上海交通大学自动化系
Department of Automation
Shanghai Jiao Tong University

系统控制与信息处理教育部重点实验室
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Multi-marginal graph-structure optimal transport: Modeling, applications, and computational methods

Ass.prof. Axel Ringh
Chalmers University of Technology
University of Gothenburg

摘要:

Optimal transport has seen rapid development over the last decades, and recently there has been a surge of research related to computational methods for numerically solving the problem. The most well-known algorithm is the Sinkhorn algorithm, in which the transport plan is iteratively updated so that its projections match the given marginals.

In this talk I will consider a generalization of optimal transport, namely multi-marginal optimal transport. In particular, I will introduce graph-structured multi-marginal optimal transport and show that this type of structured problems can be used to model and solve a variety of different problems. This includes, e.g., barycenter problems, and displacement interpolation problems. Moreover, while the Sinkhorn algorithm extends to the multi-marginal setting, it only partially alleviates the computational difficulty for the multi-marginal problem. This is because computing the corresponding projections needed in the algorithm still scales exponentially in the number of marginals. However, in this talk I will present how these projections can be efficiently computed when the underlying graph structure is a trees, as well as for some other simple graph structures. Finally, I will also show how the methods can be extended to handle a type of graph-structured tensor optimization problems. This generalization makes it possible to solve, e.g., unbalanced multi-marginal optimal transport problems, and multi-species density control problems.

简介:

Axel Ringh received the M.Sc. degree in Engineering Physics in 2014, and the Ph.D. degree in Applied and Computational Mathematics in 2019, both from KTH Royal Institute of Technology. From 2019 to 2021 he was a postdoctoral researcher with the Department of Electronic and Computer Engineering, the Hong Kong University of Science and Technology, and since 2021 he is an assistant professor at the Department of Mathematical Sciences, Chalmers University of Technology and University of Gothenburg. His research interests are within field of applied mathematics, more specifically in the intersection of areas such as optimization, systems theory, signal processing, inverse problems, and machine learning.