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Authors

Dong, Yulin

Wang, Xiyuan

Jiang, Yaomin

et al.

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Optimal mental representation of social networks explains biases in social learning and perception

Yulin Dong

Peking University, Beijing, China

Xiyuan Wang

Peking University, Beijing, China

Yaomin Jiang

Max Planck Institute for Human Development, Berlin, Germany

Muhan Zhang

Peking University, Beijing, China

Lusha Zhu

Peking University, Beijing, China

Abstract

Humans are often involved in complex social relationships, where they exhibit biased behavior when they process information from neighbors (e.g., irrational DeGroot learning) and cognitive biases on perceiving social network structures (e.g., egocentric biases, network centrality, etc.). But little is known about the cognitive reason behind. Here we propose a unified computational framework (reduced representation model, RRM) to deal with the problems, which assumes people represent an optimal reduced network based on the trade-off of utility and cognitive cost for the representation, and make rational inference on it, where DeGroot-like behavior emerges. We did simulations to show RRM can provide an underlying explanation for DeGroot model and human perceptual biases, and tested model predictions in previous dataset (n=209), lab experiment (n=248) and field data. Our work provides an optimal way to depict social network representation when considering human cognitive limitations, and may help understand widespread human biases in social environments.