Xinyu Zhong

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Education

University of Cambridge — Cambridge, United Kingdom
Bachelor of Art — *Expected December 2023*

- Physics
- Math
- Materials science

Experience

Research on algorithm design — March 2019 - June 2019
Ant Colony Algorithm — *Beijing, China*

- Study and optimization of Ant Colony Algorithm on path planning.
- Improved the update of pheromone in ACO to reduce the chance of been traped in local optimal solution.
- Designed a new algorithm based on the original ACO called Partial Ant Colony Algorithm.
- Using Python test and applied the designed algorithm on path planning problenm.
- Published a paper on EEEP2019.

Apply for Ross Mathematics program — January 2019 - February 2019
Applicant — *Beijing, China*

- Accomplished 4 big and complex problems, wrote a 60 pages solution.
- Topics include number theory, series and sequence, linear algebra, geometry, functions in complex field.
- Was accepted by the program, the acceptance rate was less than 10 percent.
- Using Python test and applied the designed algorithm on path planning problenm.
- Published a paper based on the result with one partner.

Ross Mathematics program — June 2019 - August 2019
Fresher — *Ohio, United States*

- Devoted and profound study on number theory for 1.5 months.
- Studied Ring theory, Filed theory, Vector space, Group theory.
- Deeply studied all kinds of arithmetical functions.
- Deeply studied the properties of the residue system of primes.
- Proved the residue systems of primes are cyclic groups.
- Proved Fermat's two square theorem by using residue system of primes.
- Proved Fermat's two square theorem by using Minkowski's theorem and geometry.
- Proved Quadratic reciprocity.
- Introductory level to p-adic numbers.

Competitions

CAP High School Physics Prize Examination — April 2019
Canadian Association of Physics — *Beijing, China*

- Out Standing Award Globally
- Gold Award Nationally
- Top five in China

2019 ASDAN Math Tournament — August 2019
ASDAN China — *Beijing, China*

- High Distinction in Algebra, Top 10 percent
- Top 10 in Geometry, Top 10

Australian Mathematics Competition — 2018
Australian Mathematics Trust — *Beijing, China*

- Distinction level, Year eleven

National Junior Electronic Engineer Championship — August 2016
China Radio Sports Association — *Chengdu, China*

- 1 gold medal and 1 silver medal

Projects

Simulation of refraction | *Python, Optical geometry* July 2021 – July 2021

- Use Python and pyplot library to simulate the refraction of light
- Able to simulate any shape of lens and refractive index
- The light may com4 from any chosen direction
- Able to simulate refraction of light in a multiple layered lens
- The program was created as a library and can be easily imported to use

Matrix Calculation | *Python, Linear algebra* October 2021 – October 2021

- Created a python library to carry out all arithmetic calculation on matrix
- Functions include but not limited to find inverse, multiplication, Hermitian, cominor.

Wave Dispersion | *Python, Wave* November 2021 – November 2021

- Using python to simulate the dispersion of wave
- Output a GIF or video document to show the dispersion of waves as time goes on

Simulate Fraunhofer Diffraction Pattern | *Python, Fraunhofer diffraction* November 2021 – November 2021

- Using python to simulate the diffraction pattern of plane wave with a given shape of aperture
- The result shows the intensity of light at the screen
- The intensity is represented by the depth of color
- An algorithm was designed to convert intensity to color
- An algorithm was designed to find the 2D Fourier transform

Factorial | *Analytic continuation, Calculus* February 2020 – February 2020

- Find a function of the analytic continuation of factorial function
- The domain of factorial function was expanded from integer to real number
- This function can be proved is essentially equivalent to Gamma function
- A detailed note about how it is derived and the source of my idea was taken done

Albumen Curve | *Mathematics, Geometry* March 2020 – March 2020

- Define a type of curve called 'Albumen curve'
- It was defined as rotating a length at certain angle around any closed curve
- The calculation of the area of these curves was studied, a general formula was summarized
- A detailed note about how it was derived was taken done

Find 24 | *Python, Probability* December 2020 – December 2020

- Wrote a Python library to play the classical poker game 'calculate 24'
- The program can automatically give the expression of answer
- An algorithm with high efficiency was designed
- The program was than used to study the probability of 'having solution' for all integers

Calculation of Root | *Computational mathematics* March 2018 – April 2018

- Find an efficient algorithm to calculate $\sqrt[n]{m}$
- My partner and I found an iterative formula to approximate $\sqrt[n]{m}$
- The accuracy of this algorithm increase exponentially with the number of iterations
- The algorithm was tested by Python program and the result is satisfactory
- A complete note including the math derivation, source of our idea and test results was taken down

Technical Skills

Familiar with Python programming
Familiar with Latex
Familiar with multiple developing environments, include PyCharm, Spyder, JupiterNote, VS code
Familiar with the use of Excle, Word Document and Power Point
Familiar with multiple libraries in Python, include numpy, pyplot, pandas, and so on
Be able to create and use my own python libraries
Introductory level to DataBase and SQL language
Knowledge of circuit design and welding techniques