change and workplace switching are described via computer simulations. The performance of different statistical and machine learning methods —namely linear regression, XGBoost, convolutional neural network and LSTM - in estimating these parameters is investigated. It turns out that in most of the cases, especially for shorter observation periods LSTM is the best, while in many cases XGBoost is also a strong contender. It is also an important observation that the information required for accurate estimation depends on the strength of the peer pressure effect.

Special/ Invited session

Classification

Mainly application

Keywords

hypergraph, opinion spread, parameter estimation

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