



# KIAHAN MAO

My brain is open.

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## TAUGHT

Algorithm Analysis

Combinatorics

Linear Algebra

Operations Research

Math in Real-life Applications

Probability

Algorithms Design

## CLASSROOM TOOLS

WooClap

Google Colab

TurningPoint (Clicker)

Cocalc (SageMath Cloud)

Flipped Classroom

Team-Based Learning

## LANGUAGES

Proficient: Python, Sage-Math, LaTeX

Novice: Javascript, HTML

## NTU STUDENT FEEDBACK ON TEACHING

All student feedback can be accessed here.

## TEACHING PHILOSOPHY

What humans have to learn is not mathematics as a closed system but rather as an activity, the process of **mathematising reality**.

Freudenthal (1968) "How to Teach Mathematics so as to Be Useful"

## EXPERIENCE

Assistant Professor | School of Physical and Mathematical Sciences  
Nanyang Technological University

May 2015 – present    Singapore

- Taught 30 courses, spanning 11 different course codes.
- Implemented a variety of pedagogical strategies like *flipped classroom* and *team-based learning*.
- Utilized interactive innovations like *CoCalc* and *WooClap*.
- Average Student Feedback Score: 4.68/5.
- Mentored high school research projects, including one that resulted in this preprint (arXiv:2108.09290)

- ♥ SPMS Teaching Excellence Award AY 2015-2016, AY 2016-2017, AY 2018-2019.
- ♥ International Symposium on Information Theory and Its Applications 2022 Early Career Researcher Paper Award Winner (Researcher: D. T. Dao)
- ♥ International Symposium on Information Theory and Its Applications 2020 Best Student Paper Award winner (Student: J. Chrisnata)

Postdoctoral Research Associate | Coordinated Science Laboratory  
University of Illinois at Urbana-Champaign

Feb 2014 – Feb 2015    USA

Naval Officer | Republic of Singapore Navy

Jan 2006 – Jun 2010    Singapore

## EDUCATION

PhD in Mathematics | Nanyang Technological University

2010 – 2014    Singapore

B. Sc. in Mathematics, 1st Class Honours, in Mathematics | National University of Singapore

2002 – 2006    Singapore

- Singapore Mathematical Society Medal and Prize, 2006
- Singapore National Academy of Science Award, 2006
- Dean's List, National University of Singapore, 2002-2006
- Lim Soo Peng Book Prize, 2004

# SAMPLE OF COURSES TAUGHT

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## Mathematics in Real-World Application | [MH8300](#)

📅 Academic Year 2015–2020

- **Undergraduate course** with 300 to 400 students (including students from Business and Arts Schools).
  - **Topics covered:** Modular Arithmetic with applications to communication theory and cryptography. Graph theory with applications like DNA and PageRank.
  - **Flipped classroom** (pre-COVID-19)
    - Instructional content delivered via videos
    - Routine exercises conducted via an online platform
  - **Team-based learning**
    - In-class activities prioritized, focusing on real-life applications
    - For example, during one session, we orchestrated group exercises involving the implementation of the *Diffie-Hellman key exchange protocol*. Illustrated to students the concept of secure communication within a public environment.
  - **Average Student Feedback Score:** 4.63/5
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## Algorithms for the Real World | [MH3400](#)

📅 Academic Year 2015-2018

- **Undergraduate course** with 50 to 60 students.
  - **Topics covered:** Algorithm analysis and design. Design techniques include divide-and-conquer and dynamic programming.
  - Unlike traditional algorithm courses, great emphasis placed on students' implementation of algorithms in Python
  - Designed exercises around implementation
  - Leveraged cloud platforms (like [CoCalc](#)) for real-time script debugging and feedback
  - Integrated TurningPoint for immediate student responses in lab sessions
  - **Average Student Feedback Score:** 4.74/5
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## Operations Research | [MH6201/MH6202](#)

📅 Academic Year 2018 – 2023

- **Graduate course** with 50 to 70 students.
  - **Topics covered:** fundamental optimization techniques.
  - Integrated realism through the use of PuLP, a Python library for linear programming
  - Assignments designed to develop conceptual understanding by preventing correct solutions through direct calling of library functions
  - Final assignment required application of cutting-plane and branch-and-bound methods to solve Traveling Salesperson Problem (TSP)
  - **Average Student Feedback Score:** 4.67/5
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## Combinatorics | [MH4300](#)

📅 Academic Year 2020 – 2022

- **Undergraduate course** with 10 to 20 students.
  - **Topics covered:** Combinatorics, the study of enumerating discrete structures.
  - Utilized Sedgewick and Flajolet's "Introduction to the Analysis of Algorithms" instead of traditional combinatorics texts
  - Employed advanced combinatorial techniques to analyze performance metrics of algorithms.
  - Designed assignments requiring students to use combinatorial techniques to evaluate algorithm performance
  - Demonstrated power of techniques in class using [Colab notebooks](#) for simple numerical experiments
  - **Average Student Feedback Score:** 4.87/5
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## Linear Algebra 2 | [MH1201](#)

📅 Academic Year 2022 – 2023

- **Undergraduate course** with 200 to 300 students.
  - **Topics covered:** Abstract linear space, eigenvectors, inner product spaces.
  - Utilized [WooClap](#) for immediate student responses during lectures
  - Questions injected during lecture to emphasize key points and address misconceptions
  - **Average Student Feedback Score:** 4.48/5
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# SERVICE CONTRIBUTIONS AT NTU

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## Outreach Representative

- Contributed to the design of publicity material
- Presented outreach talks, including a [public lecture in 2018](#) for Singapore Mathematical Society (SMS) Lecture series
- Engaged with students outside the classroom to learn about their experiences and accomplishments

## House Leader

- Introduced for SPMS students in August 2021, the House system fosters a strong community of care and support.
- Selected as House leader to advise and oversee the House captain, the corresponding student leader
- Actively engage with House members to listen, empathize, and provide guidance