THE UNIVERSITY OF CHICAGO | THE COMMITTEE ON COMPUTATIONAL AND APPLIED MATHEMATICS

Computational and Applied Mathematics Colloquium

MATHIAS OSTER

Institute für Geometrie und Praktische Mathematik
at the RWTH Aachen

On Semi-global Optimal Control and its Application to Machine Learning

THURSDAY, October 12, 2023, at 4:00PM
Jones 303, 5747 S. Ellis Ave. Chicago, IL 60637

ABSTRACT

We seek to learn a function by deep neural networks. An abstract optimal control problem with measure-valued controls provides an interesting mathematical framework to analyse the expressivity and optimization of such networks from a continuous point of view. This control problem can be seen as an infinite deep neural network where the last layer is of a special form. We exploit the ideas of Barron spaces as continuous interpretation of infinite wide shallow networks and neural ODEs as infinite deep residual network architectures.

We show the existence of minimizers to the optimal control problem by using Prokhorov's theorem on tight measures and some regularity assumptions on the activation function.

Secondly, we analyse corresponding gradient flows in the space of probability measures endowed with the Wasserstein metric.

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