THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS
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The Hong Kong Polytechnic University
Department of Applied Mathematics

Colloquium

Level Set Learning with Pseudo-Reversible Neural Networks for Nonlinear Dimension Reduction in Function Approximation

By

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Abstract

Inspired by the Nonlinear Level set Learning (NLL) method that uses the reversible residual network (RevNet), we propose a new method of Dimension Reduction via Learning Level Sets (DRiLLS) for function approximation. Our method contains two major components: one is the pseudo-reversible neural network (PRNN) module that effectively transforms high-dimensional input variables to low-dimensional active variables, and the other is the synthesized regression module for approximating function values based on the transformed data in the low-dimensional space. The PRNN not only relaxes the invertibility constraint of the nonlinear transformation present in the NLL method due to the use of RevNet, but also adaptively weights the influence of each sample and controls the sensitivity of the function to the learned active variables. The synthesized regression uses Euclidean distance in the input space to select neighboring samples, whose projections on the space of active variables are used to perform local least-squares polynomial fitting. This helps to resolve numerical oscillation issues present in traditional local and global regressions. Extensive experimental results demonstrate that our DRiLLS method outperforms both the NLL and Active Subspace methods, especially when the target function possesses critical points in the interior of its input domain.

Date: 1 June 2022 (Wednesday)
Time: 10:00-11:00 (Hong Kong Standard Time GMT +8)
Venue: Online Talk via Zoom (Meeting ID: 926 7956 1149)
Speaker: Prof. Lili Ju, University of South Carolina
Host: Prof. Zhonghua Qiao, The Hong Kong Polytechnic University
Click to join:
https://polyu.zoom.us/j/92679561149?pwd=RkVvcUZ0OFBlVWZNeVFsczJhZ29YZz09

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