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Personalized Modeling of High-dimensional Data through Tensorized Multi-Task Learning

In the realm of machine learning, effective modeling of heterogeneous subpopulations presents a significant challenge due to variations in individual characteristics and behaviors. This paper proposes a novel approach for addressing this issue through Multi-Task Learning (MTL) and low-rank decomposition techniques. Our MTL approach aims to enhance personalized modeling by leveraging shared structures among similar tasks while accounting for distinct subpopulation-specific variations. We introduce a framework where low-rank decomposition is used to decompose the task model parameters into a low-rank structure that captures commonalities and variations across tasks and subpopulations. This approach allows for efficient learning of personalized models by sharing knowledge between similar tasks while preserving the unique characteristics of each subpopulation. Experimental results on simulation and two case studies from healthcare domain demonstrate the superior performance of the proposed method compared to several benchmarks. The proposed framework not only improves prediction accuracy but also enhances interpretability by revealing underlying patterns that contribute to the personalization of models.

Special/ Invited session

Classification

Mainly methodology

Keywords

Low-rank decomposition, personalization, multi-task learning

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