Qian Zuo

EDUCATION

Nankai University – China **09/2021-06/2024**

Master's Degree in Applied Mathematics

- **Core Modules**: Graph Theory and Its Applications, Combinatorial Counting, Applied Graph Theory, Algebraic Graph Theory, Stochastic Processes, Topology, Measure Theory and Foundations of Probability Theory
- **GPA**: 95.41/100 Ranking: Top1%

Shanghai University – China **09/2017-06/2021**

Bachelor's Degree in Mathematics and Applied Mathematics

- **Core Modules**: Mathematical Analysis, Advanced Algebra, Probability Theory and Mathematical Statistics, Mathematical Modelling, Data Structures and Algorithms, Complex Analysis, Real Analysis, Functional Analysis, Numerical Methods, Differential Geometry, General Topology
- **GPA**: 3.78/4.0 Ranking: Top3%

PAPERS & PUBLICATIONS

Zuo, Q., & Lu, J. (2023). "*Self-attention GCN and Transformer dual-modal joint learning.*" Presented at the 3rd International Conference on Information, Electronics and Computer (ICIEC 2023), October 7, 2023. (Accepted for publication)

RESEARCH EXPERIENCE

Second Author, **Face Anti-spoofing from Structured Speckle Image** **08/2023**

- Explored the use of structured speckle images (SSI) as a new modality to detect face spoofing attacks, in light of the rise of sophisticated spoofing techniques.
- Proposed a novel multi-patch neural network with auxiliary 3D supervision to extract depth information from SSI for anti-spoofing purposes. Employed a several depth decoder for multi-patch auxiliary supervision during the neural network's training, enabling the network to extract depth information from SSI, and employed 6 patch classifiers as auxiliary spoofing supervision for final fused prediction.
- Conducted contrast experiments between SSI and RGB modalities, demonstrated that SSI's ACER is 3.68% better than RGB; APCER outperformed RGB by 56% for 2D spoofing and 4% for 3D spoofing.
- Found SSI's efficacy in identifying genuine faces with a 98% lower NPCER than RGB, surpassing RGB in all spoofing scenarios.

First Author, **Assessing Urban Habitat Perceptions: An Integrated FCE and ANN-RBF Approach in Wuhan,China** **07/2023**

- Studied the challenges posed by urbanization and the COVID-19 pandemic in Wuhan, China.
- Designed a questionnaire survey and collected 10,589 questionnaire responses, and harnessed multiple data sources, including urban planning archives and environmental assessments to investigate 13 municipal districts of Wuhan.
- Quantified the perception of the habitat environment using the FCE method; Developed an innovative research framework combining Fuzzy Comprehensive Evaluation (FCE) and Radial Basis Function Neural Network (ANN-RBF) to analyze urban habitat environment perception. Adopted the ANN-RBF to dissect the complex interplay of internal and external factors influencing urban habitat perceptions.

Single Director, **Research on Attention Algorithms in Machine Learning (Python)** **12/2020-06/2021**

- Researched traditional encoder-decoder models, attention algorithm principles, and their categories, including the attention algorithm theory, GRU model and transformer model under attention algorithm.
- Developed an attention-based GRU model, to address the risk assessment of insurance applicants, and an Insurance Transformer model based on the Transformer and Vision Transformer models.
- Evaluated the models on a Kaggle insurance dataset with 59,381 training and test samples to assess the risk levels of policyholders, and achieved classification accuracy of 98.8% and 99.2% respectively.
- Improved model training accuracy and reduced time cost for task processing compared to traditional models. Recognised as the Outstanding Graduation Thesis of Shanghai University (top 5%).

Participant, **Data Classification and Prediction of Blind Radar Signals (Matlab)** **10/2019-10/2020**

Advisor: Associate Prof. Changjun YU, Deputy Dean of the College of Science of Shanghai University

- Read literature related to radar signal identification and proposed an adaptive learning method that

simulates human eye recognition

- Utilized cubic function fitting and Support Vector Machine (SVM) for classifying and predicting mixed discrete blind signals.
- Conducted tests varying prediction duration, number of labeled test samples, and prediction steps, and achieved a classification prediction accuracy of over 90%.
- Implemented coarse classification and fine classification method using SVM, with the former consistently performing over 90% accuracy, and the latter peaking at 100% accuracy.
- Wrote the paper, "*Blind Radar Signal Classification and Prediction based on Fitting and Machine Learning"*, which was recommended to the 14th Annual National Conference of College Student Innovation and Entrepreneurship.

Participant, **Securities Investment Strategy Model based on Hamilton-Jacobi Equation 12/2018-10/2020**

Advisor: Prof. Ping AO, Chief Scientist of the National 973 Programme, Changjiang Scholar of Ministry of Education, Shanghai Leading Talent

- Developed a model of portfolio investment based on the Hamiltonian-Jacobi equation, considering the investor as one side of a differential response, viewing uncertain disturbances as the adversary of the differential response, and controlling optimally for the worst case of uncertain disturbances.
- Used the characteristic line method to solve the Hamilton-Jacobi equation under the optimal strategy and obtained the classical solution.
- Utilised partial differential theory to discuss the existence of uniqueness of solutions when the equation cannot be solved under non-optimal strategies.
- Wrote the paper as the first author, "*The Solution of a Piecewise Linear Hamiltonian Jacobian Problem and Proof of Existence and Uniqueness"*, awarded as the Outstanding Thesis of Shanghai University.

Leader, **Shanghai College Student Innovation Training Programme 12/2017-12/2018**

Advisor: Ye WANG, Senior Experimentalist

- Built a composite control scheme with an ultrasonic intelligent distance measuring system, photosensitive control system, and WIFI control system, achieving a breakthrough in the project.
- Used 3DMax to draw a model of the table lamp and 3D printing technology to print the finished product.

INTERNSHIP

Algorithm Engineer, **Deptrum** **07/2021-10/2021**

- Developed a face detection model independently using speckle images in Python, utilizing the OpenCV library, and python packages such as dlib, face_recognition, and cvlib.
- Proposed a novel multi-patch input model architecture to enhance the extraction of depth information from SSI.
- Employed a several depth decoder for multi-patch auxiliary supervision during the neural network's training phase, enabling the network to directly extract meaningful depth information from SSI, eliminating the need for complex depth reconstruction. Employed 6 patch classifiers as auxiliary spoofing supervision for final fused prediction.

AWARDS & HONOURS

- 04/2023: Shi Shu Zhong Scholarship of Nankai University (1%)
- 12/2022: Honourary Title of Outstanding Student Leader of Nankai University (2%)
- 12/2022: National First Prize, 19th Huawei Cup Chinese Graduate Mathematical Modelling Competition (1.10%, 17970 teams in total)
- 12/2021: Recommended Student Scholarship of Nankai University (6%)
- 2018-2019: Second-class Academic Scholarship at Shanghai University (10%)
- 2017-2018: First-class Academic Scholarship at Shanghai University (3%)

SKILLS & INTERESTS

- **Languages**: English (IELTS 7.0), Chinese (native)
- **Computer**: Matlab, Python, C, Lingo, SPSS
- **Interests**: Badminton, Gobang, Painting