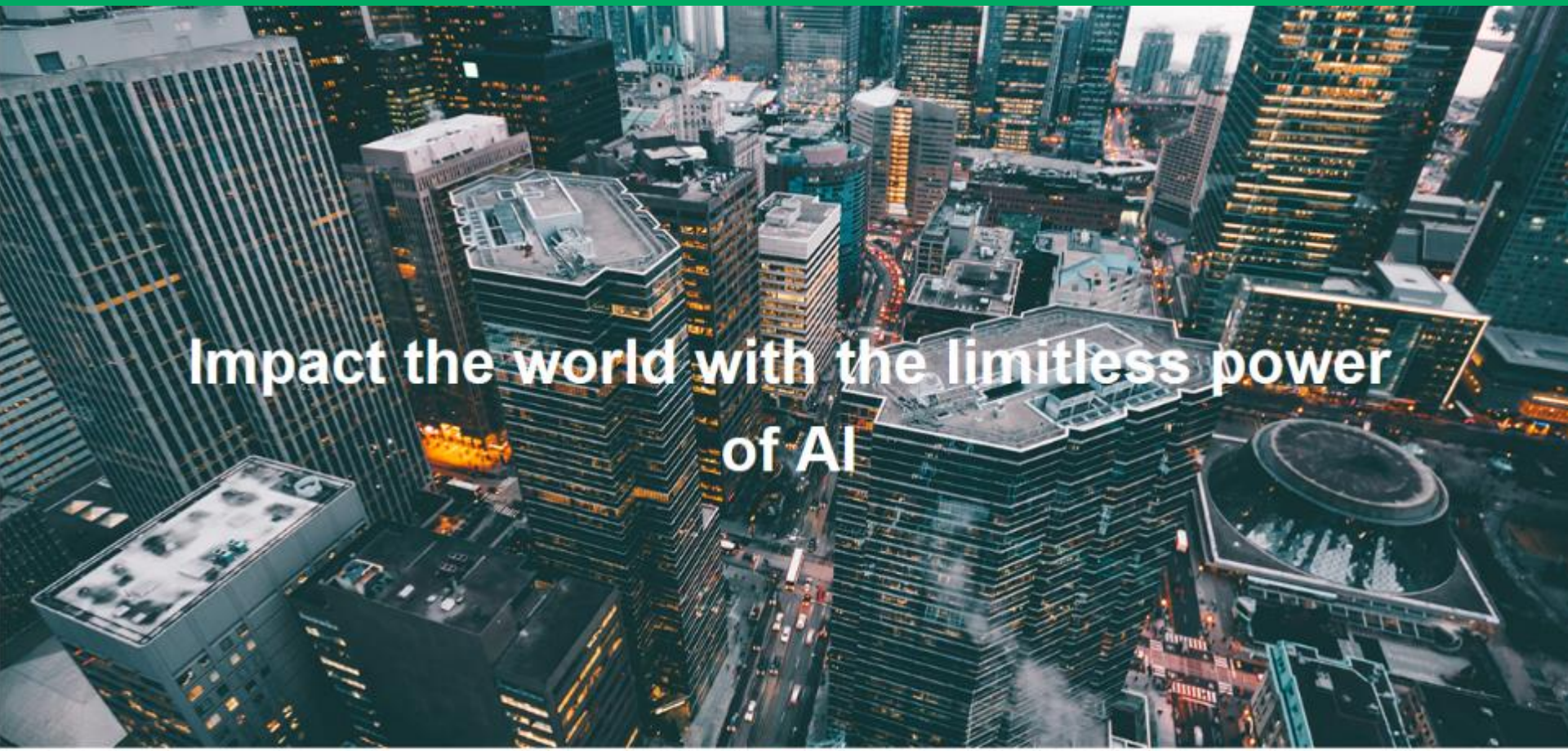
# 6224
BASc(Applied AI)

Bachelor of Arts & Sciences in
Applied Artificial Intelligence

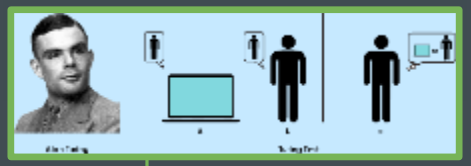


BASc
Bachelor of Arts & Sciences

香 港 大 學
THE UNIVERSITY OF HONG KONG

AI AppliedAI

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

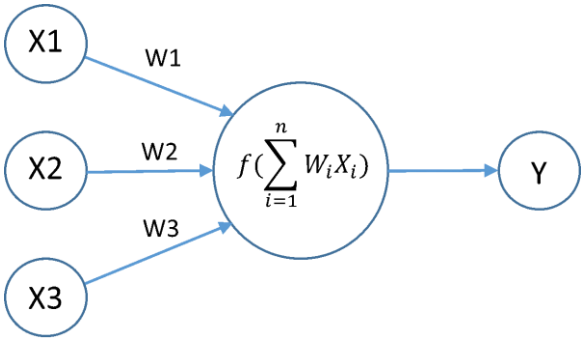
Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks

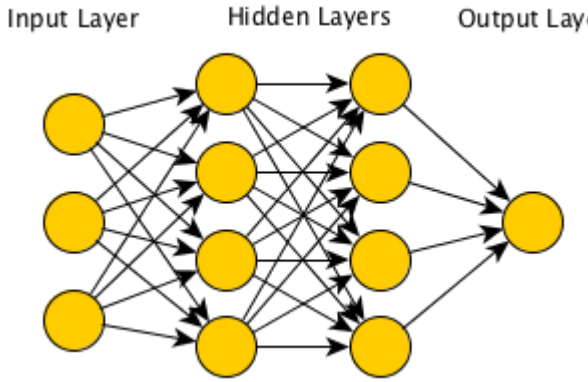
2016
TAY

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

2017
ALPHAGO

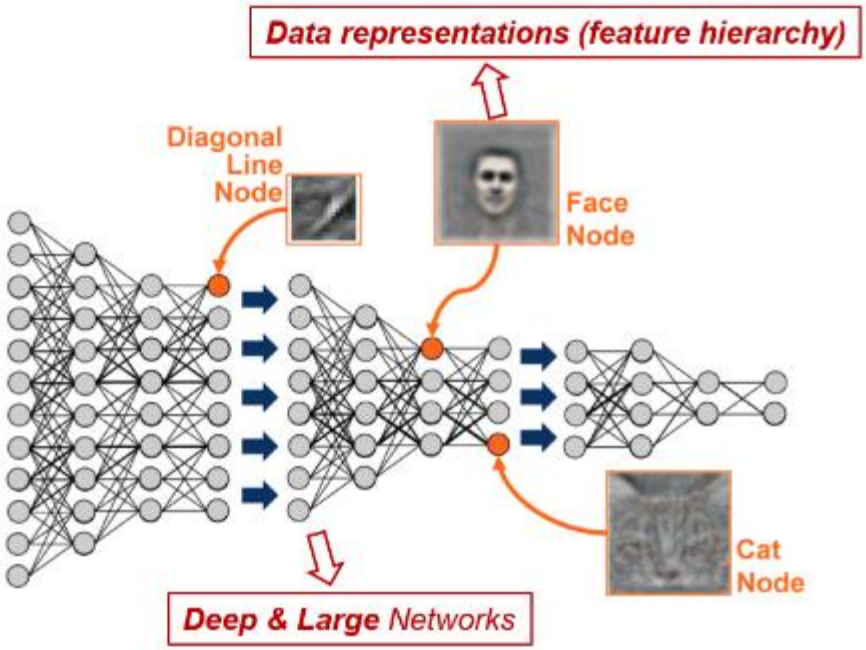
Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions





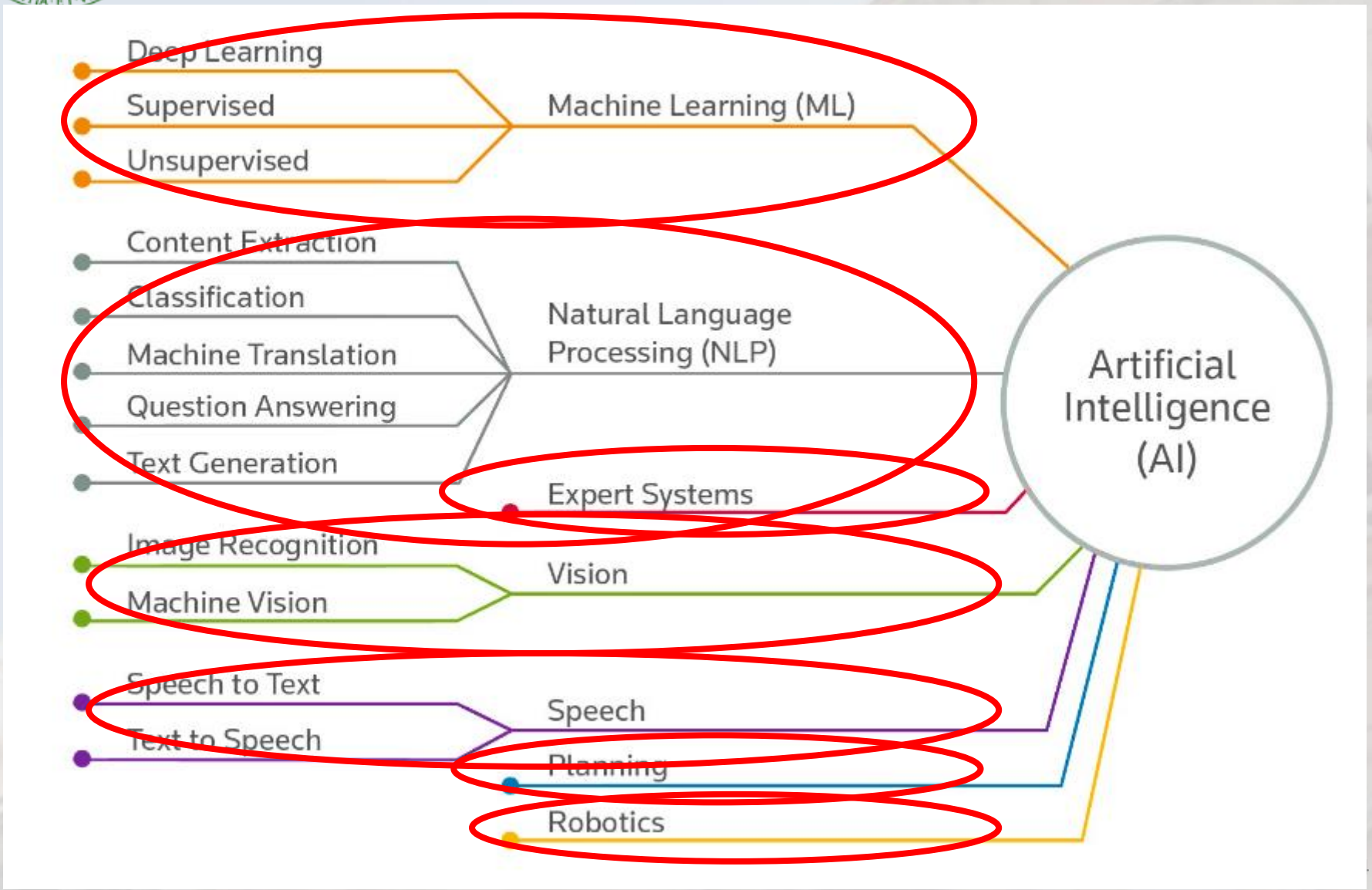
Neural Network

GPU V100



Deep Learning

AI Technology




AI is Transforming
the World

AI in Medicine

Ming Pao 9 May 2018

創科×醫健

大血管栓塞中風 港大AI 20秒斷症

本港每年有逾900宗急性中風個案出現大血管栓塞，當於病發後的黃金6小時內將血塊取出。香港大學與醫管局合作，首次用大數據研究300個急性中風個案，再以人工智能(AI)判斷是否大血管栓塞，發現系統20秒內可作出判斷，正確顯出95%大血管栓塞個案，料有助醫生加快確診時間逾兩小時。

港大醫學院臨牀神經科學教授梁嘉傑表示，大血管栓塞中風是急性中風最嚴重情況，佔中風個案13%，死亡率達四成，患者需在病發6小時內治療，才有存活機會。現時普通電腦掃描難以診斷此類中風，醫生需透過血脈判斷，安排病人接受血管造影檢查，但每個檢查需一至兩小時。

確診可快兩小時 準確度95%

醫管局2016年約有7000宗急性中風個案，其中約980宗涉大血管栓塞。港大及醫管局去年合作，首次用大數據研究2016年約300名中國病人資料，透過AI分析病人病歷、放射影像等數據，結果正確算出95%大血管栓塞中風病人。**港大統計及精算學系副教授楊良河**表示，AI在20秒內便可分析病人患有大血管栓塞的風險，有案數據可助醫生迅速作出血脈判斷，下階段會將研究擴至約7000名病人。

梁嘉傑表示，AI有望加快三分之一、即約兩小時診症時間，死亡率可減至兩成，並增加手術後回復正常生活的機會。他解釋，等候電腦掃描及血管造影結果各需兩小時，即共等4小時才可確診做手術，AI可省等候報告時間。

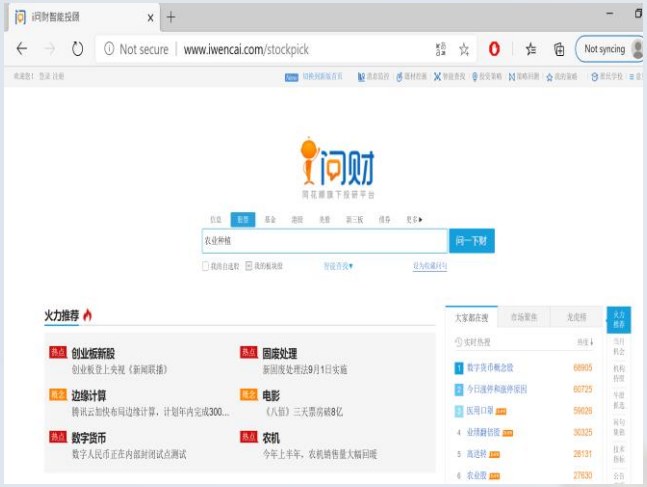
醫管局今年底將設立大數據分析平台，該局職行政經理（統計及人力規劃）徐麗霞表示，屆時會按今次研究結果，進行多個先導計劃，利用大數據和AI分析不同專科資料協助診斷。

5院更新ICU電腦系統 整合病人紀錄

另外，醫管局今年6月更新博愛醫院深切治療部（ICU）電腦系統，與現有臨牀管理資訊系統、iPad系統及深切治療部系統整合，以便醫護可在一個系統了解病人的醫療紀錄。屯門、仁濟、瑪嘉烈及東區醫院的深切治療部能後亦會更新相關系統，5間醫院的系統更新費用合共少於2000萬元。

大血管栓塞需於病發後黃金6小時內救治，香港大學與醫管局利用大數據及人工智能(AI)，研發出20秒內可判斷大血管栓塞的系統。圖左起為醫管局總行政經理(統計及人力規劃)徐麗霞、港大統計及精算學系副教授楊良河、港大醫學院臨牀神經科學教授梁嘉傑。（受訪機構）

AI in Finance

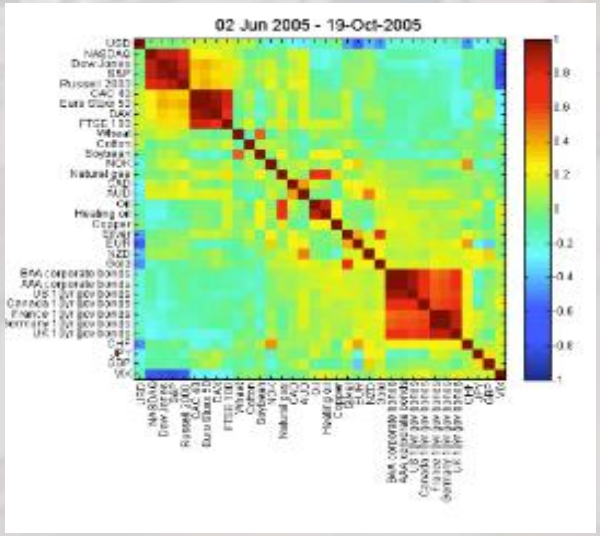


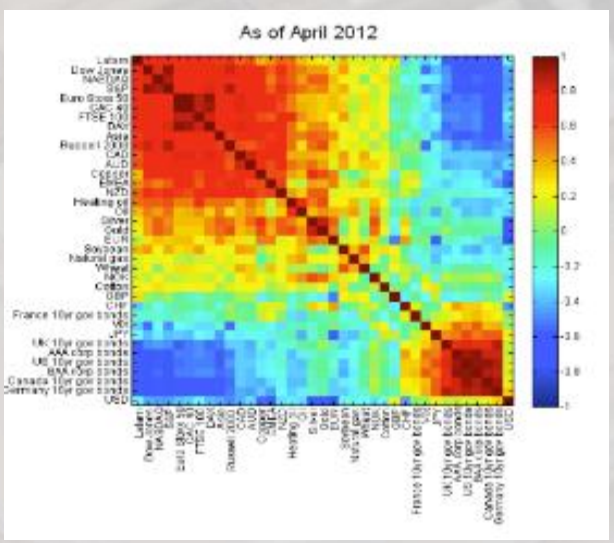
Robot advisors

Financial News Analytics

NLP

Trading on Hadoop





Forecasting High Dimensional Covariance Matrices

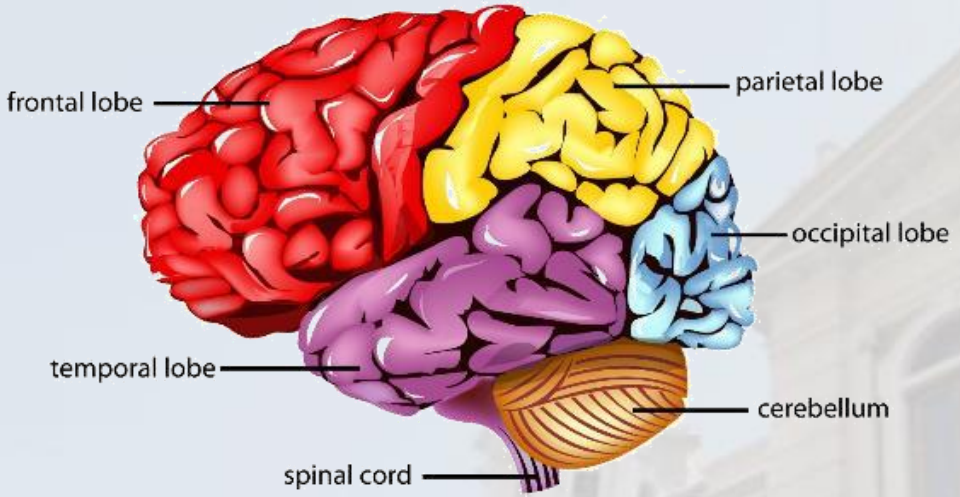
AI in Smart City

Self-driving Car

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

Understanding your brain



Cognition

Memory

Perception

Behaviour

Brian disorder

Parkinson's disease

Alzheimer's disease

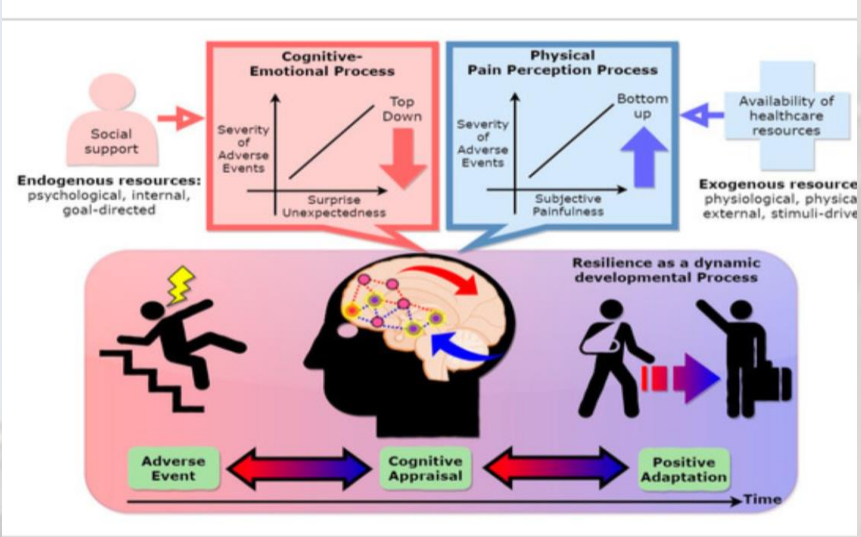


Figure 1. Cognitive appraisal of resilience (CAR) model.

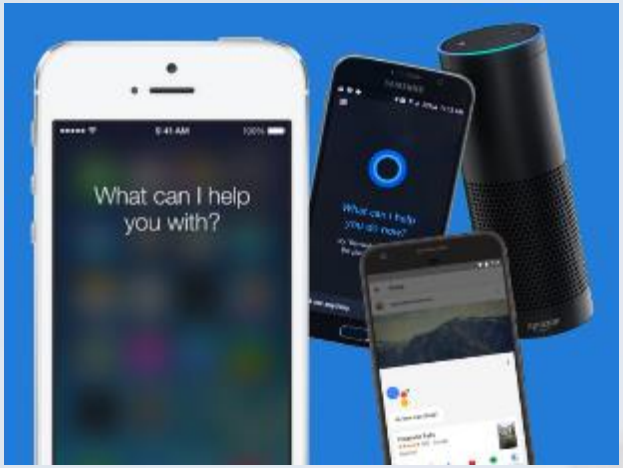
Artificial intelligence, human brain to merge in 2030s, says futurist Kurzweil

Ray Kurzweil, Google's director of engineering, says we're close to linking our brain with AI

Solomon Israel · CBC News · Posted: Jun 05, 2015 5:00 PM ET | Last Updated: June 9, 2015

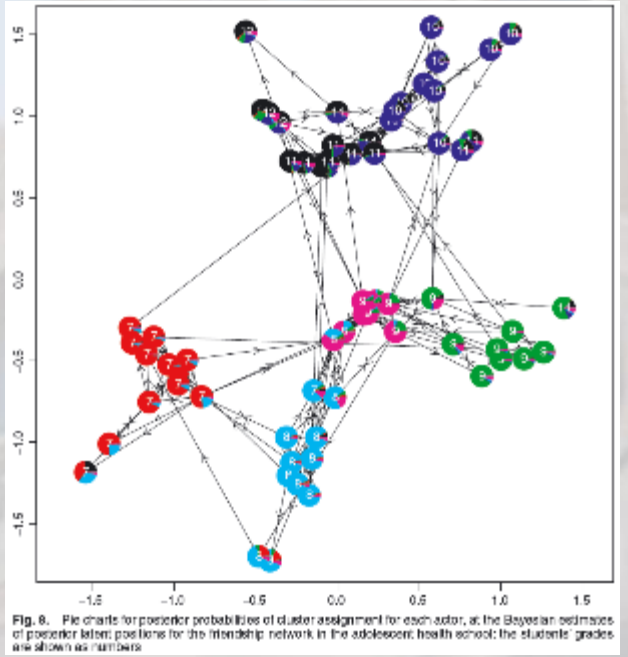
A test subject poses with an electroencephalography cap, which measures brain activity. (Michaela Rehle/Reuters)

Many More…



Apple SIRI
Amazon Alexa
Google Assistant
Microsoft Cortana

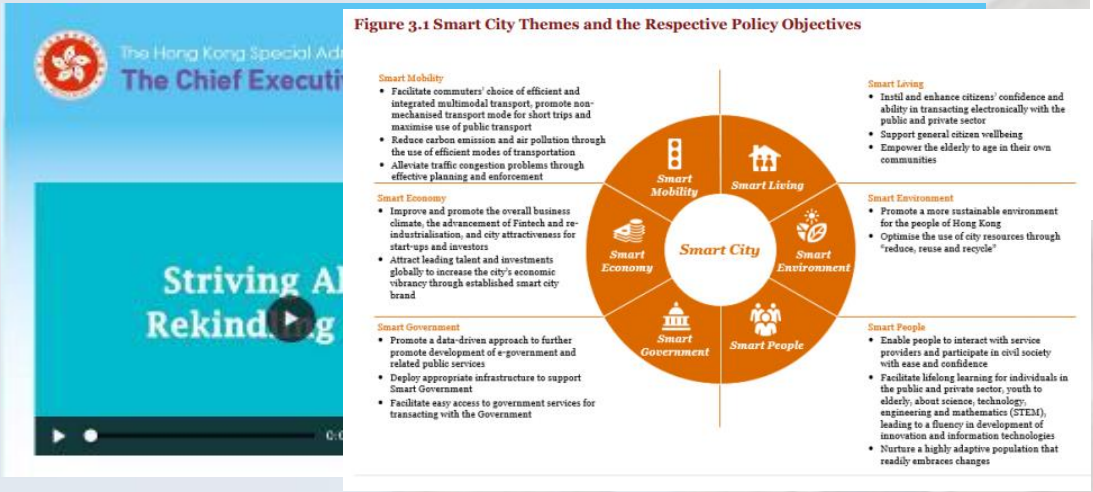
E-commerce

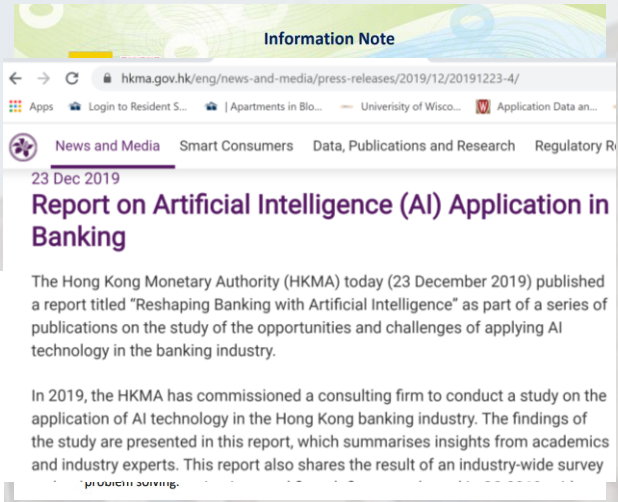


Social network
Social media

Entertainment

AI and Hong Kong

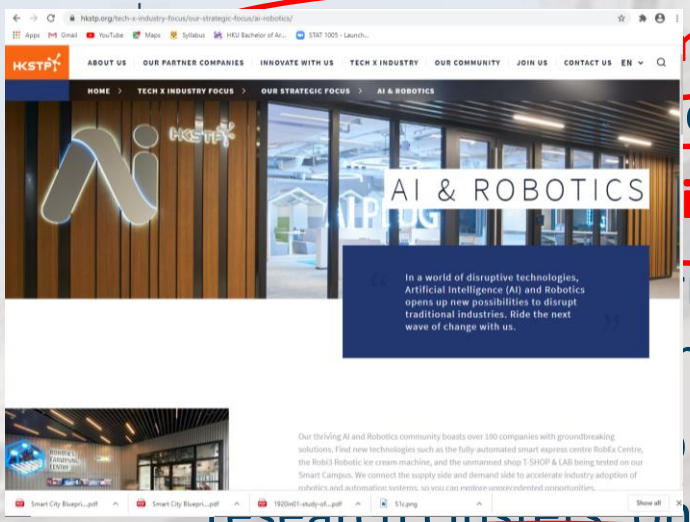




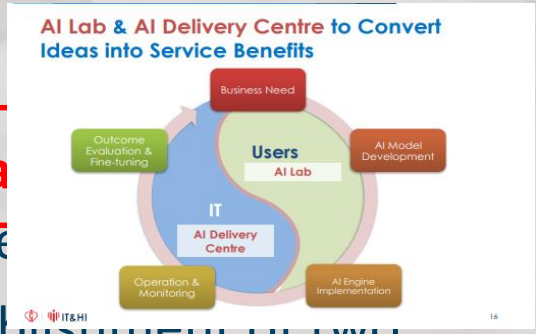
Diversified Economy

- Smart City

- Financial Technologies



nent: new information and communications
cture is an indispensable
infrastructure by 2020
m operating **big data ana**
nce e-Government service
illion to support the establishment of two
research clusters, one on **healthcare technologies** and one on **AI and robotics technologies**



AppliedAI

BASc | HKU
Bachelor of Arts & Sciences

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

New Interdisciplinary Programmes

6224

BASc Bachelor of Arts & Sciences

AI AppliedAI

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 CORE COURSES
Horizontals
(18 credits)

+

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

+

2nd MAJOR / MINOR(S) / ELECTIVES
(90 credits)

New Interdisciplinary Programmes

6224

BASc Bachelor of Arts & Sciences

AI AppliedAI

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

Impacts the world with the limitless power of AI

FACULTY OF SCIENCE THE UNIVERSITY OF HONG KONG 香港大學理學院

SHKU Science

+

Faculty of Engineering THE UNIVERSITY OF HONG KONG

+

THE UNIVERSITY OF HONG KONG faculty of architecture

+

Faculty of Social Sciences The University of Hong Kong 香港大學社會科學學院

- **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:**

AI

- Technology
- Business and finance
- Medicine
- Smart city
- Neurocognitive science

New Interdisciplinary Programmes

BASc Bachelor of Arts & Sciences

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

6224

AI AppliedAI

Impacts the world with the limitless power of AI

<table>
<tr><td><u>Core Courses</u>
(66 credits)</td><td colspan="5">Introductory Level Courses (48 credits):
o Foundations of artificial intelligence
o Computer programming
o Computer organization
o Data structures and algorithms
o University mathematics II
o Multivariate calculus and linear algebra
o Probability and statistics I
o Probability and statistics II

Advanced Level Courses (18 credits):
o Deep learning
o Introduction to optimization
o Statistical machine learning</td></tr>
<tr><td rowspan="2"><u>Elective Courses</u>
(24 credits)</td><td>AI Technology (18+ credits):
o Computer graphics
o Robotics
o Natural language processing
o Image processing and computer vision
o High-performance computing
o Special topics of applied AI</td><td>AI in Business and Finance (18+ credits):
o Marketing analytics
o Operation research I
o Financial calculus
o Time series analysis
o E-commerce technology
o Special topics of applied AI</td><td>AI in Medicine (18+ credits):
o Survival analysis
o Modern biostatistics
o Bayesian learning
o Omics data analysis
o Medical image analysis
o Special topics of applied AI</td><td>AI in Smart City (18+ credits):
o Urban & regional development I
o Urban & regional development II
o Introduction to geographic information systems
o Environmental GIS
o Transport and society
o Special topics of applied AI</td><td>AI in Neurocognitive Science (18+ credits):
o Introduction to psychology
o Perception
o Foundations of cognitive science
o Foundations of neuroscience
o Human neuropsychology
o Special topics of applied AI</td></tr>
<tr><td colspan="4">Other Elective Courses: (6 credits)
o Design and analysis of algorithms (CS)
o Database management system (CS)
o Computer and network security (CS)
o Numerical analysis (MATH)
o Game theory and strategy (MATH)
o Network models in operations research (MATH)
o Data visualization (SAAS)
o Linear modeling (SAAS)
o Multivariate modeling (SAAS)</td></tr>
<tr><td><u>Capstone Requirement</u>
(6 credits)</td><td colspan="5">Directed studies/project/internship in Applied AI</td></tr>
</table>

BASc HORIZONTAL COURSES
(18 credits)

- ☆ DESN9002 Sustainable Leadership
- ☆ BASC9001 Foundations of Human Knowledge
- ☆ STAT1005 Foundation of Data Science

- Multidisciplinary training in leadership, design thinking
- Introduction to foundations of human knowledge and data science
- Networking with fellow students from other BASc programmes

AI
SDS
BASc
D+
FT
GHD

Example of AI Application: Autonomous Mapless Robot Navigation in Crowded Scenarios

- **PI: Dr. Jia Pan* from Computer Science department**, 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.

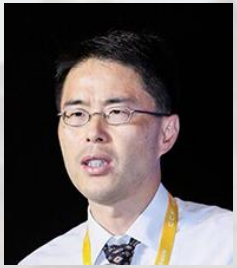
➢ The method enables different types of mobile platforms to navigate safely in complex and highly dynamic environments, such as pedestrian crowds.

Fig. 1: Mapless navigation in complex and highly dynamic environments using different mobile platforms.

Autonomous Social Distancing in Urban Environments using a Quadruped Robot

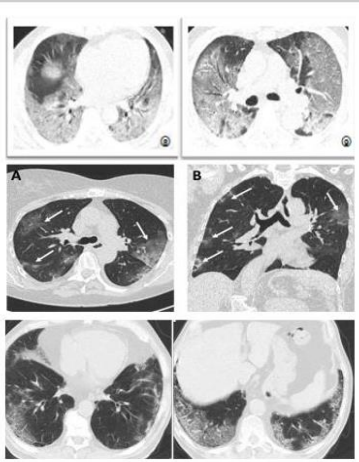
Fig. 9: Examples from the real-world experiment. The top and bottom images describes two different scenarios. Left: The robot detected and approached the crowds, then persuaded them to keep social distance. Right: The crowds density decreased.

Example of AI Application:
A Fast Online COVID-19 Diagnostic System with Chest CT Scans



PI: Prof. Guosheng Yin* from Statistics and Actuarial Science department

- CT scanning has an advantage on early COVID-19 detection
- Five lesion descriptions about COVID-19 positive cases:
  - ground glass opacities (GGO)
  - consolidation (Csld),
  - crazy paving appearance (CrPa)
  - air bronchograms (AirBr)
  - interlobular septal thickening (InSepThi)



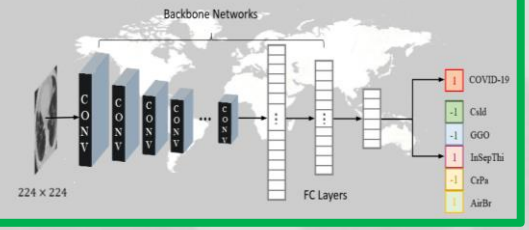
Top: CT images with various radiographic abnormalities: bilateral diffuse consolidation with air bronchograms.

Middle: COVID-19 positive with clinical and CT findings, but with repeated negative RT-PCR tests. Axial (A) and coronal (B) CT images show typical bilateral subpleural areas of GGO.

Bottom: Progress of CT findings in a COVID-19 patient, showing an increase of extent of GGO with crazy paving appearance.

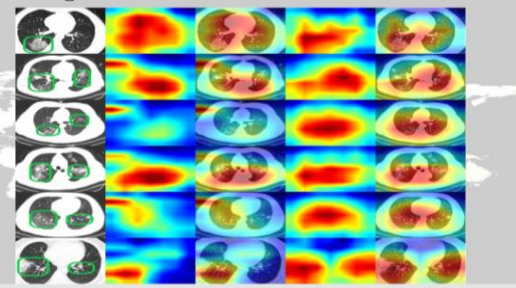
Architecture of Our System

- Lesion-Attention Deep Neural Networks (LA-DNN)



five lesions

Lesion Attention Map



Results from Testing Set

- The experimental results show that the sensitivity (recall), area under the curve (AUC), F1 score, and accuracy for COVID-19 diagnosis are 88.8%, 94.7%, 87.9%, and 89.0%, respectively.

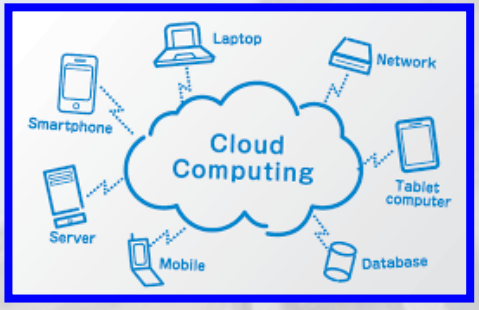
$$\text{Sensitivity} = \frac{\#\text{True Positive}}{\#\text{True Positive} + \#\text{False Negative}},$$

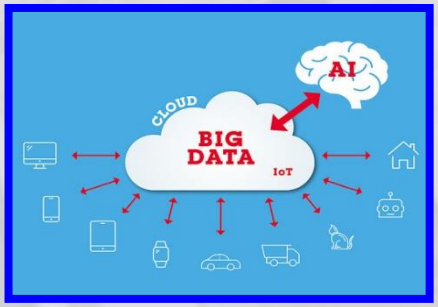
$$\text{F1} = \frac{2 \times \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}},$$

$$\text{Precision} = \frac{\#\text{True Positive}}{\#\text{True Positive} + \#\text{False Positive}},$$

$$\text{Accuracy} = \frac{\#\text{True Positive} + \#\text{True Negative}}{\#\text{Positive} + \#\text{Negative}}.$$

Example of AI Application: Optimization Problems in AI Cloud Computing





- **PI: Prof. Xiaoming Yuan from Mathematics department,** in collaboration with Huawei
- A very important problem in Cloud Computing is scheduling of various resources such as bandwidth and computing facilities (CPU, Memory, etc.).
- It turns out that a fundamental common mathematical model for these technological problems is the assignment problem (with some generalizations), which is classic in the Operational Research domain and well known to be “NP Hard” difficult (because of its integer variables).
- Additionally, the assignment problems arising in Cloud Computing are much more challenging because they are large-scale, and there are many variables and constraints in the models.

- ➢ Currently, these problems are mainly solved by standard generic algorithms in Operational Research textbooks and the efficiency is not satisfactory at all.
- ➢ Prof. Yuan developed a new and faster solver for these assignment problems in Cloud Computing based on his work on separable convex minimization models.
- ➢ The new and faster solver for generalized assignment problems in Cloud Computing showed high commercial values.

Google Cloud Platform amazon web services Microsoft Azure Alibaba Cloud

Welcome to HKU !

2022 QS WORLD UNIVERSITY RANKINGS

#22 World	#5 Asia	#1 HK	HKU

2021 QS WORLD UNIVERSITY RANKINGS by subject

#48 World	#9 Asia	#2 HK	Statistics & OR
#53 World	#10 Asia	#3 HK	Mathematics
#43 World	#11 Asia	#3 HK	Computer Science
#14 World	#4 Asia	#1 HK	Architecture
#11 World	#2 Asia	#1 HK	Geography
#34 World	#3 Asia	#1 HK	Psychology

High-dimensional data analysis
Scientific computation
Statistical learning
Machine/Deep learning
Big data optimization
Time series forecasting
Transportation
Risk management
Speech/NLP/Text analytics
Computer vision
GIS
Game theory
Information security
Financial and actuarial applications
Robotics
Neuropsychology
Operational research
DNA profiling, forensic statistics

Tam Wing Fan Innovation Wing (ready in Sep 2020, open to all Engineering as well as Applied AI students)


Maker studio


Glass facade


Research showcase


Discussion rooms


Brainstorming area


Specialized equipment


Multi-purpose room

Career Prospects

- The programme connects the exploding demand of the AI market in diverse areas, such as:
  - Business
  - Banking & finance
  - Science & technology
  - Environmental protection
  - Urban development
  - Medical informatics
  - Healthcare
  - Neurocognitive science

HUAWEI Microsoft

醫院管理局 HOSPITAL AUTHORITY

SET SAIL SOFTWARE CLICKFUL SMARTRETAI

Fund3 Clare.AI ANIWEAR MSIGHT 视见科技

FANO Labs LEXICA Emotics Analytics for Compliance eLearning 商汤 sensetime

數碼港 Cyberport

NVIDIA

Career Opportunities

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Machine Learning jobs in Hong Kong

Sort by: **relevance** - date

Page 1 of 518 jobs

Machine Learning Engineer

Apoidea (HK)

Lai Chi Kok, Kowloon

- We are looking for a **Machine Learning** Engineer to join our team.
- Proven command of Python, R or similar languages, as well as knowledgeable in natural language...

Only type the job title of "machine learning", you will find over 518 jobs in HK

2019

Hot Profe

HK$800k - 1.1m

ager: HK$850k - 1.2m

nager): HK$800k - 1.3m

HK$500k - 800k

HK$420k - 850k

HK$400k - 800k

HK$400k - 720k

HK$420k - 600k

HK$300k - 420k

HK$204k - 400k

https://ctl

Machine Learning
Senior Applied Scientist for Deep Learning

4 6 8 10

e of Growth (2012 – 2017)

Internship Opportunities

(in year 3 or year 4)

Potential collaboration company

MTR

WeBank 微众银行

中國銀行 BANK OF CHINA

PCCW

SFC 證監會

HSBC

HUAWEI

ASTRI Hong Kong Applied Science and Technology Research Institute 香港應用科技研究院

TCL

醫院管理局 HOSPITAL AUTHORITY

八達通 Octopus

pwc

6224 Bachelor of Arts and Sciences (Applied AI)

BASc Bachelor of Arts & Sciences

AppliedAI

Admissions Requirements – JUPAS applicants

Minimum Programme Entrance Requirements:

English Language	Chinese Language	Mathematics	Liberal Studies	Elective subjects	Extended Module 1 or 2 in Mathematics
Level 4*	Level 3	Level 4	Level 2	Level 3 (one subject)	Level 4

*Candidates with level 4 in English Language, if admitted, will be required to take 6 additional credits in Core University English to complete their degree studies

Selection principle: BEST 5

English Language **x** 2 + Mathematics **x** 2 + M1 or M2 **x** 2 + The BEST 2 of remaining Category A Subjects^

^Science elective subjects (Biology, Chemistry, Physics, Combined Science and Integrated Science), Information and Communication Technology **x** 1.5
Non-science elective, Liberal Studies and Chinese Language **x** 1

2022 Expected JUPAS admissions score:

53

2022 Admissions quota:

15

HKDSE 'level to score' conversion

Category A Core and Elective Subjects and Extended Module 1 or Module 2 of Mathematics							
Level	1	2	3	4	5	5*	5**
Score	1	2	3	4	5.5	7	8.5

6224 Bachelor of Arts and Sciences (Applied AI)

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2021 Admissions Statistics– Non-JUPAS

GCEAL

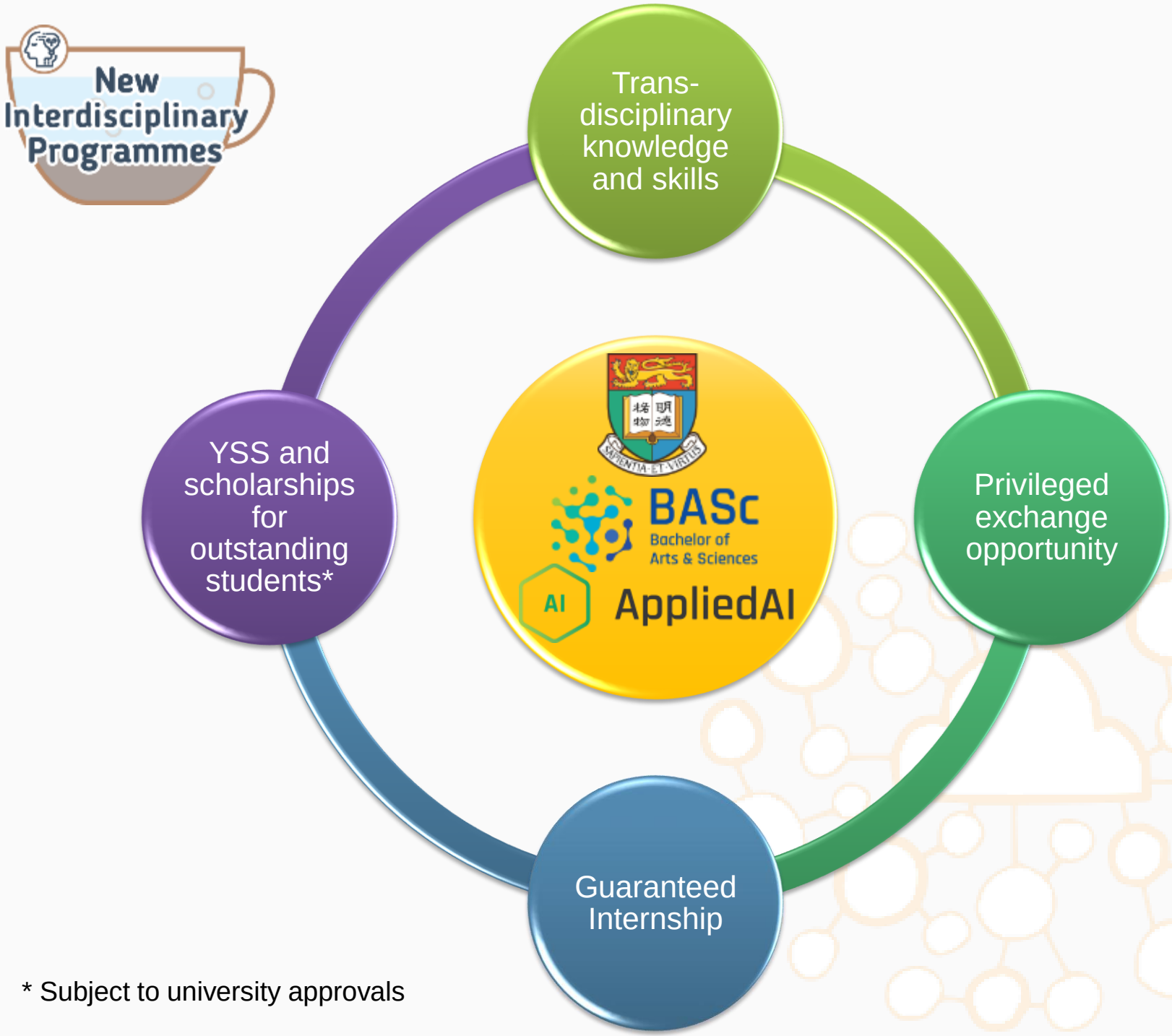
Lowest admissions score
3A*

Average admissions score
3A*

IB

Lowest admissions score
39

Average admissions score
40



* Subject to university approvals

Further Information

BASc(Applied AI) website:

https://saasweb.hku.hk/programme/ai.php

(or Google with “hku applied ai”)

- Programme
- Co-Directors

Prof. Jeff YAO
(Statistics, RRS 220)

Prof. Patrick NG
(Mathematics, RRS 424)

- Course Selection Advisers

Q&A
Email: science@hku.hk
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