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A scaling algorithm for unbalanced optimal transport

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There is a common structure to most optimization problems related to optimal transport: a nonnegativity constraint, a linear transport cost and convex functions acting on the marginals of the plan. For solving the entropic regularization of these problems, we introduce a generic Scaling Algorithm which is a direct generalization of Sinkhorn's algorithm. This algorithm is shown to converge in finite dimension if the dual problem is well-posed. Moreover, it has a linear convergence rate in infinite dimension in the important particular case of computing the Wasserstein-Fisher-Rao metric. We also describe a stabilization scheme to avoid numerical issues for small regularization parameters. Finally, we review applications to optimal transport, barycenters and gradient flows in their unbalanced version, i.e. with relaxed marginal constraints.

This is joint work with Gabriel Peyré, Bernhard Schmitzer and François-Xavier Vialard.

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