CHAU, Yu Foon Darin

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About me

Hi! I am Darin. I am a mathematics and computer science undergraduate student from HKUST. I am a motivated computer science and mathematics student with experience in research, Unity, and programming languages such as Python, C++, Rust. In my free time I love to play classical music on the piano.

Education

2020 – Present **Hong Kong University of Science and Technology** – Hong Kong
BSc in Mathematics (IRE) + Computer Science (COSC)
Cumulative GPA: 3.813
Major Cumulative GPA: 3.862

2023 – Present **University of California, Irvine** – Irvine, CA
BSc in Mathematics (Exchange)

Selected coursework

- MATH5111 Advanced Algebra I (Grade: A)
- MATH2043, MATH3043 Honors Real Analysis I, II (Grade: A, A)
- MATH4985A Commutative Algebra (Grade: A+)
- MATH4141 Number Theory and Applications (Grade: A)

Honors and scholarships

Spring 2022 S.S. Chern Scholarship : Hong Kong University of Science and Technology (Math Department)

Spring 2022 Dean's List : Hong Kong University of Science and Technology

Fall 2021 Dean's List : Hong Kong University of Science and Technology

Spring 2021 S.S. Chern Scholarship : Hong Kong University of Science and Technology (Math Department)

Fall 2020 Dean's List : Hong Kong University of Science and Technology

Industry experience

2021 - 2022 **Software Developer** (Music is the Key)
Developed chatbot utilizing natural language processing & machine learning algorithms to decipher music preferences, delivering personalized content and grew the community by 5 times. Optimized & automated functionality of the chatbot by creating APIs for scalability, resulting in response time reduced by 15%.

2020 - 2021 **Software Developer** (Youthniverse)
Developed a profile matching mobile application for a startup non-profit organization using React Native. Utilized various React Native components to create a user-friendly interface. Incorporated the AI matching algorithm for profile matching using regression techniques to connect users with similar interests and goals.

Development languages and tools

Languages Python, Javascript, C++, C#, Rust

Tools for ML PyTorch, Numpy, Keras, TensorFlow, Pandas, MatPlotLib, OpenCV

Other tools React, Angular, Vue, Firebase, Unity3D, HTML, CSS, Yew, Microsoft Excel, Powerpoint

Research experience

Sep 2022 - Dec 2022 **Cluster algebra** (Algebraic Geometry/Algebraic Combinatorics - Math)
Supervised by Prof. Ivan Ip. This research project investigates the positivity theorem of cluster algebras and the combinatorial tools developed by Gross et. al. for the proof.

Jun 2022 - Aug 2022 **Crowd Counting using CNN** (Machine Learning - CS)
Supervised by Prof. Gary Chan Sheung-Han. This research project investigates the Parasite-Host CNN model developed by Meng et. al. for video crowd counting. We developed a synthetic dataset to test the model with datasets of 4K resolution, and suggested slightly modified model structure that might lead to better results.

Feb 2022 - May 2022 **Cluster algebra** (Algebraic Geometry/Algebraic Combinatorics - Math)
Supervised by Prof. Ivan Ip. This research project investigates the cluster algebraic structure over tensor invariant rings. We developed a theorem about the classification for the case $n = 9$ and made conjectures about the underlying graph structure of the mutation graphs of the cluster algebras.

Publications

2022 **Cluster algebras and total positivity**
D. Chau
Submitted to Prof. Ivan Ip as part of the course requirements for SCIE3500.

2022 **Video crowd counting using Parasite-Host network**
J. Chang, D. Chau
Submitted to Prof. Gary Chan Sheung-Han as part of the course requirements for UROP1100.

2022 **Cluster Algebras over $SL(V)$-invariant Tensor Spaces**
D. Chau
Submitted to Prof. Ivan Ip as part of the course requirements for UROP1100.

2022 **History and Applications of Cluster Algebra**
D. Chau
Submitted to Prof. Ivan Ip as part of the course requirements for SCIE2500.

2021 **A self-contained, intuitive explanation on the insolvability of the quintics**
D. Chau
Math Journal (In preparation), commissioned by St. Joseph's College Maths Society.

2021 **Interesting irrationality proofs**
D. Chau
Math Journal (In preparation), commissioned by St. Joseph's College Maths Society.

Teaching experience

Fall 2022 **Mentor, MATH1012: Calculus I** (Hong Kong University of Science and Technology)
Undergraduate student helper in the Mathvengers programme organized by the Science School, for first year science undergraduates who under-performed in HKDSE public exam.

Summer 2022 **Undergraduate TA, COMP2211** (Hong Kong University of Science and Technology)
Undergraduate teaching assistant for the course COMP2211, in charge of creating self-tests for the course materials.

Spring 2022 **Teaching Assistant, Math Olympiad Training** (St. Joseph's College)
Alumni student helper training secondary school students in competitive mathematics. Main topics included Number Theory and Combinatorics.
Average student rating: N/A.

Fall 2021 **Mentor, MATH1012: Calculus I** (Hong Kong University of Science and Technology)
Undergraduate student helper in the Mathvengers programme organized by the Science School, for first year science undergraduates who under-performed in HKDSE public exam.
Average student rating: 4.8/5.

Spring 2021 **Teaching Assistant, Math Olympiad Training** (St. Joseph's College)
Alumni student helper training secondary school students in competitive mathematics. Main topics included Number Theory and Combinatorics.
Average student rating: N/A.

Talks and outreach

Fall 2022 Cluster Algebra and Total Positivity
Presentation to fulfill part of the course requirements for SCIE3500. We present a proof to the Laurant Positivity theorem in the theory of cluster algebra due to Gross et. al. and Nakanishi.

Fall 2022 A monad is a monoid in the category of endofunctors
Talk commissioned by HKUST Math Journal Club. We present a high level introduction to Category Theory and discuss about its applications in functional programming and implications in other fields of mathematics.

Summer 2022 Introduction to cluster algebras
Presentation to fulfill part of the course requirements for SCIE2500. We present a brief introduction to cluster algebras and present the works by Fomin and Pylyavskyy on $SL(V)$-invariant tensor spaces.

Spring 2022 Why the piano is mathematically out of tune
Talk commissioned by St. Joseph's College Math Society. We present a basic introduction to limits and measure theory from the perspective of a piano player.

Spring 2021 Pi Day - π is irrational
Talk commissioned by St. Joseph's College Math Society. We present a simplified proof that π is irrational via graphical methods and elementary calculus.

Summer 2020 An Elegant Fact about Prime Numbers (Fermat's Two Square Theorem)

Talk commissioned by St. Joseph's College Math Society. We introduce the Fermat's Two Square theorem and provide an argument accessible to junior secondary school students based on combinatorial theory, modified from a proof by David Christopher (2016)