



THE UNIVERSITY OF  
CHICAGO

COMPUTATIONAL AND APPLIED MATHEMATICS COLLOQUIUM

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**Efficient Classification of Distributions via Optimal  
Transport Embeddings**

THURSDAY, May 6, 2021 at 4:15pm (Central)

Via ZOOM

Detecting differences and building classifiers between distributions, given only finite samples, is an important task in data science applications. Optimal transport (OT) has evolved as the most natural concept to measure the distance between distributions, and has gained significant importance in machine learning in recent years. There are some drawbacks to OT: Computing OT is usually slow, and it often fails to exploit reduced complexity in case the family of distributions is generated by simple group actions.

In this talk, we discuss how optimal transport embeddings can be used to deal with these issues, both on a theoretical and a computational level. In particular, we'll show how to embed the space of distributions into an  $L^2$ -space via OT, and how linear techniques can be used to classify families of distributions generated by simple group actions in any dimension. We'll also show conditions under which the  $L^2$  distance in the embedding space between two distributions in arbitrary dimension is nearly isometric to Wasserstein-2 distance between those distributions. This is of significant computational benefit, as one must only solve  $N$  optimal transport problems to define the  $N^2$  pairwise distances between  $N$  distributions. We'll present some applications in image classification and supervised learning.

This is joint work with Alex Cloninger.

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**Organizer:**

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