Zihao Wang

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EDUCATION

University of Chicago | *B.S., Computational and Applied Mathematics* **Chicago, IL**

- GPA: 3.93/4.00; Major GPA: 3.95/4.00 Sep 2017 - Sep 2019

Wuhan University | *Mathematics Base Class* **Wuhan, China**

- GPA: 3.92/4.00; Major GPA: 3.97/4.00; Class Rank: 1/50 Sep 2015 - June 2017

Selected Courses: Measure Theory, Complex Analysis, Abstract Algebra, Convex Optimization, Nonparametric Inference, Fundamentals of Deep Learning, Advanced Natural Language Processing, Stochastic Simulation

RESEARCH EXPERIENCE

Nonnegative Matrix Factorization on Genomics Data | *Research Assistant* June 2018 - Present

Advisor: **Prof. Matthew Stephens**, Department of Statistics and Department of Human Genetics, University of Chicago

- Derived and implemented novel algorithms for Empirical Bayes Poisson Matrix Factorization problem. R package (in development) is hosted in ebpmf, and manuscript is in preparation.
- Derived and implemented novel algorithms for Empirical Bayes Poisson Mean problem. R package is hosted in ebpm
- Derived the relationship between Nonnegative Matrix Factorization, Poisson Factor Analysis and Latent Dirichlet Allocation.
- Implemented Expectation-Maximization algorithm, Gibbs sampling, Mean Field Variational Inference and Variational Auto-encoder for Poisson Matrix Factorization and Negative Binomial Matrix Factorization, and performed systematic empirical comparisons using simulated data and large scale GTEx v7 and single cell RNA-seq data.

Flu Prediction | *Research Assistant* Jan 2018- Present

Advisor: **Prof. Mercedes Pascual**, Department of Ecology and Evolution, University of Chicago.

- Investigated the heterogeneity of influenza transmission in 10 US regions using Partially Observed Markov Processes, and estimated parameters using Sequential Monte Carlo methods.
- Implemented Recurrent Neural Networks (RNN) and Convolutional Neural Networks (CNN) as alternative methods, and performed comparison across prediction methods.
- Presented results in Quantitative Biology Fellowship Conference of University of Chicago in August 2018.

Course Projects

Convex Optimization Jan 2019 – March 2019

Instructor: **Prof. Mihai Anitescu**, Department of Statistics and Department, University of Chicago and Mathematics and Computer Science Division, Argonne National Laboratory

- Implemented Newton methods for unconstrained, and equality constrained problems, interior-point methods for inequality constrained problems, Alternating Direction Method of Multipler (ADMM) for Lasso linear regression. (code is available at https://github.com/zihao12/cvx_projects)

Advanced Natural Language Processing March 2019 – June 2019

Instructor: **Prof. Kevin Gimpel,** Toyota Technological Institute at Chicago

- Designed and implemented Sentiment Analysis using Word-Embedding and Attention function in PyTorch.
- Implemented Hidden Markov Model for Structured Prediction through Viterbi algorithm, Greedy algorithm, Beam Search algorithm, and Gibbs Sampling.
- Built an unsupervised segmenter for English text with nonparametric Bayes using Gibbs Sampling. (code is available at https://github.com/zihao12/nlp)

SELECTED EXTRACURRICULAR EXPERIENCE

Product Hackathon, Shenzhen, China | Team Leader Dec 2018

- Led a team of 3 to build an innovative plan for smart backpack that learns to customize weight distribution from user data using Deep Learning and Reinforcement Learning within 24 hours.
- Led the presentation in the hackathon forum to the audience of 100+ (PowerPoint available on request).
- Won the third place of 2018 Hackathon Innovation Competition.

AIESEC in Wuhan University, Wuhan, China | Team Manager Mar 2016 - Mar 2017

- Built and managed the volunteer team from 6 countries for the Innovation Dream Plan project, an educational initiative to inspire independent and creative thinking of Chinese high school students.
- Programmed and led a class for 46 high school students.

PROGRAMMING SKILLS

Python, R , Matlab, C, Racket