Gengzhi Yang

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Education

Fudan University, China Sep 2019 - Jun 2023(Expected)
B.S. in Mathematics and Applied Mathematics

GPA: 3.61/4.0 (*Last Semester:* 3.92/4.0)
Related Courses: *Mathematical Analysis, Real Analysis, Functional Analysis, Linear Algebra, Ordinary Differential Equations, Partial Differential Equations, Numerical Linear Algebra, Numerical Methods to Differential Equations, Optimization, Probability Theory, Numerical Statistics Methods, Approximation Theory, Numerical Methods to Integral Equations, Biological Mathematics.*

Papers

ButterflyNet2D: Bridging Classical Methods and Neural Network Methods in Image Processing.
Gengzhi Yang, Yingzhou Li. [arXiv preprint].

Research Experiences

CNN with Fourier Transform Initialization [Code] Sep 2021 - Nov 2022

Advisor: Yingzhou Li
- Implemented a convolutional neural network structure with sparse channel connection that can be initialized as a Fourier Transform Operator. The architectures are inspired by Butterfly algorithms in dimension 2.
- Analysed the performance of the network on approximation to FT Operator and its inverse;
- Tested the performance of the network on ill-posed image-processing tasks, such as deblurring, denoising, inpainting.
- arXiv preprint.

Finite Expression Method through Spectral Method [Code] Aug 2022 - Dec 2022

Advisor: Haizhao Yang and Chunmei Wang
- Re-implemented the original FEX [Code].
- Used FEX to search for basis that can construct the solution of PDEs.
- Used this framework to solve time-related PDEs, such as heat equations.
- Working on Exploring potential structures for FEX inspired by natural architecture search methods.

Adaptive Training Strategies for Deep Neural Networks Oct 2022 - Present

Advisor: Haizhao Yang and Chunmei Wang
- Established a training strategy that automatically add neurons or layers to a deep neural network.
- Have done numerical experiments to several different activation functions.
- Compared the approximation results of neural networks constructed by this strategy and straightly set up ones.

Butterfly Algorithm in Discretization Invariant Learning Apr 2022 - Aug 2022

Advisor: Haizhao Yang and Chunmei Wang

– Replaced the original dense matrix in IAE-Net with multi-sparse matrices using Butterfly algorithm for a faster running speed.

– Attempted to solve the limited memory problem arised in the framework.

– Use this framework to solve PDEs, such as burgers equation.

PINN: Moving the Residual Points Sep 2022 - Present

Advisor: Yingzhou Li

– Compared several strategies that offer sampling methods about residual points.

– Constructed adaptive methods to move the residual points.

– Set up a "physical force" related to the loss for the residual points to guide them move.

– Numerical experiments have shown better results than non-adaptive sampling strategies.

Teaching Experiences

Teaching Assistant

Calculus, MATH120045.07@Fudan University. Fall, 2022-2023

Awards

- First prize of Fudan University Undergraduate Freshman Scholarship.
- Second Prize in Chinese College Student Mathematical Modeling Contest, Shanghai, China. 2021, 2022.
- Fudan University Undergraduate Academic Scholarship, 2019-2020, 2020-2021, 2021-2022.
- Third prize of Fudan University Undergraduate Scholarship, 2019-2020, 2020-2021, 2021-2022.
- Been elected in Buqing Su Top-notch Talent Program in Mathematics, 2019-2020, 2020-2021.

Skills

Programming	MATLAB, Python(Including PyTorch), R, LaTeX, C.
Languages	Mandarin, Sichuanese, English(TOEFL iBT: 104)