THE UNIVERSITY OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

Numerical Analysis Seminar

Geometry of Polynomial Neural Networks

Miss Jiayi LI
University of California, Los Angeles, USA

Abstract

Polynomial neural networks achieved remarkable performance in practical tasks such as face detection, image generation, and forecasting trading signals. Besides its empirical success, the underlying theory remains an open field of research. We study the expressivity and the learning process of polynomial neural networks from an algebraic perspective. The functional space parameterized by the weights of a network is a semi-algebraic set. We refer to the functional space as the neuromanifold, and its Zariski closure as the neurovariety. We studied the dimension, defectiveness, and the learning degree of different network architectures, providing a theoretical understanding of the expressivity and optimization complexity of these architectures. Our results are accompanied by experiments. This is joint work with Kaie Kubjas and Maximilian Wiesmann.

Date:	April 30, 2024 (Tuesday)
Time:	4:00 pm – 5:00 pm
Venue:	Room 210, Run Run Shaw Building HKU

All are welcome