JIALIN CHEN

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EDUCATION

Shanghai Jiao Tong University (SJTU) September 2018 - June 2022(expected)
B.Sc. in Mathematics and Applied mathematics

- Selected to Zhiyuan Honors Program (Top 10% at SJTU)
- Research Interests: Mathematical Machine Learning, Graph Neural Networks, Multiscale Signal Processing

PUBLICATIONS

1. **Fast Tensor Needlet Transforms for Tangent Vector Fields on the Sphere**
   *Ming Li, **Jialin Chen**, Philip Broadbridge, Andriy Olenko, Yu Guang Wang. Submitted to Electrical and Electronics Engineers (IEEE) Transactions on Signal Processing*

2. **Modeling Hierarchical Logical Reasoning Chains**
   ***Jialin Chen**, Z. Zhang, H. Zhao. Preprint*

RESEARCH EXPERIENCE

Geometric Deep Learning with Rotation Equivariance July 2021- Current
Advisors: Yuguang Wang, School of Mathematical Sciences, Institute of Natural Sciences, SJTU
Pietro Liò, Department of Computer Science and Technology, University of Cambridge

- "Spherical Needlet CNN" **(Paper in progress)**
- Proposed a new spherical convolution which is expressive and rotation-equivariant using multi-resolution Needlets (a spherical wavelet).
- Applied Shrinkage mechanism on high-pass signals as nonlinear activation for denoising and estimated the rotation-equivariant error bound caused by it.
- Experiments show model's strong performance on artificial datasets like rotated-MNIST and real-world datasets, such as 3D LiDAR point cloud, molecular atomization energies, detection of brain tumor from MRI.

Fast Tensor Needlet Transforms for Tangent Vector Fields on the Sphere July 2021 – October 2021
Advisor: Yuguang Wang, School of Mathematical Sciences, Institute of Natural Sciences, SJTU

- Constructed a semi-discrete tight frame of tensor needlets associated with a quadrature rule for tangent vector fields on the two-dimensional sphere.
- Proposed fast tensor needlet transforms, the corresponding decomposition and reconstruction algorithms with nearly linear computational complexity and low redundancy rate based on FFTs.
- Conducted detailed numerical studies on three artificial fields and one real-world wind field to demonstrate the effectiveness and efficiency of the developed fast algorithms.

Modeling Logical Inference Graph in Natural Language March 2021 - July 2021
Advisor: Hai Zhao, Department of Computer Science and Engineering, SJTU

- Designed key-phrases extraction algorithm and logical reasoning chain as the components of the proposed holistic graph-based framework handling texts at both discourse level and word level.
- Leveraged dual-level attention mechanism to capture the interaction information between phrases and discourses and the attention map provides retrospect of the reasoning process.
- Experiments on ReClor and LogiQA (two benchmark logical reasoning datasets) show the great improvement over baselines and the capability to understand more complex logical relationships.

Detection of Social Bias in Financial Text Via Domain Adaptation May 2020 - February 2021

Advisor: Yang Bao, Antai College of Economics and Management, SJTU

- Proposed a BERT-based framework with downstream fine-tuning mechanisms, FC layers and Text-CNN.
- Performed unsupervised domain adaptation from the social media text (e.g. SBIC dataset) to the business text (e.g. conference call of S&P1500) with a certain loss function.
- Detected the implicit social bias in language and predicted the most vulnerable groups (disability, gender, etc.)
- Obtained state-of-the-art performance on SBIC and substantially improved results on social bias detection.

COURSE PROJECTS

Numerical Methods and Deep Learning Frameworks for Solving Monge-Ampere Equation

- Reviewed related numerical methods and used the monotonicity properties to approximate the operator.
- Used multigrid with Gauss-Seidel operations on it and did sufficient numerical experiments.
- Compared the performances of several classical networks in solving Monge Ampere equations.

Exploration of Basic Reproduction Number and Equilibrium Points in Epidemic Model

- Discussed the concept of target reproduction number and its applications in ecology and epidemiology.
- Took the SIVS model as an example to analyze the stability of equilibrium points and gave the type of equilibrium points under different initial conditions.

An Opioid Crisis Characterization and Prediction Model Based on Factor Analysis

- Built a comprehensive model to explain the two causes of the increase in drug use, referring to Bass Model, Linear Model and Force Directed Model on the basis of Field Theory in Physics.
- Carried out cluster analysis, decision tree, Pearson correlation coefficient analysis, which provide a reliable guarantee for exploratory factor analysis.

AWARDS AND HONORS

- Meritorious Winner of the Mathematical Contest in Modeling (Top 7%) 2019
- Hanyingjuhua Alumni Scholarship (Top 5%) 2019
- The 2nd Prize of China Undergraduate Physics Tournament 2020
- Annual Undergraduate Merit Scholarship at SJTU (Top 10%) 2018 - Current
- Annual Zhiyuan Honorary Scholarship (Top 10%) 2018 - Current

LEADERSHIP AND VOLUNTEER EXPERIENCES

- Student Union Minister of Organization Department
- Secretary of Piano Association of Shanghai Jiao Tong University
- 2019 Shanghai Full Marathon volunteer
- 2019 China Coordinates·Shanghai City Orienteering volunteer

ADDITIONAL INFORMATION

- Programming Language: Python, C++, MATLAB, JAVA
- Interests: Piano (amateur of 10th level), Taekwondo (red belt), Photography, Badminton