

# Haoran Li

haoran.li2018@gmail.com | (+1)202-779-6530 | lihaoranicefire.github.io/math | linkedin.com/in/haoranli2018

## EDUCATION

**Ph.D. in Mathematics**, University of Maryland, Expected Graduation Fall 2024 (GPA 4.0/4.0)

**B.S. in Mathematics and Applied Mathematics**, Sun Yat-sen University, Graduated Jun 2018 (GPA 3.7/4.0)

- Majored in **Software Engineering** (Aug 2013 - Jun 2014). Courses: Data Structures, C++ Programming

## SKILLS

**Programming:** Python, C++, C, Javascript, MATLAB, Mathematica, MySQL, R

**Framework:** scikit-learn, Tensorflow, PyTorch, Linux, AWS

**Skills:** PDE, Statistics, Stochastic calculus, Time series analysis, Neural network, Monte Carlo simulation

## PROJECTS

**Home Credit - Credit Risk Model**, Kaggle

Apr 2024 - May 2024

- Developed a binary classification model which predict customer loan defaults, maximizing AUC scores.
- Utilized a custom differentiable loss function based on the Wilcoxon-Mann-Whitney statistic.
- Conducted correlation analysis on 500 different features, categorized and combined types, eliminated redundancies, and engineered new features, yielding a refined dataset of aggregated features.
- Constructed an ensemble of LightGBM, XGBoost and CatBoost models with the custom loss function, achieving over 90% accuracy and an AUC score of 0.80 using the average prediction.

**TED talk Classification**, INMAS, Johns Hopkins University

Feb 2023 - Apr 2023

- Employed the re package for pruning and preprocessing TED talk texts, breaking them into smaller segments.
- Applied Word2Vec to convert words into vectors and used a bag-of-words model for average representations.
- Generated 2D graphs of the word vectors, conducting correlation investigation and clustering analyses.
- Built a three-layered neural network model on 2,000 TED talk texts, capable of labeling them based on categories such as “Technology”, “Entertainment” and “Design”. Attained approximately 80% accuracy.
- Trained a BERT model for the same classification task, achieving 85% accuracy and F1 score of 0.78.

**Instacart Basket Analysis**, The Erdős Institute

Sep 2022 – Dec 2022

- Performed an in-depth exploratory analysis on 3,000,000 orders from over 20,000 Instacart customers.
- Employed PCA and KMeans clustering to categorize customers into 3 groups based on their shopping preferences.
- Developed a customized XGBoost model for each specific customer group, obtained 91% accuracy predictions based on an appropriate cutoff of the likelihoods of future repurchases of various items.

## EXPERIENCE

**Software Engineer Intern**, Wolfram|Alpha

Jun 2023 – Aug 2023

- Developed step-by-step functions to solve partial sums and sums of 7 types of series in Mathematica, utilizing VS code and Sourcetree, worked within the established framework and protocol of the Wolfram|Alpha Math team.
- Devised efficient algorithms and appropriate code structures, ensuring adaptability not only to standard inputs but also to novel instances with desirable outcomes.
- Initiated pull requests, sought peer reviews, iteratively refining codes until gaining unanimous approval, and eventually incorporated selected implementations into the Wolfram|Alpha codebase for accessibility by end users.

**Research Assistant**, University of Maryland – College Park, MD

Sep 2020 – May 2023

- Constructed models for integral motivic cohomology with multiple polylogarithms and associated Hodge structures. Proved pertinent theorems. Devised algorithms and developed Mathematica packages for computations.

**Instructor & Teaching Assistant**, University of Maryland – College Park, MD

Sep 2018 – Dec 2024

- Developed comprehensive lecture notes and slides for each class session.
- Created exams, quizzes, homework assignments, MATLAB projects.
- Held regular office hours and review sessions.
- Proficient in using Canvas, Gradescope and Matlab Grader.
- Managed and maintained my teaching page

## PUBLICATIONS & PREPRINTS

**The Lie coalgebra of multiple polylogarithms.** Zachary Greenberg, Dani Kaufman, Haoran Li, Christian K. Zickert. J. Algebra, vol. 645, pp. 164-182.

**Hopf algebras of multiple polylogarithms, and holomorphic one-forms.** Zachary Greenberg, Dani Kaufman, Haoran Li, Christian K. Zickert. arxiv:2211.08337

## AWARDS & HONORS

---

- Second prize on the 5th Chinese Mathematics Competitions (CMC)
- First prize on China Undergraduate Mathematical Contest in Modeling (CUMCM-2016)
- Dean's Fellowship, University of Maryland
- Hauptman Summer Fellowship, University of Maryland
- Scholarship of Canadian Alumni Association (Hong Kong)
- First-Class Scholarships, Sun Yat-sen University
- Aziz Osborn Gold Medal in Teaching Excellence, University of Maryland