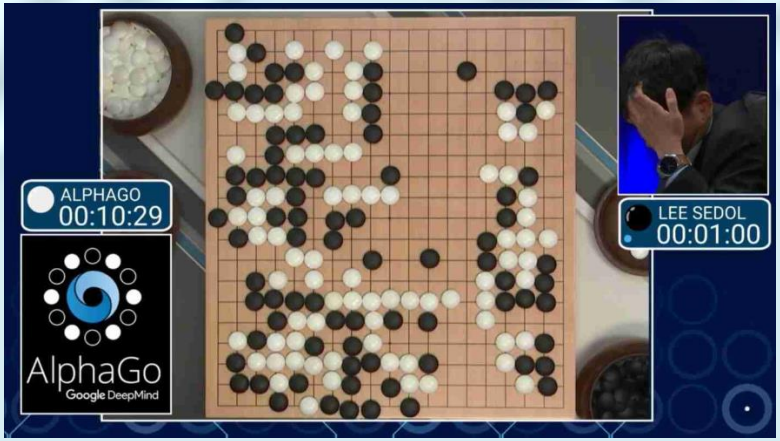
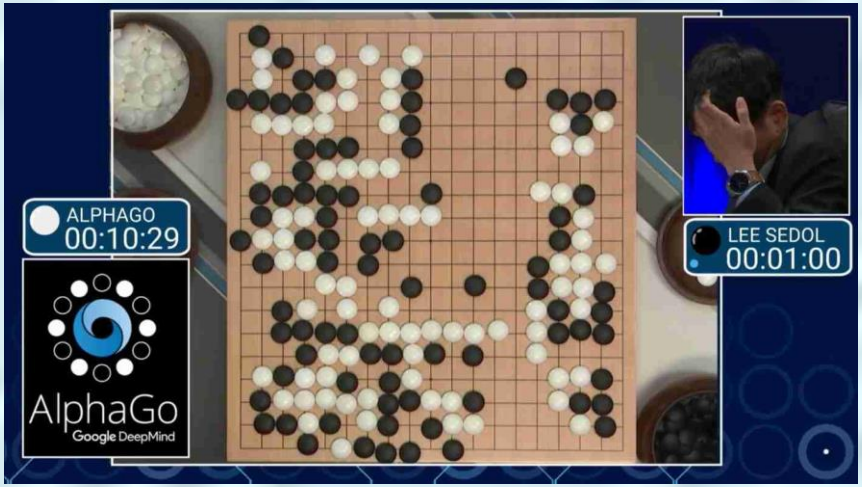
Computational Mathematics, Logistics/ Operations Research

We have five teachers working in computational mathematics and operations research and we offer many courses in these areas. Math majors who concentrate on this theme can work for banks, logistics or software companies. Indeed a lot of operations research methods are used in A.I. nowadays.



Minor in Operations Research & Mathematical Programming

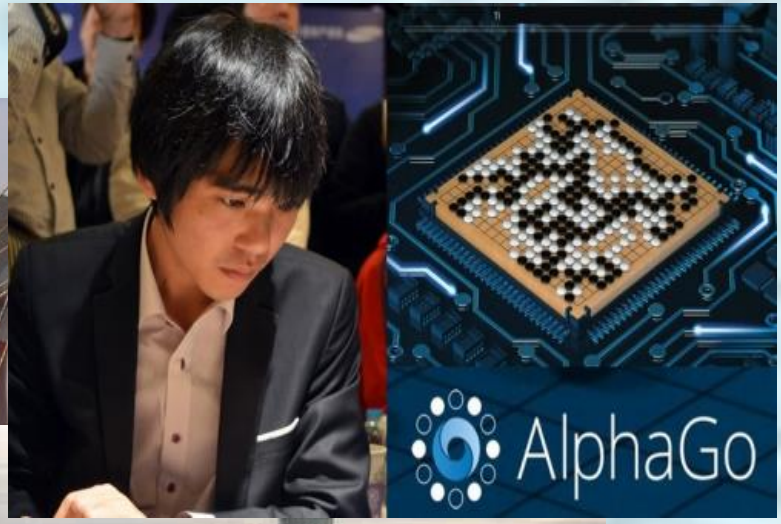


A lot of operations research methods are used in A.I.

Major in Mathematics – CMOR

Operations Research Group

Prof. W. Zang, Prof. W.K. Ching, Dr. Z. Qu



HSBC

Major in Mathematics – CMOR

- Courses in Computational Mathematics and Operations Research are taught by experts in these two areas.
- For operations research:

  Dr. Z. Qu (*École Polytechnique*)

  Prof. W.K. Ching (*CUHK*)

  Prof. W. Zang (*Rutgers*)
- For computational mathematics:

  Dr. G. Han (*Notre Dame*)

  Dr. Z. Zhang (*Tsinghua*)

  The operations research courses mainly study different types of the constraint optimization problems.

Major in Mathematics – CMOR

Constraint Optimization Problem:

- Max/Min $f(x_1,\ldots,x_n)$ under the constraints $g_i(x_1,\ldots,x_n)=0$, $i=1,..,m$.
- **MATH3901** *Operational Research I* and **MATH3902** *Operational Research II* study this optimization problem when all these functions are linear.
- **MATH3904** *Introduction to Optimization* studies the same optimization problem when some of these functions are non-linear by using multi-variable calculus.
- Numerical methods may be employed.

Major in Mathematics – CMOR

Constraint Optimization Problem (an example):

Customers redistribute themselves based on the perceived service performance (queuing time and traveling time) and customer loyalty.

Goal: Try to predict the final customer redistribution.

Major in Mathematics (4 years and at least 96 credits)

1. Introductory level courses (48 credits)

- **MATH1013 University Mathematics II (6)**
- **MATH2012 Fundamental Concepts of Mathematics (6)**
- **MATH2211 Multivariable Calculus (6)**
- **MATH2101 Linear Algebra I (6)**
- **MATH2102 Linear Algebra II (6)**
- **MATH2201 Introduction to Mathematical Analysis (6)**
- **SCNC1111 Scientific Method and Reasoning (6)**
- **SCNC1112 Fundamentals of Modern Science (6)**

2. Advanced level courses (48 credits)

- **MATH3301 Algebra I (6)**
- **MATH3401 Analysis I (6)**
- **MATH3403 Functions of a complex variable (6)**

Plus at least 24 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH6XXX level), at least 12 credits of which should be from MATH4XXX or MATH6XXX level.

Major in Mathematics – CMOR

Recommended courses:

MATH3303 Matrix Theory and Its Applications
MATH3600 Discrete Mathematics
MATH3601 Numerical Analysis
MATH3603 Probability Theory
MATH3901 Operations Research I
MATH3904 Introduction to Optimization
MATH3905 Queuing Theory and Simulation
MATH4602 Scientific Computing
MATH3902 Operations Research II
MATH3943 Network Models in Operations Research

MATH6502 Topics in Applied Discrete Mathematics
MATH6503 Topics in mathematical Programming and optimization
BUSI1003 Introduction to Management Information System
CSIS1119 Introduction to Data Structures and Algorithms
ECON0701 Introductory Econometrics
STAT3301 Time-series Analysis

Directed Studies in Mathematics (6 credits)/ Mathematics Projects (12 credits)

Selected topics in the past years:

- Exploration of the technical analysis of finance data
- Hall Theorem and Minimum Cost Network Flow (MCNF) Problems: theory, implementation and computer experimentation
- Entropy of Hidden Markov Processes
- Microarray data and diagnosis of cancer
- On Construction and Control of Probabilistic Boolean Networks

Major in Mathematics – CMOR

Job Opportunities:

- Logistics companies
- Airport Authority Hong Kong
- Banks (data mining)
- Software companies
- Transportation consulting firms