

## EDUCATION

### School of Economics and Management, Tsinghua University

Beijing, China

- Master of Science in Insurance and Big Data Finance 09/2016 - Now
  - GPA 3.5/4.0
  - Rank 1/18 in Track, 12/110 in Department
  - Master's Thesis: (Ongoing) A Risk Finance Paradigm for Dependent Catastrophe Losses with Pareto Severities, Advisor: Prof. Michael Powers

### University of Science and Technology of China(USTC)

Hefei, China

- Bachelor of Science in Mathematics (Information and Computational Science) 09/2012 - 06/2016
- Minor subject: Computer Science
  - GPA 3.92/4.30, Major GPA 4.04/4.30
  - Rank 1/22 in Track, 7/120 in Department
  - Graduation Thesis: Model of Incentives in Repeated Crowdsourcing Systems, Advisor: Prof. Qi Liu

## AWARDS AND HONORS

- National Scholarship, National Ministry of Education of China, top 1% 2013
- Gold Award of University's Excellent Students, USTC, top 3% 2014
- Outstanding Student Research, USTC, top 3% out of undergraduates in USTC 2015
- Huangyu Scholarship, USTC, top 3% in the School of Mathematics 2015
- Outstanding Graduates, USTC 2016
- First Prize Scholarship, Tsinghua University, top 3% in the Department of Finance 2017

## RESEARCH EXPERIENCE

### A Bandit Reinsurance Framework to Incentivize Insurers to Offer Precise Information

09/2017

*Master Thesis (Ongoing)**School of Economics and Management, Tsinghua University**Supervisor: Prof. Michael Powers(SEM)*

- Modeled the reinsurance problem as a dynamic Bayesian game with a bandit frame.
- Designed a mechanism to incentivize insurers to offer precise information about risks in the long run.
- Deduced the requirements of Bayesian Nash Equilibrium (BNE) where insurers finally offered a target precision level of information.

### Risk Finance Paradigm for Dependent Catastrophe Losses with Pareto Severities

09/2017

*Graduate Research (Ongoing)**School of Economics and Management, Tsinghua University**Supervisor: Prof. Michael Powers(SEM)*

- Modeled catastrophe losses' portfolios as a class of dependent Pareto severity variables with Gumbel copulas.
- Designed a parallel-serial numerical algorithm to get Fourier-analytic risks for levy-stable variables.
- Proposed a conservative risk finance paradigm that can be used to prepare the firm for worst-case scenarios with regard to (1) the firm's intrinsic sensitivity to risk, (2) the heaviness of the severity's tail and (3) the dependence between the losses.

### Model of Incentives in Repeated Crowdsourcing Systems

01/2016-06/2016

*Undergraduate Thesis Department of Data Mining, National Engineering Laboratory for Language Information Processing**Supervisor: Prof. Qi Liu(USTC)*

- Modelled the effects of performance-contingent financial rewards in crowdsourcing systems and provided answers to the question: how does the anchoring effect influence the cumulative profits of requesters and workers?

- Proved that when the anchoring effect coefficient  $r$  of requesters is smaller than 1, the cumulative profits of requesters will converge to a certain value increasingly, and the value is negatively correlated with  $r$  (which means a better strategy for requesters is to increase the wage slowly).
- Proved that when the anchoring effect coefficient  $P$  of requesters is smaller than 1 and  $r > P$ , the cumulative profits of workers will converge to a certain value increasingly, and the value is negatively correlated with  $P$  (which means a better strategy for workers is to increase the effort slowly but than the reaction of requester), otherwise, the workers should leave the game.

#### **Group Recommendation: An Approach Based on Nash Equilibrium**

01/2015-06/2015

*Undergraduate Research Department of Data Mining, National Engineering Laboratory for Language Information Processing*

*Supervisor: Prof. Qi Liu(USTC)*

- Proposed to explore the idea of Nash equilibrium to simulate the selections of members in a group by a game process to capture the group members' interactions and to ensure fairness.
- Designed a matrix factorization-based method (SVD) which aggregated the preferences in latent space and estimated the final group preference in rating space.
- The Nash approach had a Hit Rate 10% with a Harmonic(a fairness metric)1.09 while AVG method only had a Hit Rate 8% with a Harmonic 1.01.
- Awarded with *Outstanding Students Research* of USTC in 2015, Hongke Zhao, Qi Liu, Yong Ge, Ruoyan Kong, Enhong Chen, *Group Preference Aggregation: A Nash Equilibrium Approach*, In *Proceedings of the 16th IEEE International Conference on Data Mining (ICDM'16)*, Barcelona, Spain, 2016, 679-688

#### **Effect of Intramuscular Fat on Skeletal Muscle Mechanics**

07/2015-09/2015

*Undergraduate Summer Research Program*

*Simon Fraser University(SFU)*

*Supervisor: Prof. Nilima Nigam(SFU)*

- Realized different types of skeletal muscle by finite element tool dealii.
- Analyzed the mechanics of different types of skeletal muscle.

#### **A Bayesian Network in Stock Market**

12/2016-04/2017

*Supervisor: Mr. You Zhang (Chairman)*

*Derivatives-China*

- Built a bayesian network to predict linked rise or linked fall events in the stock market.
- Found the upper bound of the theoretical error and the practical error of the bounded variance algorithm.
- Brought a consistent 15.1% Year To Date (YTD) Return with a max drawdown 3.9% and a monthly sharpe 2.7 for the company.

#### **A Half-supervised Hidden Markov Model to Forecast Index Futures**

12/2016-04/2017

*Supervisor: Mr. You Zhang (Chairman)*

*Derivatives-China*

- Designed an algorithm to estimate HMM by Baum-Welch segmentally and combined the estimations by Adaboost to suit changeable economy environments and let HMM's hidden states make sense (e.g. the daily directions of index futures).
- Designed a parallel-serial optimization method to get the global solution of Balm-Welch algorithm in industry.
- Realized the code including database interface, model prediction, model back-testing, and daily automatic generation of reports.
- Brought a consistent 10.6% Year To Date (YTD) Return with a max drawdown 3.6% and a monthly sharpe 2.1 for the company.

#### **A Markov Chain Monte Carlo (MCMC) Method to Estimate HMM**

05/2017-09/2017

*Supervisor: Mr. You Zhang, thanks to Prof. Thomas J. Sargent's advice*

*Derivatives-China*

- Designed the algorithm to estimate HMM by Markov Chain quasi-Monte Carlo (MCQMC) with Sobel sequence to solve the dimension diasters in Balm-Welch method.
- Predicted GDP by a HMM estimated by MCQMC. The results showed that MCQMC has a lower error rate(0.52) in the estimation of HMM's parameters (e.g. covariance matrix) who have high dimensions and large value compared to Balm-Welch method(0.83).

## **INTERNSHIP**

#### **Learn Order Execution Problem by Monte-Carlo Learning**

03/2016-06/2016

*Supervisor: Mr. Siwei Chen (Investment Department's Director)*

*Guangzhou Securities*

- Built a model-based reinforcement problem and applied backward induction algorithm to large order execution.

- Found the upper bound of the practical error of Q-learning.
- Derived the optimal strategy for the firm to execute orders to minimize impact cost.

## TEACHING EXPERIENCE

### Teaching Assistant in Mathematics and English

2014

*Kongdian Middle School*

*Kongdian Village, Anhui Province*

- Enhanced students' studying enthusiasm for Math and English through games and educational activities with limited resources in an underdeveloped village.
- Improved students' average scores in Mathematics and English. Awarded with *Advanced Social Practice Student Prize*.

## SERVICES

### Multimedia Technical Support

09/2016-09/2017

*Liaison Department of Student Union*

*Tsinghua University*

- Supported large screen interactive multimedia display system in freshman orientation evening, Nanshan Ph.D Candidates Conference.

### Violinist

09/2013-09/2015

*School Orchestra*

*University of Science and Technology of China*

## SKILLS

### Computer Speciality

- C++, Python, C#, Java, Sql, Matlab
- Pandas library, sklearn library, theano library, pymc library, Unity, dealii

### Mathematics Speciality

- Numerical Methods, PDE, Optimization, Monte Carlo Simulation

### Finance Speciality

- CFA Level I, Securities/Funds Practitioner Qualification Certificate

## PUBLICATIONS

- Hongke Zhao, Qi Liu, Yong Ge, Ruoyan Kong, Enhong Chen, Group Preference Aggregation: A Nash Equilibrium Approach, In Proceedings of the 16th IEEE International Conference on Data Mining (ICDM'16), Barcelona, Spain, 2016, 679-688