

MA4198 PROJECT PROPOSAL (PROJECT CUM SEMINAR GROUP)

SUPERVISOR'S INFO

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PROJECT ID: PS2520-09

TITLE

Algorithms for variants of discrete optimal transport problems

BRIEF DESCRIPTION OF PROJECT

Optimal Transport (OT) is a mathematical model at the interface between probability and optimization. The goal of the model is to define a metric that is useful to compare two probability distributions, which for example, can represent the shapes of two different objects. In the discrete setting, a discrete OT model is a linear programming (LP) problem that aims to find the optimal joint distribution (represented as a nonnegative $m \times n$ matrix X) subject to the linear constraints that its marginal distributions (sum of the m rows of X and sum of the n columns of X) are equal to the two given probability distributions. Due to the potentially large size of the LP, instead of the usual simplex method to solve the LP, extremely efficient methods based on the Sinkhorn algorithm have been developed for solving these LP problems. This project will introduce algorithms for solving variants of the discrete optimal transport problems, as well as explore the practical applications of these models.

EXPECTATION/S

The students are expected to learn and understand algorithms for various variants of optimal transport problems. They are expected to implement the algorithms and apply the algorithms to appropriate application problems. The students are expected to explore ways on how to improve the efficiency of the algorithms, as well as finding appropriate application problems where optimal transport models are used.

PREREQUISITE/S (at level 3000 or below, with at most one course at level 3000)

CS1010; MA2213 or DSA2102; MA3236 or DSA3102

READING REFERENCE/S

Computational Optimal Transport: <https://optimaltransport.github.io/pdf/ComputationalOT.pdf>