Curriculum Vitae

Di Hou

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EDUCATION

Jilin University, China *2018-Present*
Tang Aoqing Honors Program in Mathematics
GPA 3.97/4.00 (ranking: 1/303)

Georgia Institute of Technology
Visiting Student at The School of Mathematics *Spring, 2021*

RESEARCH EXPERIENCE

BMSG: Block Mirror Stochastic Gradient Method for Stochastic Optimization. Oct. 2020 - Present
Area: Stochastic Optimization

- Developing a block mirror stochastic gradient method to solve stochastic optimizaiton problems involving general problems and composite problems, where the feasible set and the variables are treated as multiple blocks.
- Combining the feature of classic mirror descent stochastic method and the block coordinate gradient descent method. Acquiring the stochastic (sub)gradient information by stochastic oracles, our method updates all the blocks of variables in Gauss-Seidel type.
- Numerical Experiment on Stochastic LASSO problem and CVaR problem.
- Working paper. (Co-worker: Jinda Yang)

Deep Neural Networks for Solving American Put Option Under the Black-Scholes Model. Feb. 2020 - Present
Area: Machine Learning, PDEs

- Designing Full connected Deep Neural Networks with special multi-grid and cost function to replace classical Finite Element Method in American put option pricing problem.
- Simulation of DNNs on datasets in 2-dimention PDEs of BS equations with Admm and SGD to optimize. Comparison with Binomial tree method shows accurate results with 0.6% relative error.
- Future opportunities: design fast and potential NNs for high-dimensional PDEs, especially in option pricing and inverse problems in which classical methods meet the trouble of Curse of Dimensionality.
- Paper: Under review. (Advisor: Prof. Haiming Song)

Transfer Learning Improves Deep Neural Networks for the Diagnosis of Moyamoya Disease. Oct. 2019 - Apr. 2020
Area: ML, Medical Image Analysis

- CNNs are always considered as an end-to-end image classifier. However, we can stop the feed-ward process in any pre-assignm layers and then extract the features, which show great results when combining with classic feature selection and classification method.
- Due to the valuable and rare medical images of moyamoya disease, we prefer transfer learning to pre-train our parameters. In terms of designing the transfer learning model, our algorithm is built on the framework created by Google--Inception V3 or Resnet 18 and replaces the last full connected layers with new ones.
- Paper: Submitted. (Advisor: Prof. Haiming Song)

Software Development: Hyperelastic Constitutive Data Fitting with Nonlinear Least-Squares Method. May. 2020 - Nov. 2020
Area: Optimization

- Linear constitutive equations: fitting by Least-Squares Method directly.
- Nonlinear constitutive equations: designing both Levenberg-Marquardt Method and Genetic Algorithm in C#.Comparison with Matlab makes sure the efficiency and accuracy.
- Designing forms application and database to help researchers fit and store the data with optimization softwares automatically.
- Software: deployed. (Advisor: Prof. Tao Tang, Ran Zhang)

SEMINAR AND CONFERENCE

Seminar on Numerical and Convex Optimization (Supervisor: Prof. Li Xinxin) Sep 2020-present

- Learning topics on numerical and convex optimization including Interior-Point Method, ADMM and PPA algorithms.

Participating in Annual Academic Conferences Oct 2020 - Nov 2020

- The 18th Annual Conference of China Society for Industrial and Applied Mathematics (CSIAM)
- The 15th Annual Academic Conference of Operations Research Society of China (ORSC)

Annual Academic Forum of Everest Honor Students October 2019

- Giving a lecture 'Mathematical Thinking in Windmill' as the representative of Jilin University.

Participating in Summer School Jul. 2020 - Aug. 2020

- Peking University: Computing and applied mathematics (Lecturer: Prof. Pingwen Zhang)
- Fudan University: The Department of Big Data (Lecturer: Prof. Jianqing Fan)

SELECTED AWARDS

China National Scholarship (0.2%, Highest honor of Chinese undergraduate students)	2019, 2020
Scholarship of Tang Aoqing Honors Program of Research&Practice, Jilin University	2020
The Chinese Mathematics Competitions, First Prize	2019
The Mathematical Contest in Modeling in China, First Prize	2019
Outstanding Student(TOP 4%), Jilin University	2019

STANDARD TESTS

TOEFL Test	102	(28 R, 26 L, 24 S, 24 W)	Aug 2019

COMPUTATIONAL SKILLS

Python(Pytorch), MATLAB, C, C#, LaTeX, HTML.

TEACHING ASSISTENT

Numerical Algebra, Optimization Method I (PhD level) Fall 2020