

Mingwei Gao

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EDUCATION BACKGROUND

North Carolina State University

08/2024-present

Ph.D. candidate in **Operations Research**

PI: Eunkyong Shim, Ph.D., NC State University; Mengmeng Zhu, Ph.D., NC State University

Research focus: Development of Deep Learning Based Nonwoven Uniformity Analysis

Central South University

09/2021-07/2024

Master of Science in **Management Science and Engineering**

Major Courses: *Advanced Econometrics; Optimization Theory and Methods; Big Data Analysis; Applied Stochastic Process; Management Research Methods; Thesis Writing and Guidance*

Main research direction: *Data mining; Anomaly detection; Machine learning*

Working Paper: *Dynamic burst detection method based on fuzzy Poisson distributed state machine (Contributing)*

Honors & Awards:

- The Second prize in the Hunan Post-Graduate Mathematical Contest in Modeling (15%) 10/2021
- The First-class Scholarship in Central South University (10%) 09/2021
- The Second Prize in the Hunan Post-Graduate Mathematical Contest in Modeling(15%) 10/2022
- The Second Prize in the China National Post-Graduate Mathematical Contest in Modeling (12.29%) 10/2022
- The Second-class Scholarship in Central South University 09/2022

Central South University

09/2017-07/2021

Bachelor of Science in **Mathematics and Applied Mathematics**

Mathematical Courses: *Mathematical Analysis; Mathematical Statistics; Econometrics; Time Series Analysis; Functional Analysis; Advanced Algebra; Probability Theory; Complex Function; Real Variable Function*

Computer Courses: *Mathematical Software; Mathematical Modeling; Data Structure; Fundamentals of Computer Programming; Object-Oriented Programming; Digital Signal Process; Numerical analysis*

Honors & Awards:

- The Finalist Prize in the Mathematical Contest in Modeling (0.17%) 04/2020
- The Honorable Prize in the Mathematical Contest in Modeling (15.35%) 04/2019
- The Second Prize in the China Undergraduate Mathematical Contest in Modeling (11.39%) 10/2019
- The Third-class Scholarship in Central South University (40%) 11/2019

SELECTED RESEARCH EXPERIENCES

Dynamic burst detection method based on fuzzy Poisson distributed state machine

2022

- Based on Kleinberg state machine principle, a state machine model which can detect data flow in real time is established.
- The Poisson distribution is used to model the arrival frequency of data flow, and the Fuzzy decision idea is introduced to expand the event State level in data flow. Finally, a Fuzzy Poisson State Machine (FPSM) model is established.
- In this model, the idea of distance instead of probability simplifies the tedious solution of the probability density function of Poisson distribution, and can classify the possible events according to the arrival frequency of the data in real time, and the fuzzy decision-making idea improves the fault tolerance rate of the model.

- The burst value scoring function is introduced to optimize and quantify the model.

Issues and solutions of daily necessities allocation under the COVID-19 epidemic (Mathematical modeling contest paper) 10/2022

- Based on the distribution of people and urban streets, this paper studies how to set up material delivery points in residential areas, and uses the conditional clustering method to solve the problem, and determines the location of these material delivery points according to the street conditions.
- Based on the transport capacity of freight trucks, a set of layered material transfer storage and delivery mode is designed.

Yellow peach quality evaluation model based on mechanical index and manual score (Mathematical modeling contest paper) 11/2021

- Based on the existing indexes of yellow peach, a quality evaluation model of yellow peach was established.
- To determine whether the data of different indicators are consistent, after the data is preprocessed, SVM is used to establish a model to realize the classification of each indicator based on yellow peach. Participated in the debugging of numerical simulation and the analysis of model's statistical characteristics.
- Based on the data after analysis and processing, ARIMA model was established to determine how many experiments were needed to make the quality measurement of yellow peach accurate.

Short-time refinement of air temperature data based on video superresolution method (Undergraduate thesis) 2021

- The basic principle of variable convolutional neural network is described, and the main video superresolution methods are compared, and their advantages and disadvantages are summarized.
- The method of frame insertion and superresolution is proposed to refine the meteorological data in the two dimensions of time section and time axis, and the feasibility of applying video superresolution method to meteorological data is analyzed.
- The model was trained and predicted by python.

Numerical Simulation Analysis Based on CIR and Vasicek Model (College student innovation and entrepreneurship project) 07/2020

- Obtained the national project approval for College Students' Innovation and Entrepreneurship.
- Used the Euler-Maruyama approximation method and non-central chi-square distribution accurate simulation method to analyze the given Vasicek and CIR model.
- Participated in the debugging of numerical simulation and the analysis of model's statistical characteristics.
- Carried out the algorithm decision analysis after debugging, providing the potential users with the optimal interest-rate term model under different conditions.

An Impregnable Sandcastle (Mathematical modeling contest paper) 03/2020

- Considered the inertial force and drag force of the sand fort on the horizontal plane from the top view direction.
- Established the functional relationship of the sandcastle bottom profile curve in the Cartesian coordinate system and obtained the bottom contour curve by using the variation method based on the Morison equation.
- Determined the transverse wear rate of sand Fort caused by wave erosion and the profile in the right view direction by analyzing the wear rate.
- Launched a sand water ratio model to determine the optimal ratio of sand and water based on the empirical formula from the microscopic point of view.
- Used MATLAB to simulate and build an impregnable sandcastle.

Pressure Control of High-Pressure Tubing Based on One-Dimensional Unsteady Flow (Mathematical modeling contest paper) 09/2019-08/2020

- Founded the pressure control model of high-pressure tubing based on the law of conservation of mass and the basic equation dimension of one-dimensional unsteady flow of compressible fluid.
- Utilized MATLAB to calculate the relationship between the decompression strength and time through the

fourth-order Runge Kutta method and presented in the form of image.

- Analyzed the pressure change of the oil supply end caused by the oil pump in one stroke and improved the formula combined with the research results in the previous step.
- Added a fuel injection nozzle to reduce the pressure fluctuation range in the high-pressure oil pipe.

Design and Planning of New Generation Communication Network(Mathematical modeling contest paper) 05/2019

- Selected 32 element phased antenna arrays and established the single objective and multi-objective linear programming and then used the genetic algorithm to screen the data and get the final relative optimization result.
- Studied the backbone network configuration of Guangdong Province and configured the network line based on three different types and different prices of data transmission lines.
- Used the shortest path method to give each node and line the corresponding weight and adopted the depth first search method to achieve the optimal solution.

Biological Model of the Dragon: An Idea to Bring the Dragon into Reality(Mathematical modeling contest paper) 01/2019

- Applied logistics model to describe the possible reproduction of dragons and used the speed and energy consumption of modern aircraft to simulate the flight of dragons.
- Employed the energy consumption of different modern internal combustion engines to simulate the daily ground activities of dragons.
- Completed the model establishment of a dragon growth and reproduction.

SKILLS & HOBBIES

- Computer skills: Python; Matlab; SPSS; Eviews
- Hobbies: Hosting (presided over more than ten activities in the University); Shooting (took two micro-films); Playing basketball