

# Yuan Chen

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## Education

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### M.S. in Statistics

THE GEORGE WASHINGTON UNIVERSITY

**Expected 2021**

Washington, DC

○ **GPA:** 4.0/4.0

○ **Course Work:** Mathematical Statistics I & II, Real Analysis, Regression Analysis, Measure Theory and Integration, Stochastic Process (Ph.D. level)

### B.E. Environmental Science

HOHAI UNIVERSITY

**June 2019**

Nanjing, China

○ **GPA:** 90.7/100; **Math-GPA:** 99.3/100; **Rank:** the 1<sup>st</sup> place

○ **Course Work:** Calculus & Advanced Calculus, Linear Algebra, Probability Theory and Mathematical Statistics, Data Analysis, Machine Learning, Partial Differential Equations, Geographical Information System, Statistics and Life, Bayesian Statistics I & II (online), Practical Time Series Analysis (online)

## Research Interests

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- Numerical methods for Partial Differential Eq.s: Finite Element Method, Deep Galerkin Method
- Interface problems: Partial Differential Eq.s with discontinuities in coefficients across 'interfaces'
- Immersed finite element method (IFEM) for interface problems
- A-Prior error analysis for Immersed finite element method
- Applications of statistics and computational fluid dynamics on environmental problems

## Publications & Presentations

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### Published and Processing Journal Articles

4. YUAN CHEN, XU ZHANG, AND SONGMING HOU, (2020).  
Error Estimates for a Partially Penalized Immersed Finite Element Method for Elastodynamics Interface Problems, in preparation.
3. YUAN CHEN, SONGMING HOU, AND XU ZHANG, (2020).  
A Bilinear Partially Penalized Immersed Finite Element Method for Elliptic Interface Problems with Multi-domains and Triple Junction Points, *Results in Applied Mathematics*, under review.
2. YUAN CHEN, HUA WANG, HUAIYU YAN, DONGFANG LIANG, AND RUOSHUI LI, (2019).  
Relation of Energy to Temporal and Spatial Variations of Nutrient Distribution in Binhu Network, *Environmental Science and Pollution Research*, under review.
1. YUAN CHEN, SONGMING HOU, AND XU ZHANG, (2019).  
An Immersed Finite Element Method for Elliptic Interface Problems with Multi-domain and Triple Junction Points. *Advances in Applied Mathematics and Mechanics*, 11(2019), no. 5, 1005-1021.

### Presentations

1. AMS Southeastern Sectional Meeting, University of Virginia, March 2020.  
**Contributed Talk:** Immersed Finite Element Methods for Interface Problems with Multi-Domains and Triple-Junction Points.

## Research Experiences

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### Research on Elastodynamic Interface Problems

Washington, D.C.

Co-advised by Dr. Xu Zhang and Dr. Songming Hou

Dec. 2019 – Present

- Designed a fully discrete scheme for time-dependent elasticity interface problems based on Partially Penalized Immersed Finite Element Method (PPIFEM)
- Implemented multi-processing programs to verify the proposed scheme on numerical examples, showed optimal order convergence in  $L_2$  and semi- $H_1$  norm with NumPy, SciPy in Python
- Prove the unconditional stability for Symmetric Partially Penalized Immersed Finite Element scheme
- Completed a-prior error estimation for proposed scheme: prove the optimal convergence of numerical solution in energy norm and  $L^2$  norm under the standard piecewise  $H^2$  regularity assumption of exact solution

### Research on Multi-domain Elliptic Interface Problems

Washington, D.C.

Advised by Dr. Songming Hou

July 2017 – Aug. 2018

- Solved continuous elliptic interface problems with multi-domains and triple junction points by establishing a linear interpolation scheme based on Classical Immersed Finite Element Method (IFEM)
- Implemented proposed method on three numerical examples in NumPy in Python to show the optimal order convergence of numerical results in  $L_2$  and semi- $H_1$  norm
- Solved two-domain elliptic interface problems with discontinuous jump condition by extending Classic IFEM with an extra term and verified the optimal convergence in  $L_2$  and semi- $H_1$  norm numerically

Improvement with Partially Penalized Immersed Finite Element Method

Feb. 2019 – Nov. 2019

- Extended Partially Penalized Immersed Finite Element Method (PPIFEM) with an extra jump term to solve 2-domain continuous elliptic interface problems with non-homogeneous flux jump
- Implemented proposed method on numerical examples with NumPy, SciPy in Python to show the optimal order convergence in  $L_2$ , semi- $H_1$  norm
- Established a new bilinear interpolation scheme and a corresponding weak formulation with additional penalty on triple elements to solve elliptic interface problems with multi-domains and triple junction points
- Proved trace inequalities and degeneracy property of local linear system and verified optimal order convergence in  $L_2$ , semi- $H_1$  norm without deterioration of the method numerically

### Research on River Dynamic Measurement

Nanjing, China

Advised by Dr. Hua Wang

Feb. 2019 – Aug. 2019

- Developed an estimator for river mechanism energy measuring based on Gauss Quadrature and calculated energy of Binhu network numerically by Python with measured hydrology data & numerical simulation data
- Established a negative exponential relationship between river mechanic energy and nutrient concentration using curve fitting equipped with least square method, implemented with Python
- Developed a data operate system supports data sheet calculation and data visualization to cleanse, manipulate and visualized 5 million rows of spatial hydraulic and water quality data by Python.

## Projects

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### Project of House Price Prediction in King County, WA, Kaggle.com

Washington, D.C.

Project Leader

Nov. 2019 – Dec. 2019

- Cleansed approx. 4000 rows of house property sales records and city economics data in King county, Washington using Pandas in Python, plotted heat map for average house price distribution by QGIS
- Established a linear model for house price and 15 variables with cleansed data, evaluated and selected possible reduced models using Akaike information criterion (AIC) and Bayesian information criterion (BIC) by R
- Tested and modified selected models to meet assumptions of linear regression by R: excluded outliers with Cook's distance and Studentized Residual Rules, removed correlated variables with Generalized Variance Inflation Factor (GVIF), transformed dependent variable to keep residual variance constant, employed Durbin-Watson Test to test autocorrelation in the residuals, applied Shapiro-Wilk test to check residual normality
- Applied Cross Validation to determine the final model with proper assumptions holding and R-square 0.7

## **Project of Statistical Analysis on Energy Policy, Key Shallow Lake Lab.**

*Project Assistant*

**Nanjing, China**

*Dec. 2017 – Dec. 2018*

- Used Logarithmic Mean Divisia Index (LMDI) model to decompose carbon emission from Beijing thermal power plants into five social-economic and environmental indexes in Python, including the economic growth, population growth, energy intensity, energy structure and emission coefficient
- Visualized the trends of five indexes from 1997 to 2015 in Python, explored drivers and resistances in mitigating CO<sub>2</sub> emission of Beijing's thermal plants and advised on future eco-friendly energy policy
- Collected approx. 12 million rows of data on African nitrogenous plant trade volume, cleansed and manipulated the data to produce nine input-output tables with Pandas in Python to analyze the scale of nitrogen commerce between Africa and other continents

## **Project of Shared Bicycle Management, IETP Program of Hohai University**

*Project Leader*

**Nanjing, China**

*Mar. 2017 – June 2018*

- Applied Seasonal ARIMA forecast model in R to process 2,000 pieces of field Bicycle data to predict the bicycle demands in each control area at any given time of the day
- Adjusted the number of available bicycles based on the forecast results to meet the fluctuating demands of specific areas

## **Professional Experiences**

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### **Mobike Technology Co., Ltd. (Meituan.com)**

*Intern Product Manager in Department of Data Analysis*

**Beijing, China**

*June 2018 – Sept. 2018*

- Retrieved and aggregated 1 million rows of raw data from mobile app to analyze users behavior for optimizing function design
- Developed a user classification function on Mobike internal platform to filtrate user data according to constraints including users' personal backgrounds, physical & value characteristics and past orders for optimizing effects of targeted campaigns
- Visualized and analyzed label data on malfunction of different bike types by using Circos and Sankey diagrams in Echarts & D<sub>3</sub> to detect the association between a specific bike type and particular cause
- Isolated the testing and formal data production environments to decrease the risk of data production failure

## **Scholarships & Achievements**

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| ○ HOHAI UNIVERSITY Honored Student Scholarship   | 2016, 2018, 2019 |
| ○ HOHAI UNIVERSITY Science & Technology Innovation Scholarship                                     | 2019             |
| ○ Certificate of Honored Achievement in Bayesian Statistics I & II, Coursera online course by UCSC | 2018             |
| ○ Certificate of Achievement in Practical Time Series Analysis, Coursera online course by SUNY     | 2018             |
| ○ 3 <sup>rd</sup> Prize of China Undergraduate Mathematical Contest in Modeling                    | 2017             |

## **Skills**

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| ○ <b>Coding</b>        | C, C++, Python, R, SQL, L <sup>A</sup> T <sub>E</sub> X, VB, MATLAB                 |
| ○ <b>Data Analysis</b> | Python (pandas, matplotlib, geopy), R (ggplot), QGIS, ECHARTS, D <sub>3</sub> , sas |
| ○ <b>Algorithm</b>     | C, C++, Python (NumPy, SciPy, SymPy, multiprocessing compute), MATLAB               |
| ○ <b>Misc.</b>         | Academic Research, MS Office & VBA, Axure RP, Markdown                              |
| ○ <b>Language</b>      | Mandarin Chinese, English   |