Haowen He

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EDUCATION

Rensselaer Polytechnic Institute (RPI), Troy, New York GPA: 3.71
B.S./M.S. in Mathematics, Minor in Strategic Communication Expected May 2022

RELEVANT COURSEWORK

Partial Differential Equations (graduate level), Machine Learning for Environmental Biology, Linear Algebra, Advanced calculus, Math Models of Operations Research, Complex Analysis, Geophysical Fluid Dynamics (graduate level S21), Sequence Analysis, Mathematical Biology, Biostatistics, ODEs & Dynamical Systems, Number Theory, Numerical Computing, Numerical Methods for Differential Equations

RESEARCH

Institute for Data Exploration and Application (IDEA), Troy, NY Summer 2020
Health INCITE Lab Safe Campus Team,
Advisor: Dr. Kristin Bennett, Dr. John Erickson

- *Worked as an undergraduate research assistant to build an app that reveals the anonymous usage of Wi-Fi access points and aggregations of wireless users on the campus network at Rensselaer Polytechnic Institute*
- *Developed quantitative approaches that help college administrators simulate campus re-open plans and predict future conditions, including campus de-densification, campus network mapping, and selected social distancing models*
- *Built an interactive geographic dashboard to present analysis and visualizations of WAP data to users so they can make informed decisions on where to go for extended periods of time on campus during the COVID-19 pandemic*

Modeling and forecasting Cyanobacterial Blooms in a eutrophic drinking-water reservoir, Troy, NY Fall 2020 – Spring 2021
Department of Biological and Environmental Sciences,
Advisor: Dr. Jeremy Farrell, Dr. Sasha Wagner

- *Assessed the effects of surface water temperature, droughts, which caused extremes in reservoir elevation, and chlorophyll on cyanobacterial abundance respectively via Spearman's rank correlation, time series and cluster analysis*
- *Proposed and analyzed mathematical models describing the population dynamics of harmful algae and toxin production and decay under ecological eutrophication, and studied the bifurcation behaviors and stability of the model*
- *Forecasted and mapped onsets of cyanobacterial blooms via a nonparametric machine learning approach, using a gradient boosted regression tree model*
- *Investigated the relationship between the warming of surface waters and the stratification, and explored its impact on cyanoHAB events as cyanobacteria may encounter less competition for nutrients under stratified conditions*
- *Visualized the characteristics of cyanoHABs and the relationship between predictor variables and cyanobacterial abundance using JMP and R*

The Mathematical Contest in Modeling: Fighting Wildfires, COMAP Spring 2021

- *Formulated a quantitative model to determine the optimal strategic planning of drone-aided firefighting using Partition method and Lagrangian Relaxation*
- *Developed a predictive machine learning regression model to adapt the original operational plan for the changing likelihood of future extreme fire events*

Let's make a deal: The Monty Hall Dilemma Revisited, Troy, NY Summer 2021
Department of Cognitive Science, Advisor: Dr. Bram Van Heuveln

- *Constructed a detailed explanation of the solutions to the Classic Monty Hall Problem utilizing Monte Carlo simulations, decision trees, and mathematical concepts of conditional probability, mainly Bayes' Theorem*
- *Investigated the various Monty Hall variants and the benefits of different winning strategies, and provided both the intuition and a mathematical justification for the solutions to Monty variations based on possible host behaviors and additional generalizations of the problem*
- *Discovered the psychological mechanisms for solving the Monty Hall Problem by designing experiments using cognitive manipulations, including perspective change, mental models, and the less-is-more effect*

Darrin Fresh Water Institute at Rensselaer (DFWI), Troy, NY Fall 2021 - Present
Jefferson Project at Lake George: Watershed Forest Studies,
Advisor: Dr. Thomas Morgan

- *Characterizing the forest surrounding Lake George and quantifying the species composition of the forest canopy by using an airborne LiDAR point cloud data, acquired by IBM for high resolution topography, and aerial photography*
- *Developing a novel method for segmenting individual trees from the LiDAR points and mapping the occurrences of hemlock in anticipation of investigating Hemlock Woolly Adelgid, an invasive insect that can be deadly to hemlock trees*

TEACHING & MENTORING

Department of Mathematical Sciences, Troy, NY Fall 2019 - Present
I-PERSIST Calculus I Mentor

- *Meeting with two groups of freshmen on a weekly basis*
- *Streamlining incoming students' transition to a rigorous college environment*
- *Giving quizzes, engaging students in activities, and presenting examples*
- *Holding weekly office hours, grading quizzes and providing feedback*
- *Attending weekly supervisory meetings with faculty members*

Center for Global Communication+Design, Troy, NY Spring 2019 - Present
Undergraduate Writing Tutor

- *Working with multilingual students and explaining typical difficulties with English Writing and Speaking from their major discipline*
- *Leading Chinese mentor program and offering both tutoring and language and culture support to address non-native English-speaking students' learning needs*
- *Developing a series of COMM+D handouts on grammar and punctuation rules, citation formats, and guidelines for specific Rensselaer courses*
- Offering consultations to help students with their communication projects

SKILLS

R (tidyverse, ggplot2, markdown, etc.), Python (data analysis & visualization), LaTeX, Jupyter Notebook, JMP, SQL, MATLAB, AMPL, Microsoft Office, Linux Terminal, Written & Oral Communication, Teaching/Mentoring, Collaboration

HONORS & MEMBERSHIPS

- *Dean's Honor Lists*
- *Pi Mu Epsilon, the U.S. honorary national mathematics society*
- *Outstanding Student Intern Award – WARTSILA (Shanghai) Co., Ltd*

CLUBS & HOBBIES

Aikido, Mathematics Problem Solving Club, RPI TV, LGBTQ+ Lavender Ambassadors, Sabre Fencing, RPI Chess Club