

Zhen Huang

Department of Mathematical Sciences, Tsinghua University.
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EDUCATION

Tsinghua University, Department of Mathematical Sciences.

Sept. 2015 - Present

Bachelor of Science in Pure and Applied Mathematics.

- **Academics:** Overall GPA 3.88/4.0, Ranking 2/90.
- **Mathematics Courses:** Mathematical Analysis (I, II, III), Advanced Algebra and Geometry (I, II), Probability Theory I, Complex Analysis, Measures and Integrals, Abstract Algebra I, Differential Equations. Ongoing: Topology, Differential Geometry, Probability Theory II, Abstract Algebra II, Numerical Analysis, Partial Differential Equations.
- **Programming Courses:** Fundamentals of Programming, Introduction of Scientific Computing with MATLAB, Algorithm Design and Complexity Analysis, Introduction of Mathematical Modelling.

University of Oxford, Mathematics Institute, Department of Statistics.

Sept. 2017 – June 2018

Fully Sponsored Visiting student – Mathematics and Statistics.

- **Academics:** Achieved **A** in all the classes attended.
- **Mathematics Courses:** Functional Analysis I, Functional Analysis II, Martingales through Measure Theory, Continuous Martingales and Stochastic Calculus, Number Theory, Projective Geometry, Graph Theory.
- **Statistics Courses:** Foundations of Statistical Inference, Statistical Machine Learning, Advanced Topics in Statistical Machine Learning, Applied Statistics, Applied Probability, Computational Statistics, Bayes Methods.

Princeton University, Department of Mathematics, the Program in Applied and Computational Mathematics.

International Student Research Internship Program.

June 2018 – Aug. 2018

HONORS AND AWARDS

- P.L. Hsu Medal (winners in Probability and Statistics) in the 2017 S.-T. Yau College Student Mathematics Contests (awarded to in total 10 undergraduates within the country).
- Yinghua Scholar Program (**Top 8/6600**) 2017
- China National Scholarship (**Top 1/90**) 2016
- Qualcomm Scholarship (**Top 33/3300**) 2017
- Tsinghua Xuetang Talents Program Scholarship 2016, 2017, 2018
- Tsinghua Reading Scholarship (**Top 1/90**) 2017
- Hengda Scholarship (**Top 4/90**) 2017
- Baosteel Scholarship (**Top 1/90**) 2018
- Academic Excellence Scholarship 2016
- Sports Excellence Scholarship 2017
- Comprehensive Excellence Scholarship 2016, 2017, 2018
- Tang Lixin Scholarship (**Top 35/13200**) 2018

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RESEARCH & PROJECT EXPERIENCE

Two-dimensional Multireference Alignment

June 2018 – Aug. 2018

Advised by Prof. Amit Singer, Princeton University

- I worked on the problem of two dimensional multireference alignment, which is to estimate a planar image from many noisy shifted and rotated copies of itself.
- I established a statistical model to describe the generating process of the images, and developed a spectral algorithm, a least squares optimization algorithm, and an EM algorithm to recover the image. I also compared different algorithms with respect to the quality of their estimations and the corresponding computational time.
- I theoretically analyzed the sample complexity, and derived a lower bound of the mean square error in terms of the signal-to-noise ratio. All three algorithms were shown to empirically achieved the optimal sample complexity rate, and I proved theoretically for the spectral algorithm.

A Bayesian Non-parametric Hierarchical Model for Time-evolving Meaning Change

May 2018 – June 2018

Advised by Prof. Geoff Nicholls, University of Oxford

- We developed a statistical model to represent word meanings and detect changes in usage, using tools from the field of statistical machine learning, in particular, Bayesian non-parametrics with Monte-Carlo Bayesian inference. My main contribution was to introduce a hierarchical structure to capture the propensity of usages and incorporate certain Brownian motions to explicate the time-evolving changes.
- The model was applied to data from Corpus of Historical American English (COHA), and improvements were seen from the existing models. It worked well on tasks such as finding the meanings of target word and their mixing proportions, distinguishing differences across categories, tracking how a meaning evolve over time, and detecting the meaning of one particular word in its given context.

Planar Potts and Random-cluster Models

Oct. 2017 – Nov. 2018

Advised by Prof. Hao Wu, Tsinghua University

- Studied comprehensively about the Potts model and random-cluster Model, including their coupling, the extension to the infinite-volume measures, and the percolation theory with certain phase transitions and nontrivial critical value.

Modelling Airport Security Check

Jan. 2017

Advised by Prof. Heng Liang, Tsinghua University

- Handed in to the MCM/ICM in 2017 and won the Meritorious Winner.
- Establish two models to analyze the queuing at checkpoints on larger and smaller time scales, based on data collected from the website of Chicago's O'Hare Airport. The calculation results match well with the former.

TECHNICAL SKILLS

Programming: R, MATLAB, Python, C++, L^AT_EX.

TEST SCORES

TOEFL iBT: 104/120 (Reading 29, Listening 27, Speaking 23, Writing 25)

Revised GRE: 325/340 (Verbal 155, Quantitative 170) **Mathematics Subject Test:** 970/990 (Percentile 99%).