Ge Yuchen

Curriculum Vitae

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Education

2019 - 2023 **BS**, *Shandong University*, *Mathematics*.

GPA **4.46/5 (rank 1/130)**

Interests Stochastic and Combinatorial Optimization, Topological Data Analysis, Computer Vision, Machine Learning Theory, Probability and Statistics, Smooth and Riemannian Manifold with application to Computer Graphics

Daily Interests

Sports and Music I play basketball and swim often since I'm a school team basketball player and good at swimming. Meanwhile under the training of the game of go, I'm a player of grade three. Also I'm a huge fan of guitar.

Publications

2022 Yuchen Ge, Kejia Liu, Longxin Wang, Qianyi Xue. "Breast Cancer Classification Based on Various CNNs and Classifiers" In International Conference on Network Engineering, Algorithms and Big Data (NEABD), 2022.

Honors

2021-2022 First Prize in CMC (**Fourth Place in Shandong Province)**
China National Award (honor 1% students)

2020-2021 National College Students' Innovation and Entrepreneurship Training Program
First Prize in CUMCM
Second Prize in CMC
China National Award
Scholarship of First Level

2019-2020 First Prize in CUMCM
Third Prize in Competition on Application of Intelligent Technology
Second Prize in National College Students Energy saving and Emission Reduction Contest
Third Prize in MDMCM
Scholarship of First Level

Relevant Study

Mathematics Covering **geometry** (topology, smooth and Riemannian manifold, basic algebraic topology), **algebra** (linear algebra, abstract algebra, commutative algebra, homological algebra, basic algebraic number theory), **analysis** (mathematical analysis, real/complex analysis, ordinary differential equation, partial differential equation, basic analytic number theory), **numerical analysis**, **convex, stochastic and combinatorial optimization**, **measure-theoretic probability theory and stochastic calculus, regression analysis, multivariate statistical analysis, and mathematical statistics**.

Computer Science Efficient in Python, Matlab and LaTeX. Have a general knowledge of algorithms, computer architecture and operating systems.

English academic reading and communication *TOEFL iBT 103*, *GRE 333*

Activities

Research Item

2022 **Research Assistant**, *Algebra for Machine Learning and Stochastic Optimization*, University of Quebec in Montreal (UQAM).

- Aimed to apply algebraic methods to reduce the complexity of large-scale stochastic optimization problem
- Developed an unsupervised machine learning approach that clusters these scenarios into similarity groups measured on the basis of solutions characterizing them
- Used Grobner Basis, Graver Basis and combinatorial methods to design new algorithms and reduce the computational complexity of our machine learning approach
- Implemented by Python and the numerical result of the algorithms was much faster than existing algorithms

2022 **Leader**, *Deep Learning: Theory and application*, Massachusetts Institute of Technology (MIT).

- Aimed to develop a conversational agent for breast cancer patients, based on highly accurate training datasets while deploying Natural Language Processing (NLP) and Deep Learning (DL) techniques
- Used VGG-16, VGG-19, Xception, ResNet50, Inception-V3, and Inception-Resnet-V2 to extract features
- employed fully connected layer (FCL), logistic regression (LR), and SVM to classify breast cancers
- Designed some tricks to enhance the performance which included Cyclic Learning Rate Decay, Local optimal solutions for small datasets, Increasing the number of dense layers and etc.
- Obtained the optimal accuracy rate of 93.9% on eight-classification (much better than existing results) and developed a chatbot for interaction based on TKinter.

Seminars and Coursera Courses

2022 **Participant**, *Seminars and Coursera Courses*, Online.

- Seminars: Algebraic topology and TDA, Advanced Probability and Measure Theory, Modern Differential Geometry, Advanced Linear Algebra, Advanced Algebra, Lectures on Modules and Rings, Introduction to Algebraic Geometry.
- Coursera: Data Science (IBM), Operating System.

Mathematical Modeling

2020 **Leader**, *First Prize in Contemporary Undergraduate Mathematical Contest in Modeling*, Online.

- Built linear programming model and analyzed data for 402 enterprises by Matlab
- Combined with the particle swarm optimization algorithm based on Scikit-learn
- Utilized Anylogic to simulate different traffic conditions for better analysis

Smart Car Design and Competition

2019 **Leader**, *Competition on Application of Intelligent Technology*, Qianfo Mountain Campus in Shandong University.

- Intelligent vehicle design of automatic tracking with Keil programming and PID control
- Responsible for hardware design including assembling motor drive and operational amplifier circuits
- Used 8 bit AT89C51 single-chip micro-controller as the core control unit and PWM
- Designed successfully intelligent vehicle and achieved 18s as track record

Study and Preparation on Nano-sized Upconversion Phosphor

2019 **Teammate**, *Study and Preparation on Nano-sized Upconversion Phosphor*, Qianfo Mountain Campus in Shandong University.

- Aimed for the optimal conditions for light-emitting mechanism of the up-conversion luminescence
- Utilized Python for data visualization and drew the detailed XRD diffraction pattern for further investigation
- Did XRD diffraction pattern Data preprocessing and analysis with Jade
- Implemented Random Forest Algorithm and CNN to detect different XRD diffraction pattern
- Selected as National Undergraduate Innovation and Entrepreneurship project and completion

Current Interest

Stochastic and Integer Optimization	Application of pure mathematics (e.g. Grobner and Graver Basis in commutative algebra) to stochastic and combinatorial optimization
Probability and Statistics	Theory of probability, statistical and bayesian inference with application to financial mathematics
Machine Learning Theory	Develop learning algorithms with an eye towards the use of learning as part of a larger system. For example, one would like algorithms that have more powerful models of their own confidence or that can optimize multiple objectives. One would like models that capture the process of deciding what to learn, in addition to how to learn it.
Topological Data Analysis	Theory of TDA with application to several areas, including to neuroscience, to multi-target tracking, to multi-modal data fusion, and to a probabilistic theory of database merging