Bachelor of Arts & Sciences in

Applied Artificial Intelligence

Impact the world with the limitless power of AI
Bachelor of Arts & Sciences in
Applied Artificial Intelligence

💡 Focusing on *AI applications in diverse areas*, with a philosophical and ethical dimension

💡 Providing *fundamental and practical knowledge* for the design and construction of intelligent systems

💡 Emphasizing *problem-based learning*
AI History

1950
TURING TEST
Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence.

1955
A.I. BORN
Term 'artificial intelligence' is coined by computer scientist John McCarthy to describe "the science and engineering of making intelligent machines.

1961
UNIMATE
First industrial robot, Unimate, goes to work at GM replacing humans on the assembly line.

1964
ELIZA
Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans.

1966
SHAKEY
The 'first electronic person' from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions.

A.I. WINTER
Many false starts and dead-ends leave A.I. out in the cold.

1997
DEEP BLUE
Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov.

1998
KISMET
Cynthia Breazeal at MIT introduces Kismet, an emotionally intelligent robot insofar as it detects and responds to people’s feelings.

1999
AIBO
Sony launches first consumer robot pet dog AIBO (AI robot) with skills and personality that develop over time.

2002
ROOMBA
First mass-produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes.

2011
SIRI
Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S.

2011
WATSON
IBM's question answering computer Watson wins first place on popular $1M prize television quiz show Jeopardy!

2014
EUGENE
Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human.

2014
ALEXA
Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks.

2016
TAY
Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments.

2017
ALPHAGO
Google’s A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2170) of possible positions.
AI is Transforming the World
AI Technology

- Deep Learning
  - Supervised
  - Unsupervised
- Machine Learning (ML)
- Content Extraction
- Classification
- Machine Translation
- Question Answering
- Text Generation
- Natural Language Processing (NLP)
- Expert Systems
- Vision
- Machine Vision
- Speech to Text
- Text to Speech
- Speech
- Planning
- Robotics

Artificial Intelligence (AI)
AI in Medicine

Ming Pao 9 May 2018

大血管栓塞中風 港大 AI 20秒斷症

AI分析病人病歷及血管造影影像等數據，結果可診斷95%大血管栓塞中風病人。港大統計及精算學系教授賴錦江表示，AI在20秒內便可分析病人患有大血管栓塞的風險，根據數據幫助醫生迅速作出臨牀判斷。
AI in Finance

Forecasting High Dimensional Covariance Matrices

Robo advisors

Trading on Hadoop

Financial News Analytics

NLP
AI in Smart City

Sophia the Robot, robot of Hanson Robotics, attends the Day 2 of the RISE Conference 2017 at the Hong Kong Convention and Exhibition Centre on 12 July 2017, in Hong Kong: https://www.youtube.com/watch?v=9kiEK4LrCgQ
AI in Neurocognitive Science

Cognition
- Memory
- Perception

Behaviour
- Brian disorder
- Parkinson’s disease
- Alzheimer’s disease

Understanding the brain

- hippocampus
- frontal lobe
- parietal lobe
- occipital lobe
- temporal lobe
- cerebellum
- spinal cord
Many More…

Apple SIRI
Amazon Alexa
Google Assistant
Microsoft Cortana

Social network
Social media

E-commerce

Entertainment

AlphaGo Zero 無人自學三日勝過去3000年
Example of AI Application: A Deep Learning Based Sketching System for 3D Face and Caricature Modeling

- PI: Prof. Yizhou Yu
- Face modeling has many applications: cartoons, avatars for social media, face-related art and design, etc.
- A deep learning based sketching system for 3D face and caricature modeling has been developed.
  - Allows the user to draw freehand imprecise 2D faces.
  - A novel neural-network based deep regression network would then infer 3D face models from the 2D sketches.

Using the system, an amateur user can create non-trivial 3D faces or caricature models in just a few minutes. Both models shown above were created in less than 10 minutes by a user without any prior drawing and modeling experiences.
Example of AI Application: Automatic Polyp Detection in Colonoscopy

• PI: Dr. K.Y.K. Wong, in collaboration with HKU Medicine

• Colorectal cancer (結直腸癌) is the most common cancer in Hong Kong.

• Prevention by detecting and removing colorectal polyps (息肉) before they develop into malignancy.

• The standard procedure (colonoscopy) often fails to detect all of the polyps.

• AI (computer vision) is used in a real-time automatic polyp detection system to assist doctor during colonoscopy to decrease the polyp miss-rate, hence reducing the number of patients who may develop a late-stage colorectal cancer.
Example of AI Application: Autonomous Mapless Robot Navigation in Crowded Scenarios

• PI: Dr. Jia Pan*, in collaboration with Baidu

• Navigation is an essential capability for mobile robots.

• A generalized yet effective 3M (i.e., multi-robot, multi-scenario, and multi-stage) training framework is proposed, which uses a robust policy gradient algorithm.

• The method enables different types of mobile platforms to navigate safely in complex and highly dynamic environments, such as pedestrian crowds.

* Dr Pan was formerly a HKU colleague, now at City U, and will re-join HKU CS in 2019.
AI and Hong Kong

IV. Diversified Economy
- Smart City
- Financial Technologies

💡 Smart city development: new information and communications technology infrastructure is an indispensable

💡 Reforming its cloud infrastructure by 2020

💡 Developing a platform operating big data analytics and AI application to enhance e-Government services

💡 Earmarking HK$10 billion to support the establishment of two research clusters, one on healthcare technologies and one on AI and robotics technologies
I think about AI as a very powerful tool. What I'm most excited about is applying those tools to science and accelerating breakthroughs (in material & drug design).

One way you can think about our research program is [that it's investigating] ‘Can we build out from our perception, using deep-learning systems and learning from first principles? Can we build out all the way to high-level thinking and symbolic thinking?’

AlphaGo doesn't understand language but we would like them to build up to this symbolic level of reasoning -- maths, language, and logic.
Bachelor of Arts and Sciences in Applied Artificial Intelligence BASc(Applied AI)

Impacts the world with the limitless power of AI

Curriculum Structure
Forty 6-credit courses spanning over 4 years of full-time study
(240 Credits)

- UNIVERSITY EDUCATION
  Language Courses
  Common Core Courses
  (36 credits)

- BASc COMMON COURSES
  Horizontals
  (18 credits)

- PROGRAMME CORE
  Core Courses
  Concentration & Electives
  Capstone Course
  (96 credits)

- 2nd MAJOR / MINOR(S) / ELECTIVES
  (90 credits)
Bachelor of Arts and Sciences in Applied Artificial Intelligence BASc(Applied AI)

Impacts the world with the limitless power of AI

New option for elite students
Formal training to elite students who wish to join the AI profession

Interdisciplinary training
Provides a wide range of courses in mathematics, statistics, computer science, geography, psychology, and urban studies

Featured concentrations:
Bachelor of Arts and Sciences in Applied Artificial Intelligence BASc(Applied AI)

**Impacts the world with the limitless power of AI**

<table>
<thead>
<tr>
<th>Core Courses (66 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introductory Level Courses (48 credits):</strong></td>
</tr>
<tr>
<td>- Foundations of artificial intelligence</td>
</tr>
<tr>
<td>- Computer programming</td>
</tr>
<tr>
<td>- Computer organization</td>
</tr>
<tr>
<td>- Data structures and algorithms</td>
</tr>
<tr>
<td>- University mathematics II</td>
</tr>
<tr>
<td>- Multivariate calculus and linear algebra</td>
</tr>
<tr>
<td>- Probability and statistics I</td>
</tr>
<tr>
<td>- Probability and statistics II</td>
</tr>
<tr>
<td><strong>Advanced Level Courses (18 credits):</strong></td>
</tr>
<tr>
<td>- Deep learning</td>
</tr>
<tr>
<td>- Introduction to optimization</td>
</tr>
<tr>
<td>- Statistical machine learning</td>
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</table>

<table>
<thead>
<tr>
<th>Elective Courses (24 credits)</th>
</tr>
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<tbody>
<tr>
<td><strong>AI Technology (18+ credits):</strong></td>
</tr>
<tr>
<td>- Computer graphics</td>
</tr>
<tr>
<td>- Robotics</td>
</tr>
<tr>
<td>- Natural language processing</td>
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<tr>
<td>- Image processing and computer vision</td>
</tr>
<tr>
<td>- High-performance computing</td>
</tr>
<tr>
<td>- Special topics of applied AI</td>
</tr>
<tr>
<td><strong>AI in Business and Finance (18+ credits):</strong></td>
</tr>
<tr>
<td>- Marketing analytics</td>
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<tr>
<td>- Operation research I</td>
</tr>
<tr>
<td>- Financial calculus</td>
</tr>
<tr>
<td>- Time series analysis</td>
</tr>
<tr>
<td>- E-commerce technology</td>
</tr>
<tr>
<td>- Special topics of applied AI</td>
</tr>
<tr>
<td><strong>AI in Medicine (18+ credits):</strong></td>
</tr>
<tr>
<td>- Survival analysis</td>
</tr>
<tr>
<td>- Modern biostatistics</td>
</tr>
<tr>
<td>- Bayesian learning</td>
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<tr>
<td>- Omics data analysis</td>
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<tr>
<td>- Medical image analysis</td>
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<tr>
<td>- Special topics of applied AI</td>
</tr>
<tr>
<td><strong>AI in Smart City (18+ credits):</strong></td>
</tr>
<tr>
<td>- Urban &amp; regional development I</td>
</tr>
<tr>
<td>- Urban &amp; regional development II</td>
</tr>
<tr>
<td>- Introduction to geographic information systems</td>
</tr>
<tr>
<td>- Environmental GIS</td>
</tr>
<tr>
<td>- Transport and society</td>
</tr>
<tr>
<td>- Special topics of applied AI</td>
</tr>
<tr>
<td><strong>AI in Neurocognitive Science (18+ credits):</strong></td>
</tr>
<tr>
<td>- Introduction to psychology</td>
</tr>
<tr>
<td>- Perception</td>
</tr>
<tr>
<td>- Foundations of cognitive science</td>
</tr>
<tr>
<td>- Foundations of neuroscience</td>
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<tr>
<td>- Human neuropsychology</td>
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<tr>
<td>- Special topics of applied AI</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Elective Courses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Design and analysis of algorithms (CS)</td>
</tr>
<tr>
<td>- Database management system (CS)</td>
</tr>
<tr>
<td>- Computer and network security (CS)</td>
</tr>
<tr>
<td>- Numerical analysis (MATH)</td>
</tr>
<tr>
<td>- Game theory and strategy (MATH)</td>
</tr>
<tr>
<td>- Network models in operations research (MATH)</td>
</tr>
<tr>
<td>- Data visualization (SAAS)</td>
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<tr>
<td>- Linear modeling (SAAS)</td>
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<tr>
<td>- Multivariate modeling (SAAS)</td>
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</tbody>
</table>

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<tr>
<th>Capstone Requirement (6 credits)</th>
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</thead>
<tbody>
<tr>
<td>Directed studies/project/internship in Applied AI</td>
</tr>
</tbody>
</table>
Why HKU?

QS World University Rankings 2019
#25 worldwide  #5 Asia  #1 HK

QS World University Rankings 2018
#28 worldwide  #5 Asia  #2 HK (Statistics & OR)
#28 worldwide  #5 Asia  #1 HK (Mathematics)
#26 worldwide  #7 Asia  #2 HK (CS & IS)
#12 worldwide  #3 Asia  #1 HK (Architecture)
#23 worldwide  #4 Asia  #1 HK (Geography)
#36 worldwide  #1 Asia  #1 HK (Psychology)

Big data optimization
Scientific computation
Risk management
Game theory
Financial and actuarial applications
Operational research

Statistical learning
Bayesian methods
Time series forecasting
Speech/NLP/Text analytics
DNA profiling, forensic statistics
Preference Learning

Machine/Deep learning
Transportation
Computer vision
Robotics
Information security
GIS

SKL of Brain and Cognitive Sciences

Error! Reference Source Not Found.
Tam Wing Fan Innovation Wing
(ready in 2020, open to all Engineering as well as Applied AI students)
Career Prospects

The programme connects the exploding demand of the AI market in diverse areas, such as:

- Science & technology
- Environmental protection
- Medical informatics
- Healthcare
- Business
- Banking & finance
- Urban development
- Neurocognitive science
# Career Opportunities

![Distribution of Base Pay for Open AI Jobs on Glassdoor](image)

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Metro</th>
<th>Estimated Median Base Pay</th>
<th>Employer Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of AI</td>
<td>San Francisco</td>
<td>$257,269</td>
<td>Internet &amp; Tech</td>
</tr>
<tr>
<td>VP of AI Product Management</td>
<td>San Jose</td>
<td>$249,500</td>
<td>Marketing &amp; Advertising</td>
</tr>
<tr>
<td>Data Engineer for Deep Learning</td>
<td>San Jose</td>
<td>$243,623</td>
<td>Computer Software &amp; Hardware</td>
</tr>
<tr>
<td>Attorney for AI Division</td>
<td>Los Angeles</td>
<td>$203,710</td>
<td>Internet &amp; Tech</td>
</tr>
<tr>
<td>Deep Learning Engineer for Self-Driving Cars</td>
<td>San Francisco</td>
<td>$203,450</td>
<td>Consulting</td>
</tr>
<tr>
<td>Director of Marketing for AI</td>
<td>San Jose</td>
<td>$202,876</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Director of Machine Learning &amp; AI</td>
<td>San Jose</td>
<td>$200,627</td>
<td>Computer Software &amp; Hardware</td>
</tr>
<tr>
<td>Director of Technical Sales for AI</td>
<td>San Francisco</td>
<td>$190,098</td>
<td>Computer Software &amp; Hardware</td>
</tr>
<tr>
<td>Director of Research for AI</td>
<td>Seattle</td>
<td>$188,966</td>
<td>Computer Software &amp; Hardware</td>
</tr>
<tr>
<td>Software Engineering Lead for AI</td>
<td>Seattle</td>
<td>$186,435</td>
<td>Retail</td>
</tr>
<tr>
<td>Director of AI Product Management</td>
<td>San Francisco</td>
<td>$186,427</td>
<td>Internet &amp; Tech</td>
</tr>
<tr>
<td>Senior AI Architect</td>
<td>San Francisco</td>
<td>$186,273</td>
<td>Banking &amp; Financial Services</td>
</tr>
<tr>
<td>Head Scientist for Deep Learning</td>
<td>San Francisco</td>
<td>$184,330</td>
<td>Farming &amp; Agriculture</td>
</tr>
<tr>
<td>Applied Scientist for AI</td>
<td>San Jose</td>
<td>$183,843</td>
<td>Retail</td>
</tr>
<tr>
<td>Engineer for Deep Learning</td>
<td>San Francisco</td>
<td>$182,862</td>
<td>Manufacturing</td>
</tr>
</tbody>
</table>

Source: Glassdoor Economic Research. Active unique job listings on Glassdoor with "artificial intelligence" or "deep learning" job titles as of October 20, 2017.

Note: Exact job titles have been modified to mask the identity of specific employers.

Source: Glassdoor Economic Research. Active unique job listings on Glassdoor with "artificial intelligence" or "deep learning" job titles as of October 20, 2017.
Partner with Industrial Leaders
Guaranteed Internships

Deep Learning Solutions Architect

Job Description:

- Knowledge sharing and coaching for local industries and start-ups to adopt deep learning as part of their core business.
- Facilitate joint research and engineering between NVidia and local universities.

Internship Project:

- Using deep learning to build models on stocks, and derivative pricing and optimization
Career Advising Programme (CAP)

- Professional Preparation Programme (PPP)
- Individual consultation on cover letter, CV and interview skills
- Corporate Mentorship Programme (CMP)
- Market information workshop
- Firm visits and alumni sharing
- SAAS Career Fair
Minor in Science Entrepreneurship

Opening the doors to entrepreneurship

This Minor aims at:

- Broadening the horizon of our undergraduate students with respect to entrepreneurship
- Bringing students huge insights via critical analysis of the operation of existing enterprises
- Offering more competitive edge to our students via connecting their academic knowledge with the real world

TSSSU@HKU
Technology Startup Support Scheme for Universities at HKU

Up to $1,200,000 per year
FinTech Hackathon
Application of Machine Learning in Banking

Customers' Feedback Autodetection

- Happy (97%)
- Neutral (93%)
- Angry (95%)

Second Runner-up
HKD 10,000
May 2017
JUPAS Applicants

Admissions Requirements

6224 BASc (Applied AI)

Mathematics
- Level 4

Chinese Language
- Level 3

Elective subject
- Level 3

Liberal Studies
- Level 2

English Language
- Level 5

Extended module 1 or 2 in Mathematics
- Level 4

# Candidates with level 4 in English Language and good results in other HKDSE subjects will be considered on a case by case basis.

2019 Admission Quota
15-20
Admissions Formula for 6224 BASc(Applied AI)

**JUPAS**

- English
- Mathematics
- Extended module 1 or 2 in Mathematics

**DSE Subjects**

- English language
- Mathematics
- Extended module 1 or 2 in Mathematics
- Science subject (Biology, Chemistry, Physics, Combined Science or Integrated Science)
- Other Category A subjects

**Weighting**

- × 2
- × 1.5
- × 1

*HKU new JUPAS scoring system: 5→5.5; 5*→7; 5**→8.5


**Non-JUPAS**

**Expected lower boundary score**

- IB Diploma: 37
- GCE A-Level: 2A*, 1A
- SAT: 1350
Trans-disciplinary knowledge and skills

Guaranteed Internship

Privileged exchange opportunity

Scholarships for outstanding students*

* Subject to university approvals
Further Information

BASc(Applied AI) website: https://saasweb.hku.hk/programme/ai.php
(or Google with “hku applied ai”)

Q & A