Master of Science in Artificial Intelligence [MSc(AI)]

Admission for 2023-24 Intake
What is Artificial Intelligence (AI)?

- The idea of AI can be dated back to 1935 - Alan Turing described an abstract computing machine consisting of a limitless memory and a scanner that moves back and forth through the memory, symbol by symbol, reading what it finds and writing further symbols.

- The official birthdate of this (then) new field is generally recognised as the period of July-August of 1956. Which was the year this special workshop took place.

- The workshop was proposed by John McCarthy (Dartmouth), Marvin Minsky (Harvard), Nathaniel Rochester (IBM), and Claude Shannon (Bell Labs).

- An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. For the present purpose the artificial intelligence problem is taken to be that of making a machine behave in ways that would be called intelligent if a human were so behaving.
What is Artificial Intelligence (AI)?

A Proposal for the
DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE
June 17 - Aug. 16

We propose that a 2 month, 10 man study of artificial intelligence be
carried out during the summer of 1956 at Dartmouth College in Hanover, New
Hampshire. The study is to proceed on the basis of the conjecture that every
aspect of learning or any other feature of intelligence can in principle be so pre-
cisely described that a machine can be made to simulate it. An attempt will be
made to find how to make machines use language, form abstractions and concepts,
solve kinds of problems now reserved for humans, and improve themselves. We
think that a significant advance can be made in one or more of these problems if
a carefully selected group of scientists work on it together for a summer.
Why AI? Why now?

- With recent technologies - sophisticated hardware design, coding efficacies, and computing power, AI supersedes human minds in many aspects.
- In 2016: AlphaGo crushed Lee Sedol in a game of 4-1
- In 2017: AlphaGo crushed Ke Jie in a game of 3-0
- Nowadays AI is everywhere, it’s expected that in 2025, AI industries will generate >5 trillion RMB market revenues and in 2030, >10 trillion RMB. (Development Solutions 2018)
- IBM CEO and chair Arvind Krishna believes that AI will add USD$10 trillion to global GPD by 2030
### Why AI? Why now?

<table>
<thead>
<tr>
<th>2020</th>
<th>Advanced levels of AI technologies, being important drivers of economic growth:</th>
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<tbody>
<tr>
<td></td>
<td>• Core AI industries &gt; RMB 150 billion</td>
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<td></td>
<td>• AI-related industries &gt; RMB 1 trillion</td>
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Several Chinese enterprises should achieve international competitiveness and technological breakthroughs, especially in the areas of: big data intelligence, autonomous intelligence systems, cross-medium intelligence, swarm intelligence, hybrid enhanced intelligence.

<table>
<thead>
<tr>
<th>2025</th>
<th>Leading level in some AI technologies and their applications, breakthroughs in fundamental AI theories:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Core AI industries &gt; RMB 400 billion</td>
</tr>
<tr>
<td></td>
<td>• AI-related industries &gt; RMB 5 trillion</td>
</tr>
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Wide application of AI technologies in the areas of: intelligent manufacturing, smart healthcare, smart cities, smart agriculture, and national defence. Completion of the basic legal framework for AI (standards, safety assessment, supervision, etc).

<table>
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<tr>
<th>2030</th>
<th>World leader and global centre for all AI theories, technologies, and applications</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Core AI industries &gt; RMB 1 trillion</td>
</tr>
<tr>
<td></td>
<td>• AI-related industries &gt; RMB 10 trillion</td>
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</tbody>
</table>

Deep and integrated application in all segments of the production chain, in social governance and national defence. A series of world-leading AI technology innovation bases and teams established in China.

Real world AI applications

- Smart assistants: Siri and Alexa
- Pandora and Netflix: personalised song and entertainment recommendations
- Chatbots
- TikTok: AI algorithm that got millions of users hooked
- Robotic vacuum cleaners
- Self-driving vehicles
- Facial recognition software
- Fraud prevention in credit cards
- Healthcare
Why HKU MSc(AI)? Why us?

- HKU is the “best” university in Hong Kong, top among universities in Asia, top university in the world
- The most comprehensive Masters Programme in Artificial Intelligence available in the region.
- Hosted by Department of Mathematics, and in collaboration with Department of Statistics and Actuarial Science, and Department of Computer Science
- Emphasised the role of mathematics in AI - three of the “founders” of AI held PhD’s in Mathematics
- Research and Internship opportunities
- Exceptional career prospects
World-class Rankings of HKU

Quacquarelli Symonds (QS)

QS World University Rankings 2023: #21 World Rankings
QS Asia Rankings 2022: #3

Times Higher Education (THE)

THE World University Rankings 2022: #30 World Rankings
THE Asia Rankings 2022: #4

Eminent Subject Ranking

QS World University Rankings by Subject 2022: #56 Mathematics

Top-notch Scientists in the Faculty

Clarivate Analytics' Essential Science Indicators 2021: 18% of our professoriate staff are the world's Top 1% scholars
Department of Mathematics

- Worldwide respectable department
- Leading researchers: Ngaiming Mok, Xiaoming Yuan, Michael Kwok-Po Ng, Wai-Ki Ching, Guangyue Han
- Eminent visitors: Yam-Tong Siu, Efim I. Zelmanov, Tze Leung Lai
- Awards and achievements: Future Science Prize in Mathematics and Computer Science, Chern Prize, Member of the Hong Kong Academy of Sciences, Member of the Chinese Academy of Sciences, Fields Medal Selection Committee, ICM speakers, Oberwolfach speakers, China's Excellent Young Scientists, The Young Academy of Sciences of Hong Kong, Keynote speaker at SIAM and IEEE
Department of Mathematics

- Master’s students
  - received various fellowships/scholarships
  - further study at prestigious universities - Princeton, Harvard, Columbia, Berkeley, etc.

- PhD students
  - awarded Best Paper Awards/Best Thesis Awards
  - won various international contests

- PhD graduates
  - taken up postdoctoral positions or professorships at top universities
Why do we launch an MSc in AI?

- To address the need for talents in the field
- To collaborate with the Department of Statistics & Actuarial Science and the Department of Computer Science to adopt an interdisciplinary academic focus and make our programme a comprehensive study in AI
- To provide students with foundational principles and knowledge in AI, and develop their practical skills and capabilities in applying AI to solve real world problems with ethical awareness
“Tapping into the AI expertise of our teaching team, we set out to nurture talents who will be geared up to meet the mounting demand for AI professionals both in Hong Kong and worldwide.”

Programme Director and Head of Department of Mathematics
Professor Xiaoming Yuan
Programme Team

Programme Director
Professor Xiaoming Yuan, Department of Mathematics

Associate Programme Director
Professor Guangyue Han, Department of Mathematics

Programme Coordinator
Dr Fai Lung Tsang, Department of Mathematics
Programme Features

- Interdisciplinarity
- Well-balanced curriculum
- Learning within and beyond AI
- Industry connections and career prospects
# Programme Information

<table>
<thead>
<tr>
<th>Mode of Study</th>
<th>Full-time (daytime, evenings, and/or weekends)</th>
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<tbody>
<tr>
<td>Study Period</td>
<td>1.5 years</td>
</tr>
<tr>
<td>Tuition Fees</td>
<td>HK$300,000* for the 2023-24 intake; payable in three instalments over 1.5 years for full-time study. <em>Subject to approval</em></td>
</tr>
<tr>
<td>Offering Departments</td>
<td>Department of Mathematics (host)</td>
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<tr>
<td></td>
<td>Department of Statistics &amp; Actuarial Science</td>
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<tr>
<td></td>
<td>Department of Computer Science</td>
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<tr>
<td>Target Intake Numbers</td>
<td>Full-time: 75 students</td>
</tr>
<tr>
<td>Expected Graduation</td>
<td>Summer (July 2025)</td>
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</table>
Programme Structure

- 72 credits
  - 42 credits of Compulsory Courses
  - 18 credits of Disciplinary Electives
  - 12 credits of Capstone Project
Programme Curriculum

**Compulsory Courses** (42 credits)

- ARIN7001  Foundations of artificial intelligence
- ARIN7011  Optimization in artificial intelligence
- ARIN7013  Numerical methods in artificial intelligence
- ARIN7101  Statistics in artificial intelligence
- ARIN7102  Applied data mining and text analytics
- COMP7404  Computational intelligence and machine learning
- DASC7606  Deep learning
Programme Curriculum

Disciplinary Electives

(at least 18 credits, with at least 6 credits from List A, List B, & List C)

List A:

- ARIN7014  Topics in advanced numerical analysis
- ARIN7015  Topics in artificial intelligence and machine learning
- MATH7224  Topics in advanced probability theory
- MATH7502  Topics in applied discrete mathematics
- MATH7503  Topics in advanced optimization
Programme Curriculum

*Disciplinary Electives*

**List B:**
- STAT6011 Computational statistics and Bayesian learning
- STAT7008 Programming for data science
- STAT8020 Quantitative strategies and algorithmic trading
- STAT8021 Big data analytics
Programme Curriculum

Disciplinary Electives

List C:

- COMP7308  Introduction to unmanned systems
- COMP7309  Quantum computing and artificial intelligence
- COMP7409  Machine learning in trading and finance
- COMP7502  Image processing and computer vision
- ARIN7017  Legal issues in artificial intelligence and data science
Programme Curriculum

**Capstone Project** (12 credits)

- ARIN7600  Artificial intelligence project
- Provides students with an opportunity to pursue their own research interest under the supervision of a teacher. The teacher will meet the student regularly to discuss project progress
- Assessment includes a research report (totaling no more than 20,000 words) and an oral presentation
## Possible AI specializations

<table>
<thead>
<tr>
<th>Themes</th>
<th>List A: MATH</th>
<th>List B: STAT</th>
<th>List C: COMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big data analytics</td>
<td>ARIN7015, MATH7224, MATH7503</td>
<td>STAT7008, STAT8021</td>
<td>COMP7308, ARIN7017</td>
</tr>
<tr>
<td>AI in business</td>
<td>ARIN7015, MATH7503</td>
<td>STAT7008, STAT8020</td>
<td>COMP7409, ARIN7017</td>
</tr>
<tr>
<td>Engineering and Computer Science</td>
<td>ARIN7014, MATH7224, MATH7503</td>
<td>STAT6011</td>
<td>COMP7308, COMP7309, COMP7502</td>
</tr>
<tr>
<td>AI and machine learning</td>
<td>ARIN7015, MATH7503</td>
<td>STAT7008</td>
<td>COMP7308, COMP7309, ARIN7017</td>
</tr>
</tbody>
</table>
## Career Prospects

<table>
<thead>
<tr>
<th>Career Path</th>
<th>Description</th>
<th>Salary ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Data Analyst</td>
<td>Find meaningful patterns in data by looking at the past to help make predictions about the future</td>
<td>$133,442</td>
</tr>
<tr>
<td>AI Engineer</td>
<td>Build AI models from scratch and help product managers and stakeholders understand results</td>
<td>$126,536</td>
</tr>
<tr>
<td>Data Mining and Analysis</td>
<td>Finding anomalies, patterns, etc. within large data sets to predict outcomes</td>
<td>$93,044</td>
</tr>
<tr>
<td>Business Intelligence Developer</td>
<td>Analyze complex data sets to identify business and market trends</td>
<td>$92,283</td>
</tr>
<tr>
<td>Research Scientist</td>
<td>Expert in applied math, machine learning, deep learning, and computational stats. Expected to have an advanced degree in computer science or an advanced degree in a related field supported by experience.</td>
<td>$123,279</td>
</tr>
</tbody>
</table>
Admission Information
2022 Admission

- Total number of applicants: > 1000
- Number of students admitted: 106 (Full-time)
- Applicants' academic background:
  - Mathematics, Statistics, Computer Science, Software Engineering, Data Science, etc.
Admission Schedule for 2023-24 Intake

► Application opens:
  • 12:00 noon (HKT), November 4, 2022

► Application Deadlines:
  • Main Round: 12:00 noon (HKT), January 31, 2023
    (Candidates who apply within this period will be given admission priority)
  • Clearing Round: 12:00 noon (HKT), April 17, 2023
Admission Requirements

To be eligible for admission to the courses leading to the degree of Master of Science in Artificial Intelligence, a candidate

(a) shall comply with the General Regulations and the Regulations for Taught Postgraduate Curricular;
(b) shall hold
   (i) a Bachelor’s degree with honours of this University, or
   (ii) another qualification of equivalent standard from this University or another University or comparable institution acceptable for this purpose; and
(c) shall pass a qualifying examination if so required; and
(d) shall possess knowledge of linear algebra, calculus, probability theory, introductory statistics, and computer programming.
English Language Requirements

For applicants graduating from institutions where *English was not the medium of instruction*

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>TOEFL:</td>
<td>550 or above (paper-based test)</td>
</tr>
<tr>
<td></td>
<td>213 or above (computer-based test)</td>
</tr>
<tr>
<td></td>
<td>80 or above (internet-based test)</td>
</tr>
<tr>
<td>IELTS:</td>
<td>A minimum overall band of 6 with no subtest lower than 5.5</td>
</tr>
<tr>
<td>GCE:</td>
<td>Grade C or above</td>
</tr>
<tr>
<td>IGCSE:</td>
<td>Grade C or above</td>
</tr>
<tr>
<td>Cambridge Test of Proficiency in English Language:</td>
<td>Grade C or above</td>
</tr>
</tbody>
</table>

*IELTS-Indicator / TOEFL Home Edition result is not listed under proof of English language proficiency*
Admission Procedures

Online application ONLY:

https://admissions.hku.hk/tpg/
Points to Note

- Supporting documents could only be uploaded online after the submission of application form and payment of application fee. Once submitted, the application form cannot be revised.

- As applications would be reviewed from time to time, applicants are recommended to upload their supporting documents at their earliest convenience.

- [https://admissions.hku.hk/tpg/faq](https://admissions.hku.hk/tpg/faq)
HKU Facilities and Services
Libraries / Chi Wah Learning Commons

**Libraries**
- 3D printers and scanners
- Discussion rooms
- VR Salon / VR Facilities
- AI facilities (e.g., Deep Learning Lambda Tensorbook, NVIDIA Jetson TX2 Developer Kit)

**Chi Wah Learning Commons**
- Learning spaces
- Study rooms
Sports Facilities

Sports Centres
- Flora Ho Sports Centre
- Stanley Ho Sports Centre

Fitness Centres
- 3/F of Centennial Campus
- HKU B-Active
- Flora Ho Sports Centre
- Henry Fok Fitness Complex
Other Services

**IT Services**
- HKU Virtual Private Network (HKUVPN)
- Software Download
  - Microsoft Office 365
  - Matlab and Simulink
  - Teams

**University Health Service (UHS)**
- Clinical services
  - medical consultation
  - nursing care
  - physiotherapy service
  - dental service

**CEDARS**
- Campus Life
  - Catering Services
- Counselling
- Study / Career Advices
Living in Hong Kong
Dining

- **On-campus Dining (~HKD30-50)**
  - Chinese / Japanese / Western-style
  - Vegetarian (Buffet style)
  - Fast food / Cafes

- **Near HKU (~HKD50-100+)**
  - Chinese / Thai / Japanese / Western-style
  - Fast food / Cafes
Transportation

- Railway
- Buses
- Minibuses
- Trams
- Ferries
Attractions

- Museums (M+, Hong Kong Palace Museum, Hong Kong Museum of Art, etc.)
- The Peak
- Disneyland
- Ocean Park
- Geoparks
- Great trails for hiking
Enquiries

- Tel: (852) 2859 2258
- Email: mscai@maths.hku.hk
- Website: https://hkumath.hku.hk/web/mscai/minindex.php
Q & A