Charles **Zhang**

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"Be the change that you want to see in the world."

January 29, 2020

Esra Kadioglu Urtis

Professor
Mathematics,Statistics, and Computer Science Department
Macalester College
Saint Paul, MN 55105

Dear Professor Kadioglu,

About Me

I was thrilled to see your listing for the research: ***Learning Based Area Coverage*** for Summer 2020. As a highly passionate Mathematics and Computer Science student at Macalester College with a solid background in mathematical modelling, programming, and data analysis, I am confident that I would be a strong addition to your team.

Why This Research?

While competing in the Mathematical Contest of Modelling for drones light show, I was responsible for building mathematical models to determine the drones' locations and flight routes based on the configuration transformed by pictures using MATLAB and Python. Experience in this project allowed me to hone my modelling skills and the ability to present non-technical design to mathematical languages and programming. At that time, I was indulged in the beauty of combination among mathematics, computer programming, and piratical applications, so now I yearn for learning and then unveiling the much more impeccable system for the localization and coverage of drones involved in your research, improving my understanding of the deep learning and providing me experience for further study of artificial intelligence in graduate school in the future.

Why Me?

I am a self-motivated and fast learner. I love learning extra knowledge that I am interested in by myself. In the winter break, I learned machine learning and I won 13^{th} place out of 19526 teams and individuals(0.06%) in Kaggle Data Science competition building models in Python for the prediction of house prices. I long for a deeper understanding of machine learning as well as deep learning and neural network, so I am learning OpenCV and Tensorflow in Python(R) now by myself. Therefore, I wish eagerly that I can have this opportunity working with your research to learn how to make modellings for robot path planning, coverage algorithms and reinforcement learning. I am not only a self-learner but also a born team player. In the last semester, I collaborated with two other students at Macalester College and won 9^{th} place in the Mathematical Association of America-North Central Section(MAA-NCS) Team Contest.

For your convenience, I have attached a resume that further outlines my relevant skill set, experience, and accomplishments. Thank you for your consideration, and I look forward to hearing from you soon!

Sincerely,

Charles Zhang

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Education

Macalester College, Saint Pual, MN *B.A. Expected May 2023*

Major GPA 4.0/4.0 *Mathematics, Computer Science*

- Charles J. Turck Presidential Honor Scholarship(Four-year scholarship)
- **Relevant Coursework**: Computational linear algebra, Complex Analysis, Data Structure, Applied Multivariable Calculus, Linear algebra, Discrete Mathematics, Intro to the Data Science, Digital Ethics

Skills

Programming **R**(ggplot, ggmap, plotly, leaflet, gganimate, rvest, shinny), **Python**(numpy, pandas, easygui, matplotlib, xgboost, openCV, tensorflow), **Java, MATLAB, SQL, HTML, CSS, Markdown, TEX, COMSOL**

Experience

Teaching Assistant *St. Paul, MN*

Mathematics, Statistics and Computer Science Department, Macalester College *Jan. 2020 - PRESENT*

- Teaching Assistant(Preceptor) in STAT/COMP 112 Intro to the Data Science at Macalester College
- Help 48 students in two class sessions with realize multivariate visualization, data wrangling, interactivity, Leaflet, scraping data, Shinny APP, SQL, and machine learning by *R*(RStudio)

Math Tutor *Jinan, China*

Self-employed *Jun. 2019 - Aug. 2019*

- Designed one-to-one study programs based on high school curriculum to help students excel in learning mathematics everyday in summer holiday in China
- Developed a class timing and scheduling system by *Python* for students having classes in record

Conference Member *Beijing, China*

the First BRICS Mathematics Conference *Jul, 2017 - Aug. 2017*

- Was invited to attend and listen series of worldwide cutting-edge mathematical lectures from the conference at Chinese Academy of Sciences
- Consulted mathematicians from five BRICS(Brazil, Russia, India, China and South Africa) countries and made a manuscript

Projects

Kaggle: House Price Prediction

13^{th} placs(0.06%) out of 19506 teams *Jan. 2020 - Feb. 2020*

- Using Ridge, Lasso, LGBM, XGB, and Stacking CV Regressor, and series of data visualization and analytical techniques to reach 0.10643 root mean squared logarithmic error and 12449.19063 mean absolute error, got 13^{th} place, 0.06% out of 10506 teams(individual)

R for Data Science: Pizza Party

Final Project for Data Science course at Macalester College *Oct. 2019 - Dec. 2019*

- Using some data from TidyTuesday's Pizza Party data-set, analyzed and created methods and visualizations for a pizzeria that everyone would like in New York

Mathematical Modeling for Drone Light Show

Honorable Mention out of 938 teams in Mathematical Contest in Modeling *Jan. 2018 - Feb. 2018*

- Using *MATLAB*, I built models to determine the required number of drones and every drone's initial location during the process.
- Any simple pictures or icons could be designed for the drone show by my *MATLAB* program.

Design and Optimization of Comb Drive Accelerator for High Frequency Oscillation

Published in Modern Mechanical Engineering Vol.8 No.1, February, 2018 *Apr. 2017 - Feb. 2018*

- This project is mentored by a doctor at UCLA and the final paper was published. In this work, using *COMSOL* and *MATLAB*, a finite element code was used for the design, optimization, and visualization of a comb drive accelerator.

Generalizations of Locus about Fixed Point and Fixed Line Moving to Magnify and Shrink

Published in Mathematical Study and Research Vol 19, 2017 *Sep. 2016 - Feb. 2017*

- This Chinese geometrical paper is for mathematical Olympics competitions, generalized series of problems of locus by an elegant method and visualized by *Geometer Sketchpad*

Honors

Jan, 2020	**13th place(0.06%) out of 19506 teams,** Kaggle Data Science Competition	*U.S.A*
Dec, 2019	**Top 9,** The Mathematical Association of America-North Central Section(MAA-NCS) Team Contest	*U.S.A*
Feb, 2018	**Top 5%,** American Mathematics Competition(AMC12)	*U.S.A.*
Nov, 2017	**Honorable Mention,** Mathematical Contest in Modeling	*U.S.A*
Sep, 2017	**First Prize,** Chinese Mathematics League	*China*