Artificial Intelligence: Systems and Technologies (JS4468 / AISTN)

In CUHK Technology Forum…

'*With the* **omnipresence** *and* **power** *of AI clearly in sight and within our reach, how should humans co-exist and manage this new "being" as a benevolent partner? This is particularly relevant to Hong Kong as it is actively striving for the advancement of Innovation and Technology.*'

\- Prof. Rocky S. TUAN, Vice-Chancellor and President of CUHK

Press Release: https://www.cpr.cuhk.edu.hk/en/press_detail.php?1=1&1=1&id=2703&t=cuhk-faculty-of-engineering-holds-technology-forum-to-explore-the-future-possibilities-of-ai

AI is transforming the way we live!!!

Many disciplines are changing

   A –   Automotive

   B –   Bioscience

   C –   Creative Services

   D –   Data

   E –   Education

   F –   Finance

   G –   Gaming (note: G may also mean Government)
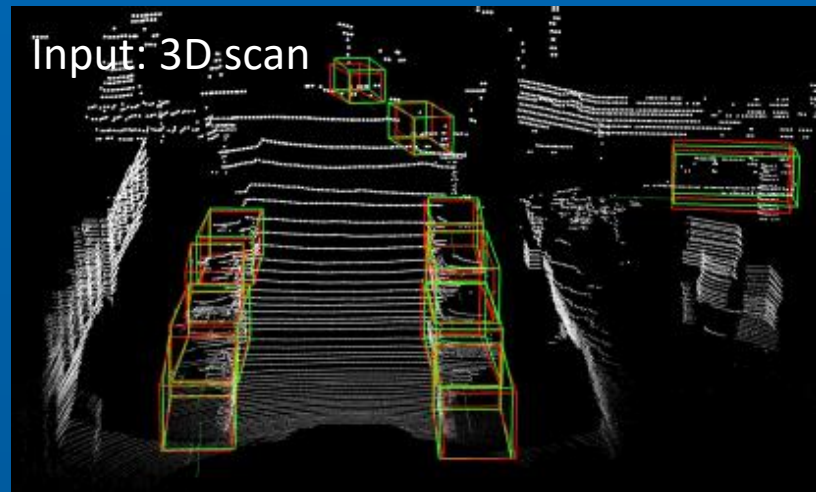
   H –   Healthcare

   I –   Internet of Things

… …

AI in Automobile

Computer vision enables

- Road line detection
- Traffic sign recognition
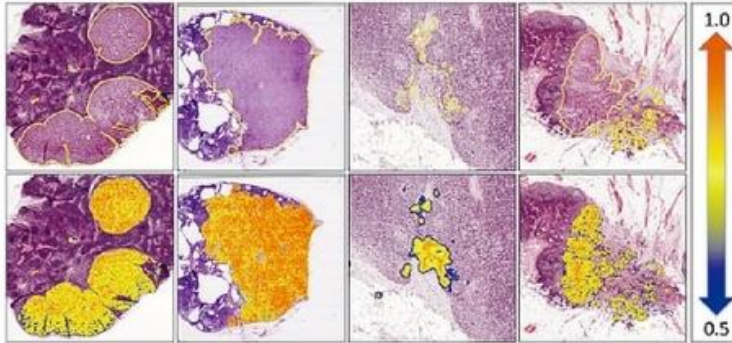- Vehicle / pedestrian detection
- …

Our result

Input: 3D scan

Reference: KITTI dataset
http://www.cvlibs.net/datasets/kitti/eval_object.php?obj_benchmark=3d

AI in Bioscience

Prof. P.-A. Heng

Prof. Dou Qi

Reference:

https://bit.ly/38ofojs (2021年5月27日明報大學道專題)
https://cutt.ly/xEYdPYC (2019年5月10日明報大學道專題)

AI in Creative Services

AI removes & auto-fills word balloon in manga
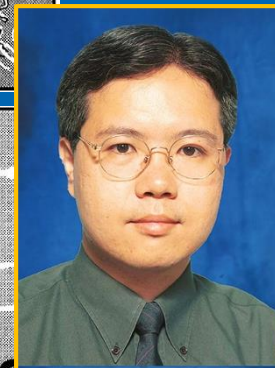

AI執筆創作「手塚」味漫畫　本月下旬面世

02月08日(六) 18:00

AI執筆創作具「手塚治蟲」（左圖）味的漫畫。　◀ 1/2 ▶

周日（9日）是日本已故漫畫家手塚治蟲逝世的30周年，其筆下《小飛俠阿童木》等作品是不少人的童年回憶。有日本公司去年與大學聯合開發一項「手塚治蟲新漫畫」紀念企劃，透過讓AI「學習」手塚治蟲以往的漫畫作品，再執筆創作出具手塚大師影子的新作品。破格的新漫畫將於本月27日刊登於日本人氣漫畫雜誌《Morning》。

Prof. T.-T. Wong

References:

https://hk.on.cc/hk/bkn/cnt/aeanews/20200208/bkn-20200208180001681-0208_00912_001.html

http://www.cse.cuhk.edu.hk/~ttwong/papers/mangainpaint/mangainpaint.html

AI in Data

AI can help find insights in data, e.g., **social media data**, and relate different kinds of data

Can we predict a series of key phrases for a social media post with both texts and images?
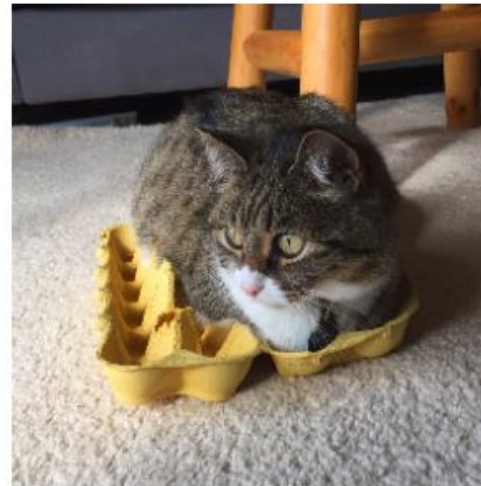
Prof. Michael Lyu

Prof. Irwin King

Post (a): Contemplating the mysteries of life from inside my egg carton...☺
#cat #cats #CatsOfTwitter

Post (b): The <mention> have the slight lead at halftime!

#NBAFinals

AI in Finance

80%銀行未來5年增人工智能投資

HOW MACHINE LEARNING AND AI ARE TRANS... FINANCE INDUSTRY

SEPTEMBER 22, 2021   1:38 PM UTC, FINANCEFEEDS EDITORIAL TEAM

Thanks to the wealth of data that are increasingly available to banks and the general public, sophisticated algorithms are enabling improved processes in many areas of finance.

Image Source: **Canva Pro**

A subfield of artificial intelligence (AI), machine learning (ML) enables systems to learn and improve independently without the need for explicit programming or human involvement. But ML only works when it has access to enormous volumes of data, allowing

Like   69 people like this. Sign Up to see what your friends like

原文刊於信報財經新聞

銀行業在人工智能應用上面對困難，包括相關人才不足及監管環境不斷轉變等（資料圖片）

金融科技為近年發展大趨勢，金管局旗下金融學院的香港貨幣及金融研究中心日）發表研究報告，80%受訪銀行表示，計劃在未來5年內增加對人工智能的投風險管理和提升客戶體驗為最大原因。

【金融科技】本港虛銀：AI及數據應用成發展關鍵 港具地理優勢

文章日期：2020年1月14日 14:16

Like 0   Share   A⁺ A⁻ 🔖 ✉ 🖨 f 🐦 ⊙

本港8家虛擬銀行料今年陸續開業，當中多家虛銀高層今均出席亞洲金融論壇分享行業的發展看法。平安壹賬通銀行行政總裁馮鈺龍則表示，人工智能（AI）已推動銀行業的整體發展，例如Chatbox（聊天機械人）、語音機械人等，未來虛銀將致力加強有關應用，又指香港具有鄰近內地的地理優勢，有利於兩地的人才交流與人才引入。

References:
https://www.mpfinance.com/fin/instantf2.php?node=1578982602897&issue=20200114
http://startupbeat.hkej.com/?p=91478

AI in Gaming

Some games start to use AI:

- To bring non-player characters (NPC) to life
- To adapt to each player's gameplay
- To create stronger AI players, e.g., E-sport in Starcraft II (not only chess games)
- To create a more dynamic virtual world

References:
https://www.nature.com/articles/d41586-019-03630-0
https://www.nature.com/articles/d41586-019-03298-6

AI in Healthcare

- Radiology
- Imaging
- Disease Diagnosis
- Telehealth
- Electronic Health Records
- Drug Interactions
- Creation of New Drugs

Reference:
https://inews.hket.com/article/2572760/

創科鬥室 StartUpBeat

中大研發新系統 0.04秒完成評估
AI分析CT圖速驗新冠肺炎

由香港中文大學工程學院及醫學院組成的跨學科團隊，研發一款新型人工智能（AI）系統，可針對胸部電腦斷層掃描（CT）影像，快速檢測是否感染新冠肺炎，只需0.04秒內即完成分析，其準確度更高達96%。該研究成果已發表於Nature旗下綜合期刊npj Digital Medicine上。

中大醫學院影像及介入放射學系主任余俊豪教授指出，坊間對新冠肺炎的早期檢測一般採用核酸測試或CT影像核酸測試靈敏度大約為70.6%至97.5%，惟本地曾經有人的測試結果呈陰性，後來卻成為隱形患者。

至於CT影像方面，準確度高達96%。惟醫生每檢查一個CT影像，需時5至10分鐘；診斷過程耗時且容易出錯；AI系統僅在0.04秒內即可準確評估整個三維CT影像，有望輔助醫生應付日常重複的診斷工作，提高臨床診斷效率。

200患者數據訓練模型

中大團隊在去年1月至4月採集來自本地及海外醫院的CT數據，當中包括本港威爾斯親王醫院、瑪嘉烈醫院、屯門醫院，以至北京大學深圳醫院、德國耶魯大學...

■余俊豪教授（右二）強調，醫生日後用AI輔助診斷，須簽署相關文件承擔醫療責任；旁為寶琪（左二）。（朱美俞攝）

高AI的準確度。

在保護病人私隱的前提下，團隊成功採集約200名來自不同醫院的患者數據；另通過域特定特徵歸一化（Domain-specific feature...）過，日後如有發現確診個案，團隊將分析有關數據。

助追蹤腫瘤放射診療

除了應用於新冠肺炎CT影像檢測，AI系統亦...

Reference (Apr 2021): http://startupbeat.hkej.com/?p=102056/

Prof. Dou Qi

麻省理工AI發現超級抗生素　有效殺滅多種致病細菌

科技 17:40 2020/02/24

hket

AI首次發現超級抗生素
有效殺滅抗藥性超級細菌

▲ 美國麻省理工大學的研究團隊發現了開創性的機器學習方法，利用人工智能系統開發出新種抗生素，可殺死多種致病細菌。

Growing Demand and Opportunities

- **Expect more than 50,000 jobs** for high-tech industries with the HKSAR government's policies in innovation and technology

- **AI Specialist is the most popular among the top 15 emerging jobs** with annual growth of 74% in demand in USA (LinkedIn 2020 Emerging Jobs Report)

- **150M technology-related jobs expected to be added globally** over the next five years (LinkedIn Jobs on the Rise in 2021)

References:
https://business.linkedin.com/content/dam/me/business/en-us/talent-solutions/emerging-jobs-report/Emerging_Jobs_Report_U.S._FINAL.pdf
https://business.linkedin.com/talent-solutions/resources/talent-acquisition/jobs-on-the-rise-us#digital

#1   74% annual growth

Artificial Intelligence Specialist

What you should know:
Artificial Intelligence and Machine Learning have both become synonymous with innovation, and our data shows that's more than just buzz. Hiring growth for this role has grown 74% annually in the past 4 years and encompasses a few different titles within the space that all have a very specific set of skills despite being spread across industries, including artificial intelligence and machine learning engineer.

Skills unique to the job:
Machine Learning, Deep Learning, TensorFlow, Python, Natural Language Processing

Where the jobs are:
San Francisco Bay Area, New York, Boston, Seattle, Los Angeles

Top industries hiring this talent:
Computer Software, Internet, Information Technology & Services, Higher Education, Consumer Electronics

Digital Transformation

Digital platforms are more important than ever to our everyday lives. The primary ways we communicate and consume information now happen in front of screens. The demand for digital skills is increasing, with no signs of slowing down.

150M
Number of technology-related jobs expected to be added globally over the next five years

Artificial intelligence practitioners

Demand is strong for tech professionals with artificial intelligence experience. In fact, this was the top emerging job trend from last year's report.

Top titles
Machine Learning Researcher, Machine Learning Engineer, and Artificial Intelligence Specialist

Top skills
TensorFlow, Scikit-Learn, Python

Top regions
San Francisco Bay Area, Denver metropolitan area, Austin, Texas metropolitan area

Growing Demand and Opportunities

- Many industries are now looking for the use and advancement of AI to boost up the work efficiency
  - » Opportunities for you to innovate and change the world!

- Many other possible occupations
  - » AI Specialist
  - » Data Scientist
  - » Software Developer
  - » Computer Engineer
  - » R&D for AI
  - » …

The AIST Programme

中大計算機科學與工程學系
科技知識培養人才　推動香港人工智能發展

人工智能（AI）發展一日千里，本年政府更大力推動有關AI科技的項目，可見此已成為現今科技的大趨勢，社會對相關人才亦相當渴求。因此，香港中文大學（中大）開辦了「人工智能：系統與科技」工程學士課程教授學生基礎知識、創新及可靠的AI解決方案，以及與道德和社會相關的AI問題等，培養能應對各種有關AI挑戰的專才，以應付社會對AI人才的需求。

中大計算機科學與工程學系系主任金國慶教授表示，香港是金融中心及智能城市，今年香港貿易發展局更在生物科技、AI、金融科技、智慧城市等四大領域推行了發展，所以，可見AI對香港而言，是非常重要的科技發展。加上近年AI在不同層面上的應用不斷增加，社會對AI人才的需求殷切，很多相關的工作與政府或大型企業都有密切關係，它的前景非常廣闊。

因此，為配合社會需要，中大在兩年前開辦了「人工智能：系統與科技」工程學士課程，以培養學生掌握人工智能的知識，從而培育更多AI方面的人才。雖然其他大學亦有開辦類似的課程，但金教授指出，中大這個課程非常獨特，有別於其他大學開辦的課程，這課程的全部科目，例如：數學、工程，還有電腦編程等基本專業知識都集中在工程學院裏學習，非常重視有志成為科學家及工程師等的學生。

課程除了培育學生具備設計和操作人工智能系統和技術的能力，藉着數學、基礎科學、數據結構、統計學、分佈式計算等基礎，從大量信息中分析、推理和推斷知識。旨在培育學生應付當今人工智能和相關專業領域的巨大需

▲金國慶教授指出，「人工智能：系統與科技」工學士課程獨特之處是集中在工程學院內教授學生專業科技知識，培訓科學家及工程師等人才。

求，使學生能開發尖端人工智能解決方案，這些方案在學術、工業和社會均具實際意義。課程亦着重數理基礎、科學理論和實用的系統技術，並提供四個專修範圍，供學生根據自己的興趣選修。

學生因應興趣　選讀四大專科範疇

在「智能生物醫學」範疇，學生可在生物醫學上學習應用AI技術，例如探測生物心臟跳動、量血糖等各式各樣的醫學工作；而「智能多媒體處理」範疇，則讓學生能運用AI在影像、語言處理及其他多媒體上進行智能處理，例如將某個人的臉部或說話口音轉化成另一個人，或者透過AI撰寫文章，甚至對一些文章作出分析等。

「大規模人工智能－理論與系統」範疇主要教授學生AI理論與系統上的學問，由於現在AI

技術發展愈來愈普及，人們很多時需要AI提供更快及更精確的工作，例如5年前流行應用大數據，當時使用了更強大的CPU/GPU及電腦處理它們，形成更發達的AI技術，解決這個問題；最後是「智能製造與機器人學」範疇，將AI系統結合在機器人上，希望以後可以製造的機器人不只能動，還能看、聽、說，以及與人交流，多年來，科學家的理想是創造出模仿人類的機器人，雖然要達到這個目標仍有距離，但我們已完成很多東西，例如使用Google進行訊息處理等，這些都能提高工作效率和減少出錯。

另外，學生不只在工程、理論及系統上學習AI相關的知識，本課程亦會提供一些相關社會科學的內容，讓學生了解人工智能發展有機會對社會造成甚麼的影響，科目會幫助同學思考，利用AI製作出的產品能為人類及社會帶來

甚麼好處。金教授舉例，學生製作智能飛彈殺人好嗎？製作者能夠製造出壞機械人，做出缺德的事怎樣？如果有人利用AI多媒體技術將個人的臉轉換成別人的樣子，再偷東西等？科目教導要懂AI知識的學生，從人為的角度看事情，增強他們的三觀思考，令教授AI更人性化，讓學生運用AI在社會中發揮正面作用。

行業前景向好　工作職位眾多

除了一般科目，課程於2021至22年更推出工作學習計劃，讓學生能夠通過為期十二個月的實習獲得實踐工作經驗。參與計劃的學生有機會到企業或國際機構實習，部門過往曾有學生於匯豐銀行、思科系統公司、百度、阿里巴巴、香港金融管理局等公司及機構獲得實習職位，在專業人士的指導及培訓下，使學生獲得廣泛的實踐技能，並在現實環境中，尤其是在AI領域中獲得大量的寶貴的工作經驗。在實習過程中，學生可以將課堂知識應用於工作環境、學習人際關係技巧，更有助畢業後，成為AI專業技術專家做準備。

金教授表示，現今本地和全球就業市場上的AI專家均存在人力短缺問題。根據創新科技局的資料，香港政府在創新科技方面的政策包括重新工業化，擴建將軍澳工業區的科學園，以及在落馬洲建立香港至深圳的創新科技園，預計將為擁有高端技術知識和技能的人才，創造50,000個工作崗位。

另外，根據LinkedIn 2020年新興工作報告，人工智能專家在美國15個新興工作中都名列前茅，需求年增長率為74%。基於這些原因，香港中文大學旨在培訓未來的AI工程師、科學家、生物醫學工程師、信息和計算技術人才、製造和機器人工程師，以及為互聯網公司提供的智能多媒體處理。他續說：「總括而言，就讀課程的學生前景是光明、積極及令人鼓舞的！」

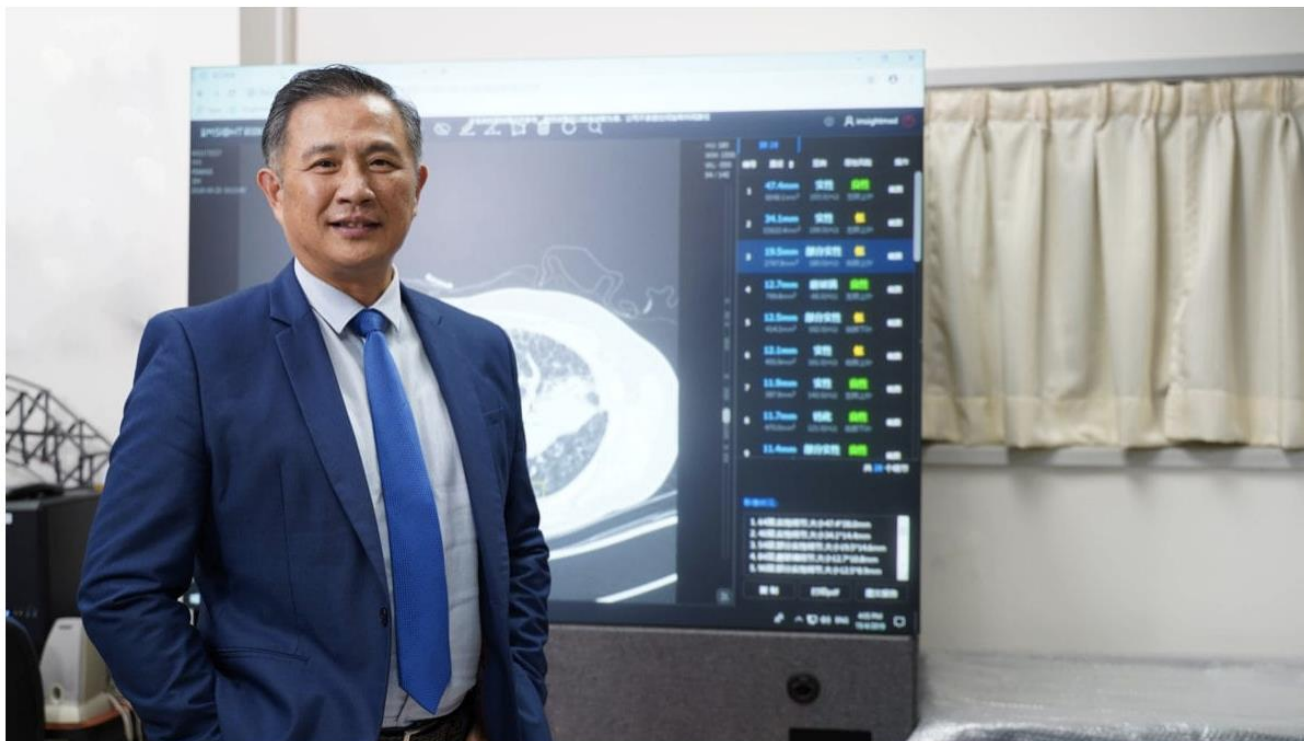# 中文大學首創人工智能課程　為未來創科五萬職位提供人才

◇ 業界專訪　by Antony Shum　on 六月 5, 2019

人工智能無疑是近年非常熱門的新科技潮流，其應用範圍之廣，甚至可以取代真人的工作，影響就業市場。不過也有意見認為人工智能的普及會為求職市場增加需求，在香港新增達五萬個職位。香港中文大學就看準這個機會，開辦人工智能課程培育相關人才。

Special Features

- 1st Bachelor of Engineering programme in AI in Hong Kong
  - » More preferred by students (based on past JUPAS data)

- 4 specialized streams
  - » Biomedical Intelligence
  - » Intelligent Multimedia Processing
  - » Large-scale Artificial Intelligence
    - Theory and Systems
  - » Intelligent Manufacturing and Robotics
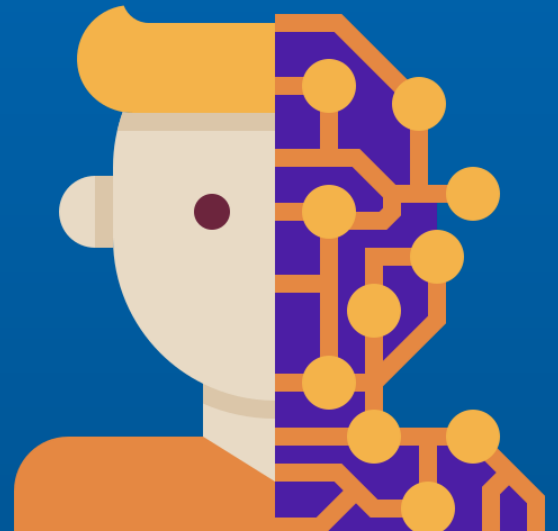
Mission

- Enable students to develop cutting-edge AI solutions that are of practical interest to academics, industry, and society

- Nurture local talents in AI related applications to meet today's tremendous need of well-trained talents in AI and related specializations

Programme Objective

- Equip students with the capabilities of building AI systems that can analyze and infer knowledge from massive information

- Backed by rigorous foundations like data structures, statistics, machine learning and distributed computing

- Emphasize solid trainings on
  - » Mathematical analysis and reasoning on massive data
  - » Large-scale system design and implementation for processing massive data

Let's take a look at our department
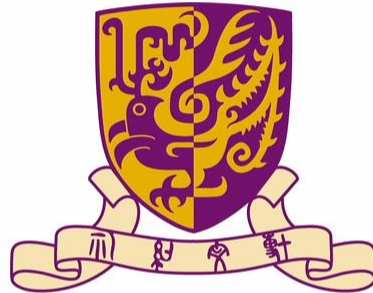
香港中文大學
The Chinese University of Hong Kong

A Long History

- The first computer science department in HK
- Offering AIST, CDAS, CENG and CSCI programmes
- A strong alumni network

CS department
CS minor

BCS accredited

First in HK
AIST program

1968

1978

1991

2022

1973

1983

2019

Offered courses

CS major

Engineering faculty
CE program

CDAS program
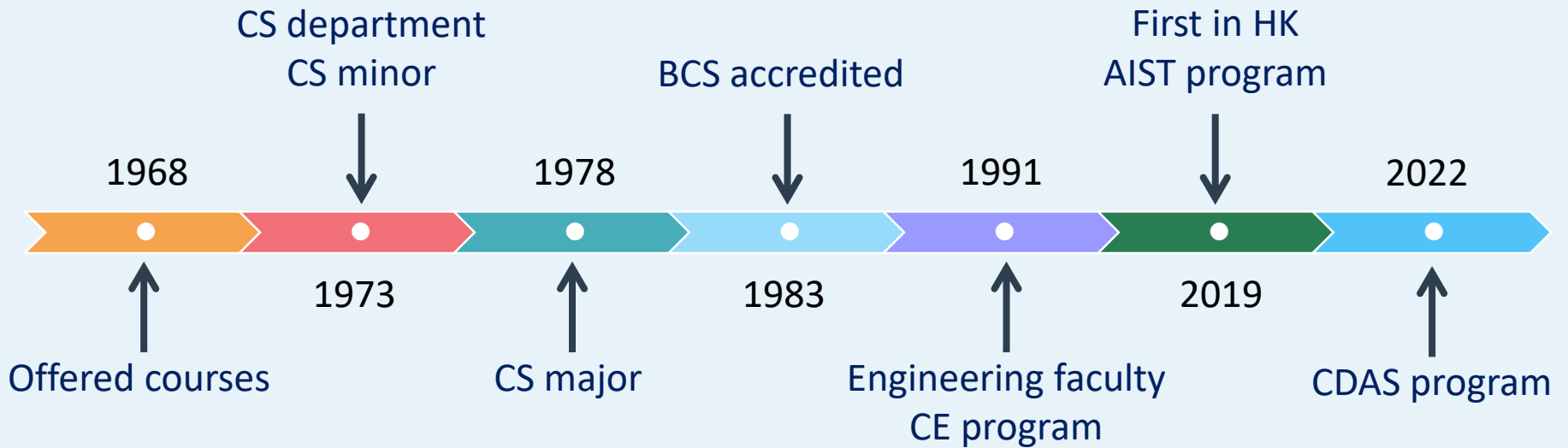
Excellence in Teaching and Research
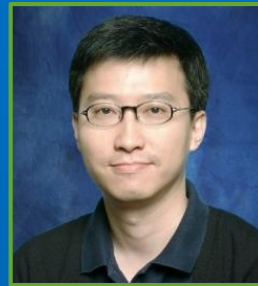
2021 Kyoto Prize Laureate and Turing Award Recipient

Prof. Andrew Yao

Seven ACM Fellows

Prof. Andrew Yao, Prof. Martin Wong, Prof., Michael Lyu, Prof. Benjamin W. Wah, Prof. John Lui, Prof. Yufei Tao, etc.

Ten IEEE Fellowship

Prof. Irwin King, Prof. John Lui, Prof. Jiaya Jia, etc.

CUHK University Education Award 2020

Prof. Irwin King, for the KEEP team (Knowledge & Education Exchange Platform)

Vice-Chancellor's Exemplary Teaching Award 2019

Senior Lecturer Michael Fung

Recent Achievements in Intl'/local Competitions

3 Awards in International Conference on Computer-Aided Design (ICCAD)

- *1st place for topic "GPU-Accelerated Logic Rewriting" and 2nd place for "Routing with Cell Movement Advanced" in 2021 CAD Contest*

- *2nd place in 2021 CADathlon*
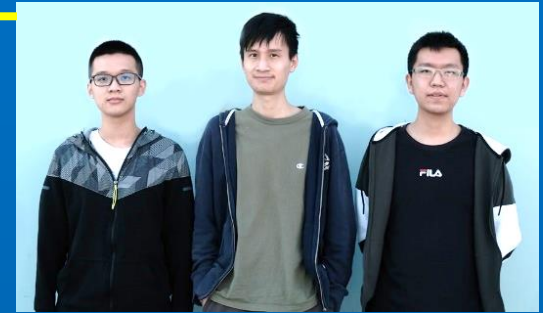
International Collegiate Programming Contest (ICPC) *(formerly named ACM Programming Competition)*

2019: ranked 12th (over 3000 universities)

2012: ranked 8th

2011: ranked 13th

2001: ranked 8th
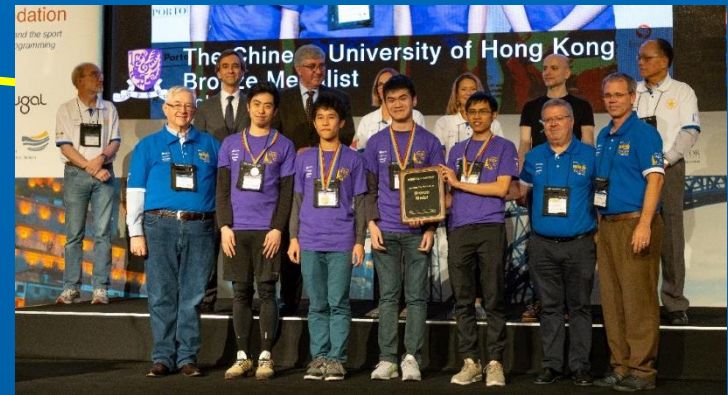
PwC's HackaDay 2019

2nd place

2022 QS World University Ranking

- *#26 Worldwide in Computer Science and Information Systems*
- *#5 in Asia*
- *#1 in Hong Kong*

(https://www.topuniversities.com/university-rankings/university-subject-rankings/2022/computer-science-information-systems)

CSRanking in 2022

- *#33 worldwide in Computer Science*

- *#9 in Asia*

- *Top in Hong Kong*

  (http://csrankings.org/#/fromyear/2021/toyear/2022/index?all&world)

Student Training

CUHK Amazon Deep Learning Workshop 2019

& AWSome Day 2020

Cooperated with Amazon to offer student training in deep neural networks and machine learning

City Challenge – Bridge to a Smarter City 2016

Designed technology-based living applications for the elderly and won the second runner-up

Industrial Visits

- Visit to companies to learn latest development in industry

Work-Study Scheme

- One-year placement and internship for students to gain practical experience in a real working environment

More details will be announced when places are available!

Example of Previous Opportunities in CSE

Strong Alumni Network
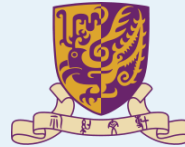
Sharing from Our CSE Students

I'm now working in **Deloitte's Cyber Risk Advisory Team**. Cybersecurity is a promising job, you can equip yourself to be a cybersecurity expert by enrolling relevant courses provided by the Department of Computer Science and Engineering. Cybersecurity professionals, like information security analysts, protect businesses, governments, and individuals from criminal activities on the internet. With the explosive growth of the internet in business, education, and personal communication, computer experts with knowledge of cybersecurity are in high demand.

Ka Ki CHAU,
CSCI Graduate of 2021

Sharing from Our CSE Students

The courses offered by the CSE department give a solid foundation on both the practical and theoretical sides of CSCI programme. I'm now working in **Google's Android Pixel team**, topics from CSCI courses still often pop up during my day-to-day job. As the software industry becomes increasingly competitive, I feel quite lucky that I've undergone such rigorous academic training.

Yu CHAO,
CSCI Graduate of 2020

Sharing from Our CSE Students

During the 4 years of my study as a CENG student, I could take courses on different topics. These courses not only **consolidate my knowledge** related to my major but can also train up my critical thinking and logical thinking skills. We have to **design & implement a smart hardware** product in just a few weeks and this project not only gives me a hands-on experience on designing smart hardware product, but also improves my communication skill and time management skill.

Hei Yiu LAW,
CENG Graduate of 2021

Sharing from Our CSE Students

The special thing about AIST programme is the learning experience which has been eye-opening. I can get to build a **solid foundation** on not only the **problem-solving mindset**, but also **fundamental knowledge** such as calculus and statistics. Although some may find them difficult, they are valuable tools that will help distinguish me from the non-engineering counterparts.

Marco AU YONG,
AIST Year 3 Student

What's More?

- Chances to create your own project and innovation with support and advice from CSE teachers

- Exchange opportunities to world-class universities

- High competitiveness in job market with 90% of CSE graduates employed within one month of graduation

- CSE teachers usually have the highest teaching evaluation scores

Why CSE Department?

Because it is fun!
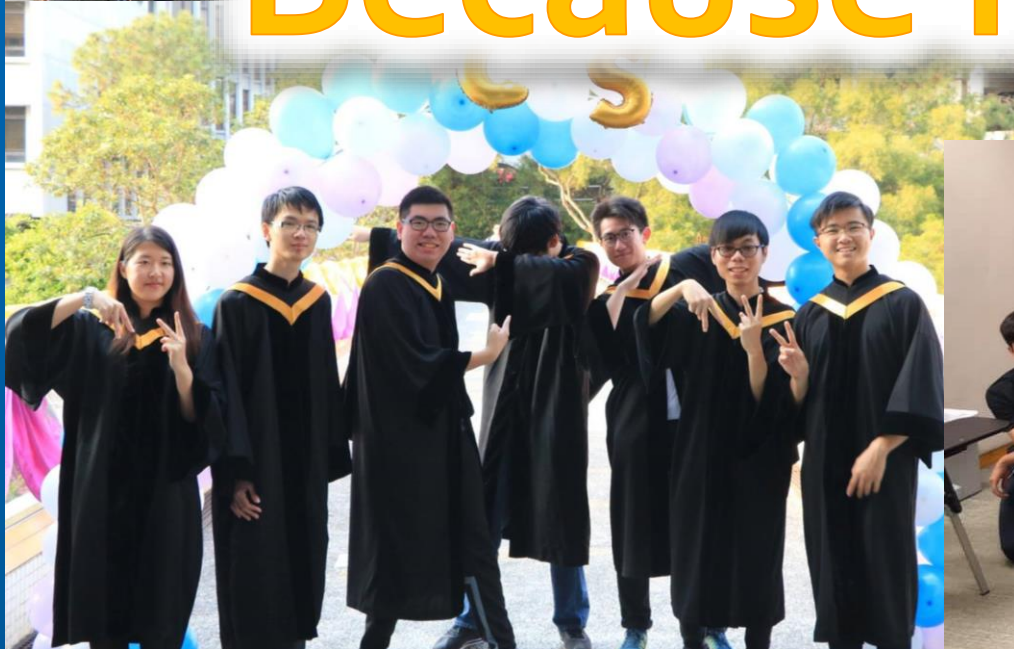
Admission Requirements for JUPAS Applicants

AIST Admission Requirements (2022 Entry)

HKDSE Subject	Minimum Level	Subject Weighting
HKDSE Core Subjects		
English Language	4	1.25
Chinese Language	3	1.25
Mathematics (Compulsory Part)	5^	1.75
Liberal Studies	3	1
HKDSE Elective Subjects		
Any two subjects	3	#

^   *Applicants with level 4 in Mathematics (Compulsory Part) and good results in other HKDSE subjects will be exceptionally considered on a case-by-case basis.*

*The AIST programme accepts any subject as elective, with subject weighting of **1.75** for Mathematics M1/M2; **1.5** for Biology, Chemistry, Physics, Combined Science and ICT; and **1** for any other subjects.*

Selection is based on the Best 5 HKDSE subjects with subject weighting applied. Bonus points will be awarded to the 6th and 7th subjects, if any.

AIST Admission Grades (2...

Percentile	CHI	ENG	MATHS	LS	M1/M2	Elective	Elective	Elective	Reference Score ^
Upper Quartile	4	5**	5**	4	5*	5*	5*	5*	32
Median	3	5	5**	3	5**	5*	5	5	30
Lower Quartile	3	5	5**	4	5	5*	5*	5	29

^ *The Total Reference Score is the total score of the applicant calculated based on the best 5 subjects in Category A or Category C of HKDSE:*
*where lv 5** = 7, lv 5* = 6, lv 5 = 5, lv 4 = 4, lv 3 = 3, lv 2 = 2, lv 1 = 1 for Category A subjects;*
and Grade A = 5, Grade B = 4, Grade C = 3, Grade D = 2, Grade E = 1 for Category C subjects.

Admission is not based on public examination results alone, and the overall scores of students admitted vary from year to year. The information provided is for reference only and should not be used to predict the chance of admission in subsequent years.

Reference: latest admission information in http://admission.cuhk.edu.hk/jupas/download.html.

Admission Requirements for Non-JUPAS Applicants

AIST Admission Requirements (for Non-JUPAS & International Applicants)

- Applicants seeking admission on the strength of qualifications other than HKDSE examination results (*e.g.,* IB, GCE-AL, overseas qualifications) can apply through Non-JUPAS channels

- Will be considered on the basis of their education background and academic achievements

- Will be expected to demonstrate outstanding abilities in English, mathematics and science subjects

Check more details at OAFA's website!

Non-JUPAS Applications: http://admission.cuhk.edu.hk/non-jupas-yr-1/requirements.html
International Applications: http://admission.cuhk.edu.hk/international/requirements.html

Curriculum Structure

Curriculum – Overview

4	Final Year Project	Major Electives		
3	Major Core	Major Electives	University Common Core (Languages, GE, PE) *(39 Units)*	Free Electives *(9 Units)*
2	Major Foundation	Major Core		
1	Faculty Package	Major Practicum	Major Core	

123 units
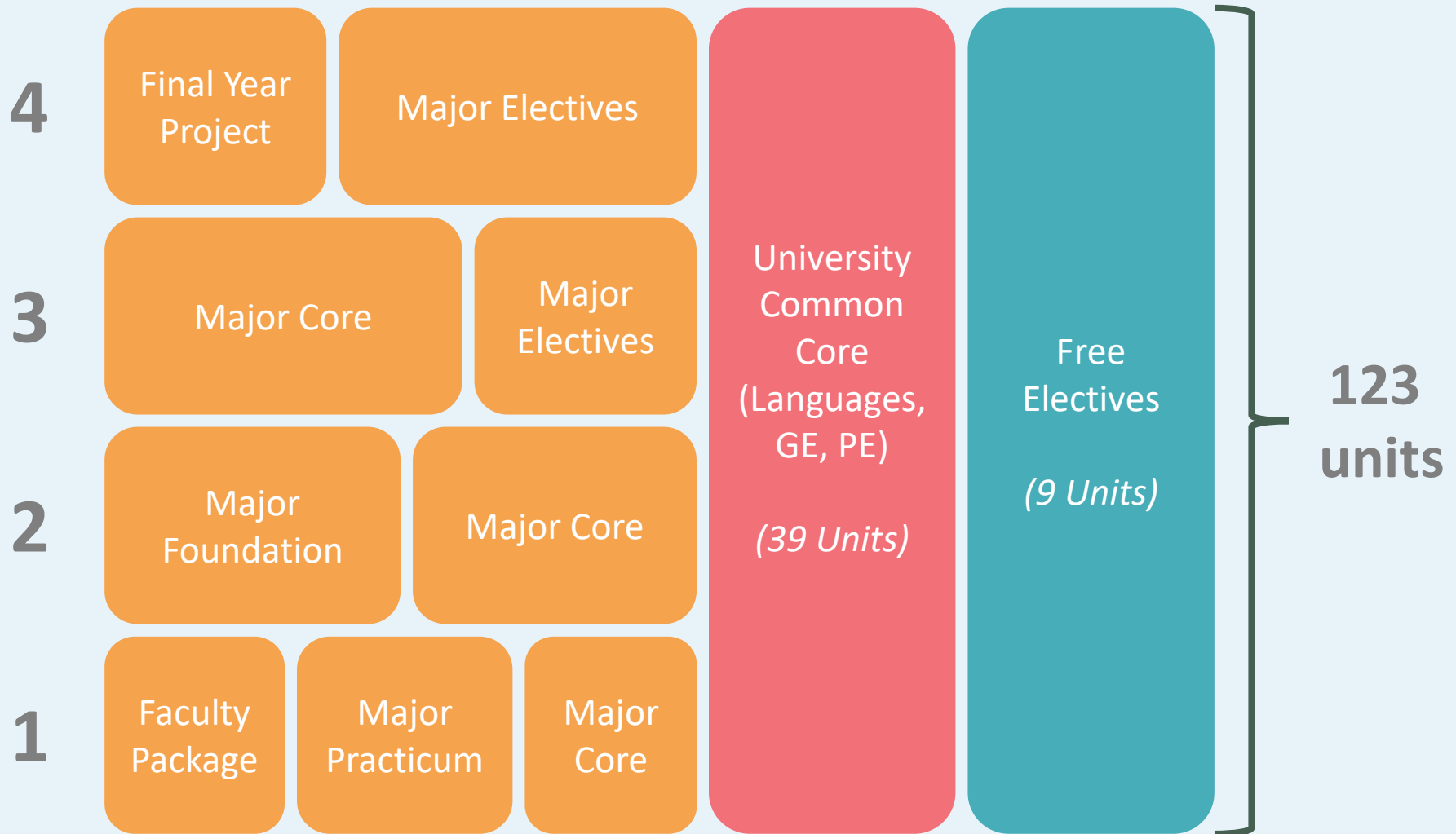
Curriculum – Major Requirements

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Practicum	Major Core

75 units

Curriculum – Faculty Package and Foundation

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Practicum · Major Core
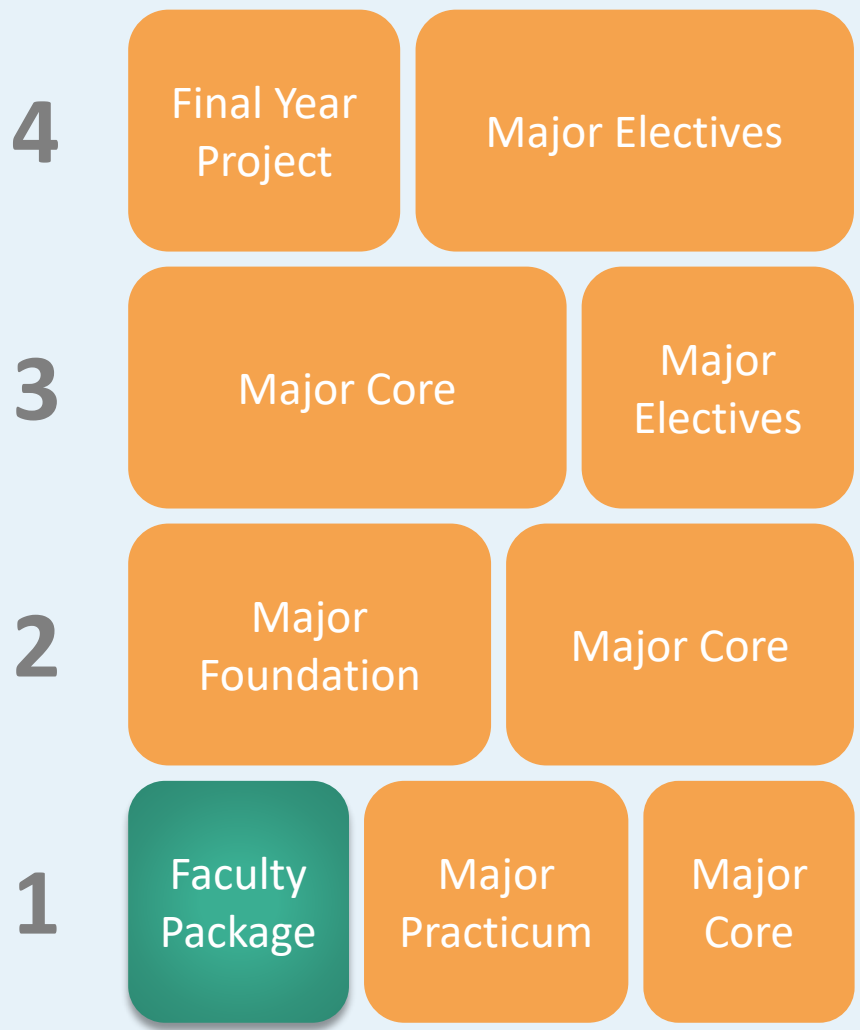
Faculty Package and Foundation (15 units)

- » Problem Solving By Programming (ENGG1110)
- » Linear Algebra for Engineers (ENGG1120)
- » Multivariable Calculus for Engineers (ENGG1130)
- » Calculus for Engineers (MATH1510)
- » General Physics for Engineers (PHYS1003)

Curriculum – Major Practicum

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Practicum	Major Core

Major Practicum (3 units)

» Technology, Society and Engineering Practice (AIST2601)

» Engineering Practicum (AIST2602)

Curriculum – Major Foundation

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Practicum	Major Core

Major Foundation (10 units)

- » Introduction to Computing Using Python (AIST1110)
- » Discrete Mathematics for Engineers (ENGG2440)
- » Probability for Engineers (ENGG2760)
- » Statistics for Engineers (ENGG2780)

Curriculum – Major Core

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Practicum / Major Core

Major Core (18 units)

» Introduction to Artificial Intelligence and Machine Learning (AIST1000)

» Numerical Optimization (AIST3010)

» Introduction to Computer Systems (AIST3020)

Curriculum – Major Core

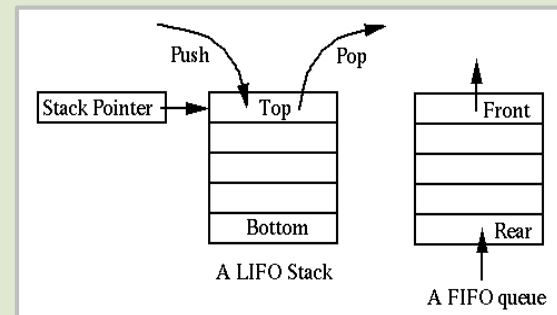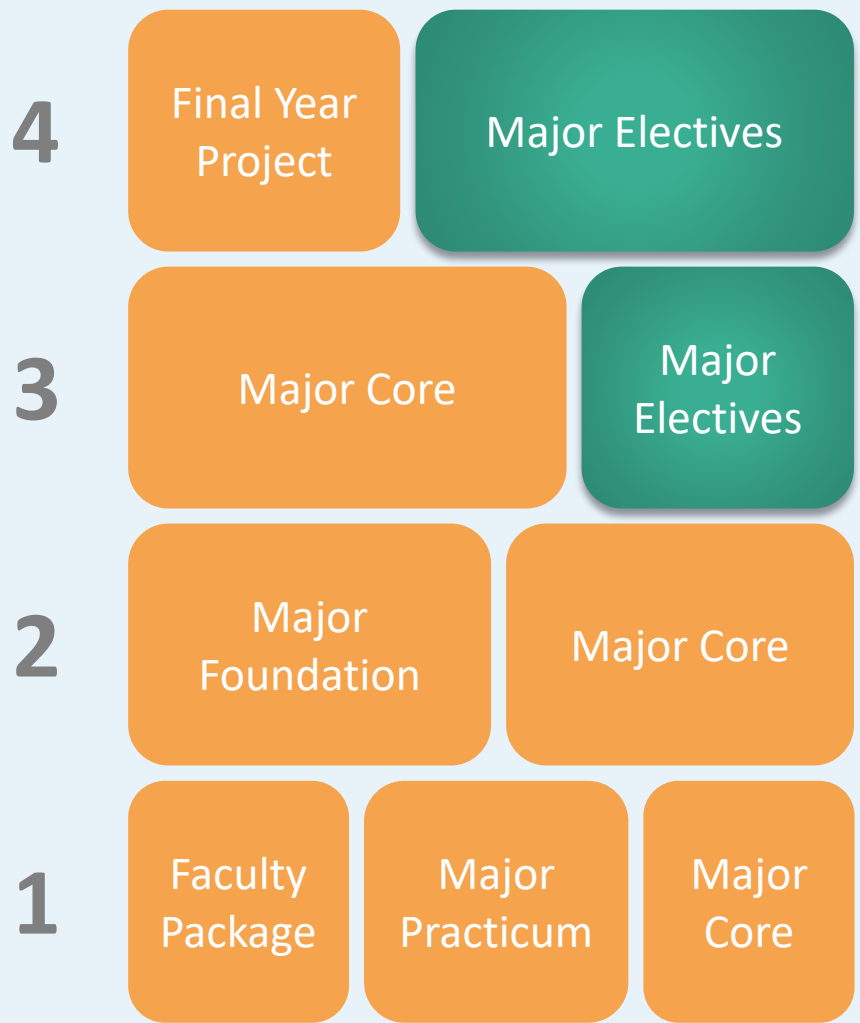|		
4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Practicum	Major Core

Major Core (18 units)

» Data Structures (CSCI2100)
» Design and Analysis of Algorithms (CSCI3160)
» Fundamentals of Artificial Intelligence (CSCI3230)
» Fundamentals of Machine Learning (CSCI3320)

Push   Pop

Stack Pointer → Top

Bottom

Front

Rear

A LIFO Stack

A FIFO queue

Curriculum – Major Electives

|		
4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Practicum / Major Core

Major Electives (23 units)

Streams

1. **Biomedical Intelligence**
2. **Intelligent Multimedia Processing**
3. **Large-scale Artificial Intelligence – Theory and Systems**
4. **Intelligent Manufacturing and Robotics**

Non-Stream

5. General Artificial Intelligence: Systems and Technologies

Stream 1: Biomedical Intelligence

- Study how to build intelligent biomedicine and healthcare applications

- Two emerging markets:
  - » Personalized genomics and precision medicine (*e.g.,* disease prevention, prediction, early diagnosis and treatment)
  - » Clinical record systems (*e.g.,* electronic medical records and pharmacy prescription information and insurance records)
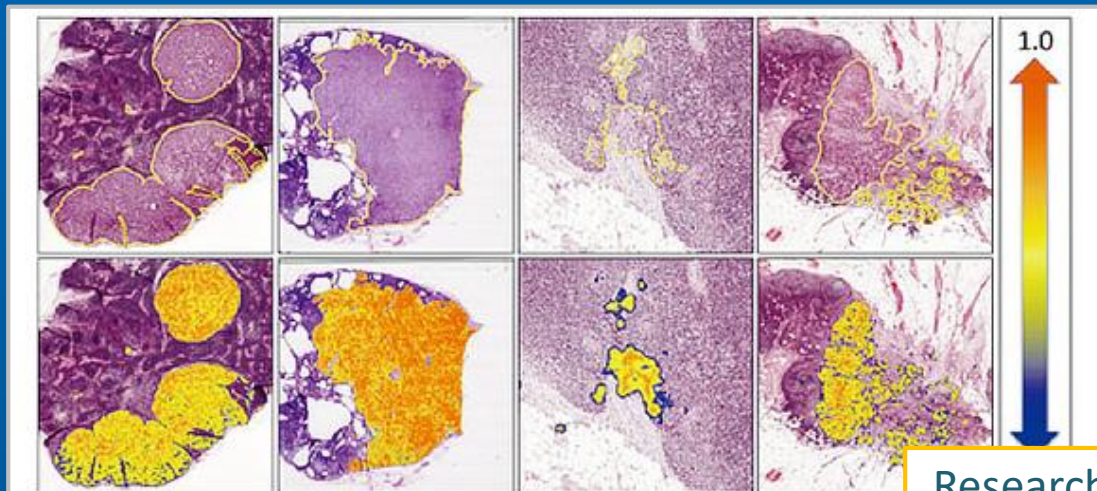
▲利用深度學習技術檢測癌細胞轉移情況

Research on medical image analysis by Prof. P.-A. Heng

Stream 2: Intelligent Multimedia Processing

- Study how to bridge AI and human brain functions and design models, algorithms, and systems for multimedia processing with high performance and high accuracy.

- Areas: digital image processing, face recognition, computer animation, human-computer interactions, speech and audio processing, computational linguistics


Color input | Invertible grayscale | Restored color image

Stream 3: Large-scale AI – Theory and Systems

- Study the advanced techniques of realizing large-scale artificial intelligence from both theory and system perspectives
  - » **Theory**: machine learning theory, statistical inference, online algorithms, *etc.*
  - » **Systems**: high performance computing, distributed storage, big data management, *etc.*
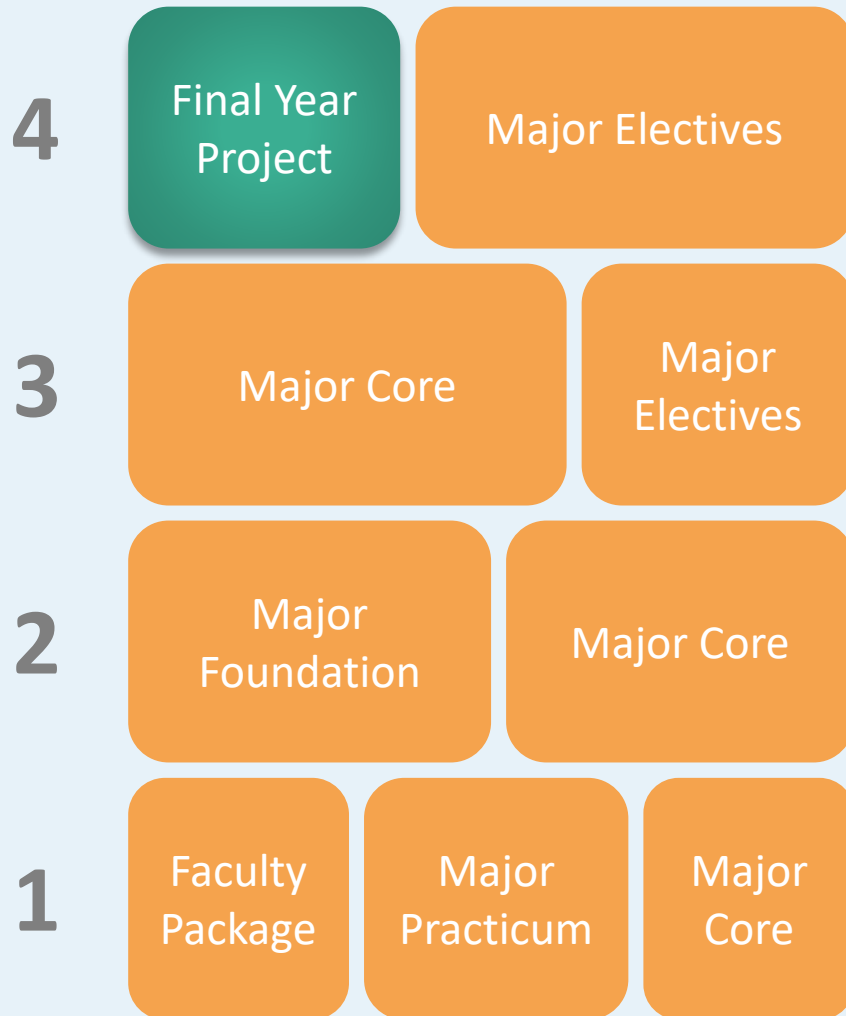
Stream 4: Intelligent Manufacturing & Robotics

- Study how to integrate manufacturing and robotics with AI for different aspects of human activities.

- Focus on the topics of mechanics, sensing and control, design & manufacturing, human-robot interactions, *etc.*
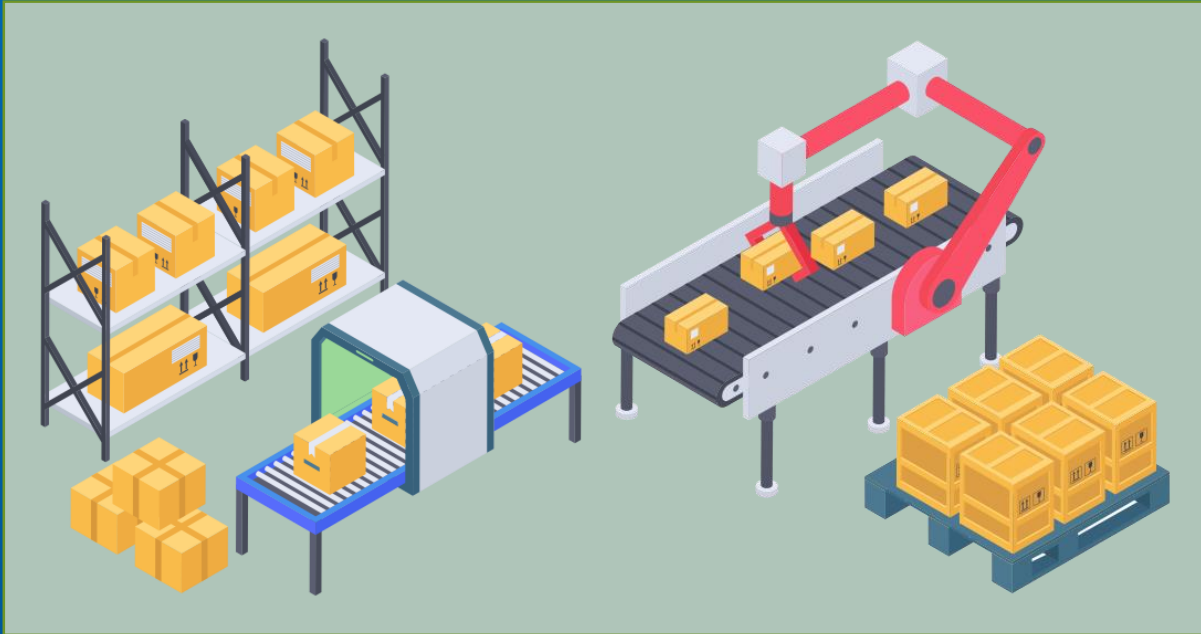
Distinct Topics

- Many other practical and interesting courses in AI:
    - » Machine Learning
    - » Deep Learning
    - » Large Scale Distributed Computing
    - » Intelligent Embedded Systems
    - » Knowledge Representation/Inference
    - » Human-Computer Interactions
    - » Natural Language Processing
    - » Big Data Analytics
    - … …

Curriculum – Final Year Project (FYP)

|		
4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package / Major Practicum / Major Core	

Final Year Project (6 units)

- » Pick an interesting topic
- » Interdisciplinary nature
- » Apply the knowledge learnt in the previous courses
- » Many open topics. Your creativity and discussion with the supervisor
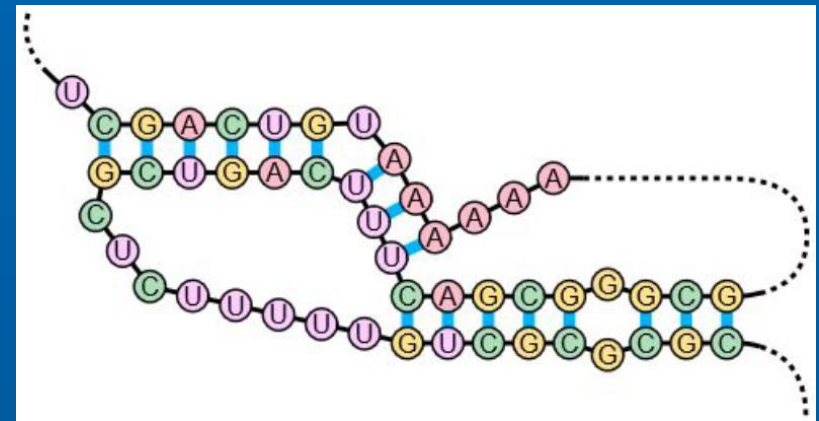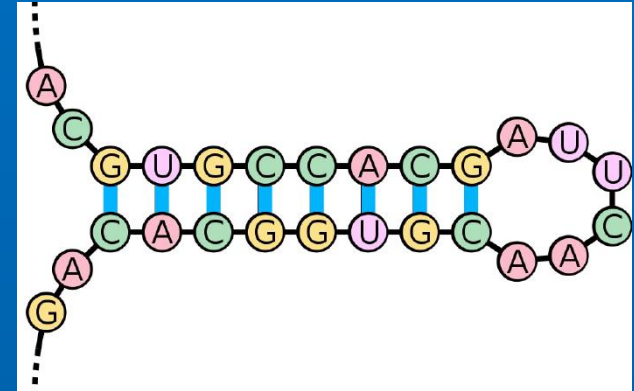- » Complete a project under the supervision of an advisor

Open topic FYP – you may also propose a project to a professor

FYP (AI + Bioinformatics)

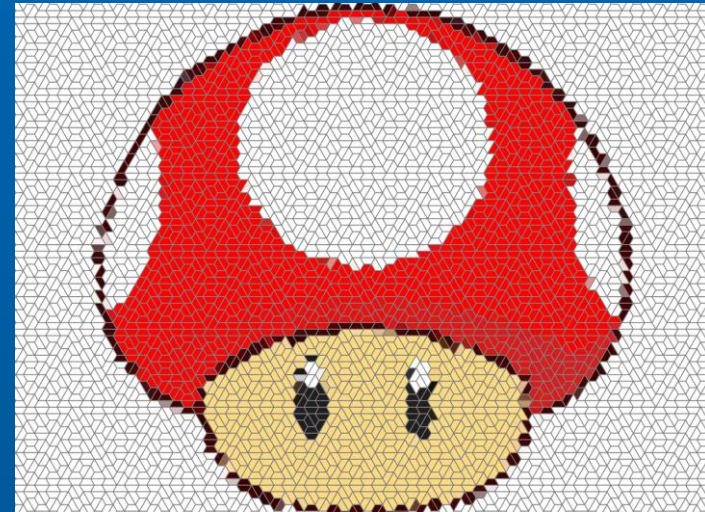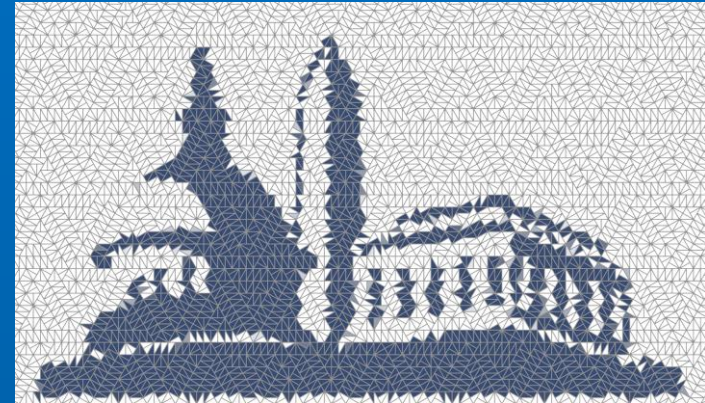- Apply machine learning to predict RNA-protein interaction
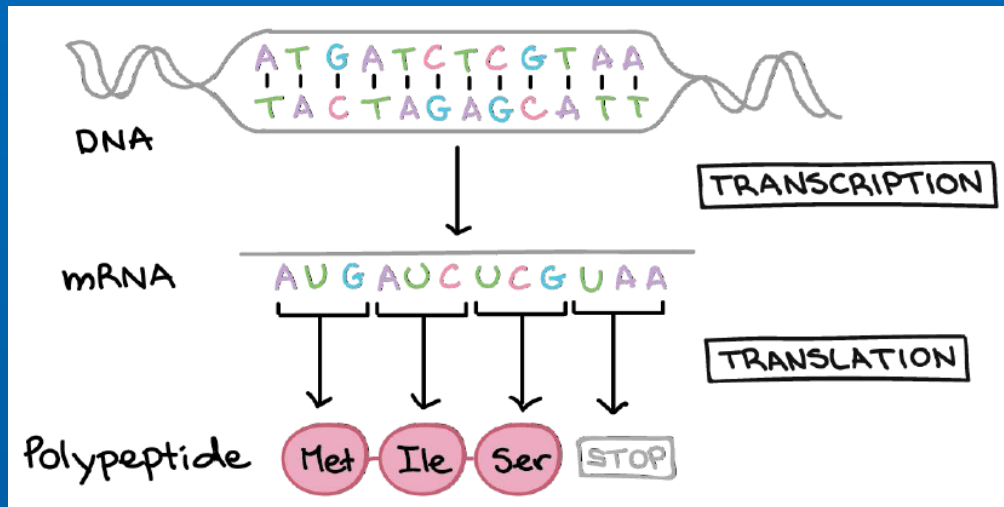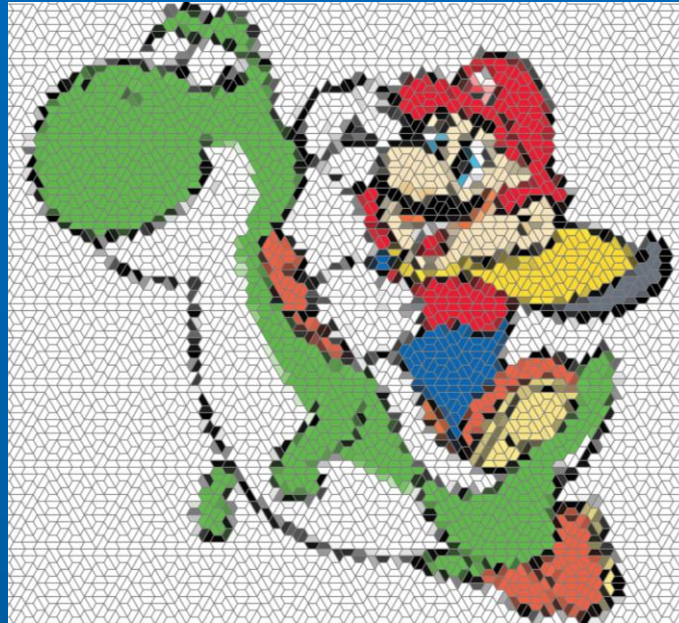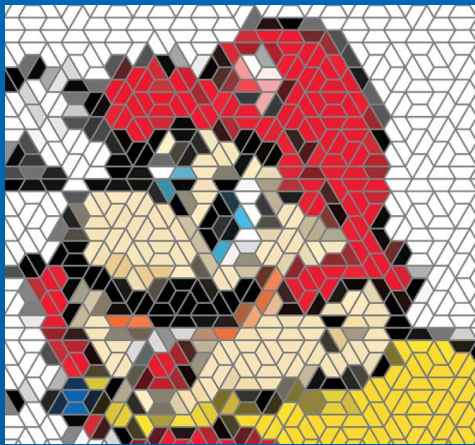

RNA-binding protein (RBP)

RNA folds to a specific structure to fit into the protein binding site
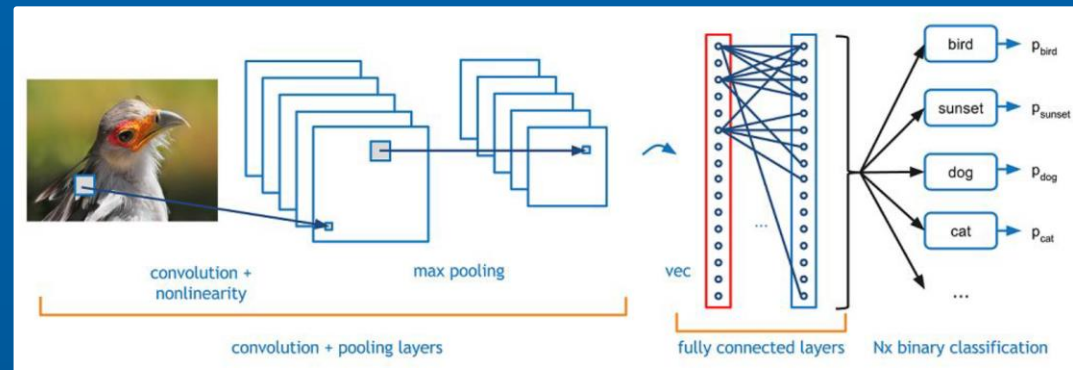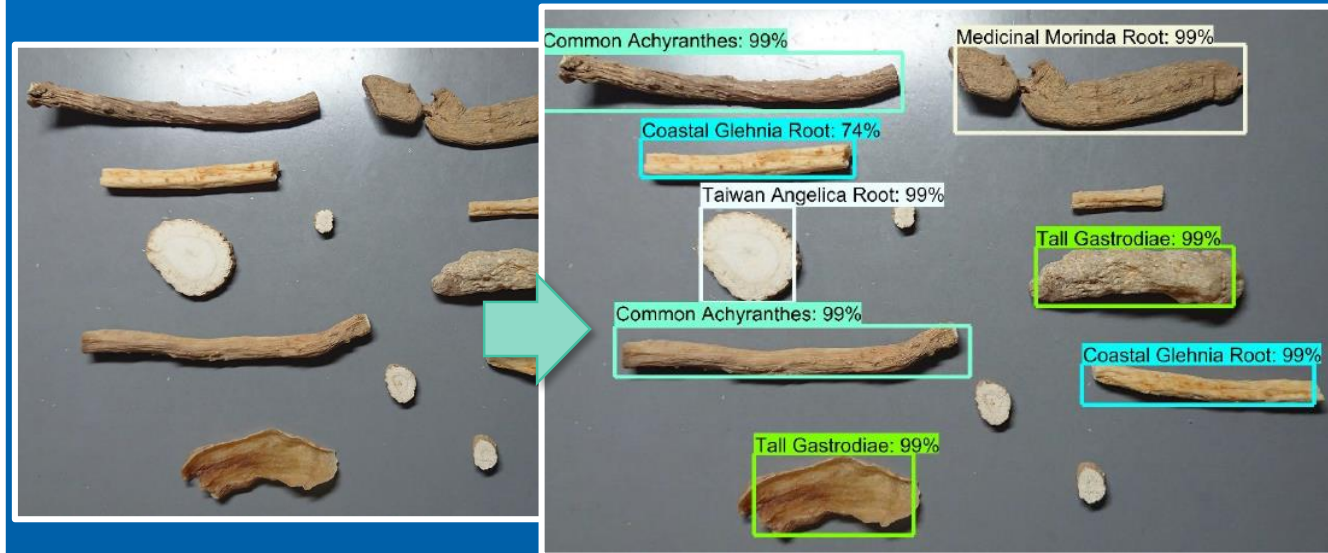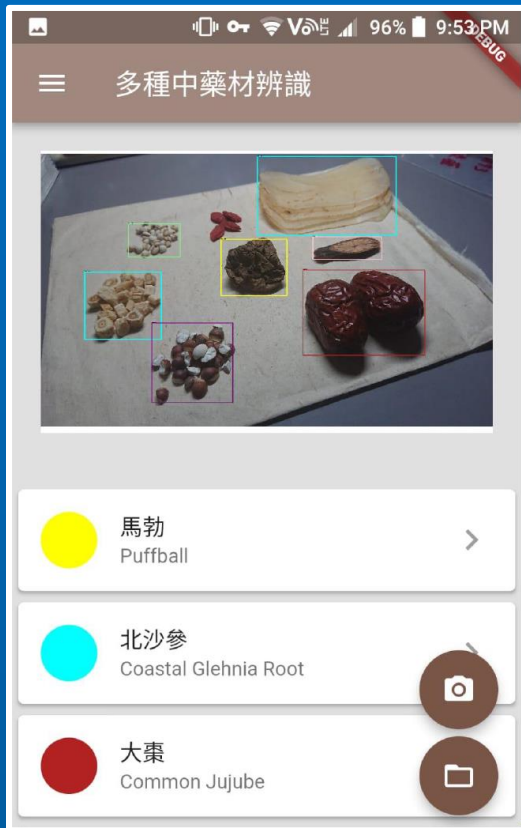
FYP (AI + Multimedia)

- Design a neural network that learns to produce a tiling

FYP (AI + Computer Vision)

- Chinese Medicinal Herb Recognizer

Sample from current CE/CS students (FYP MHW1804)

FYP (AI + 3D Vision)

- Design the best neural network for 3D car detection
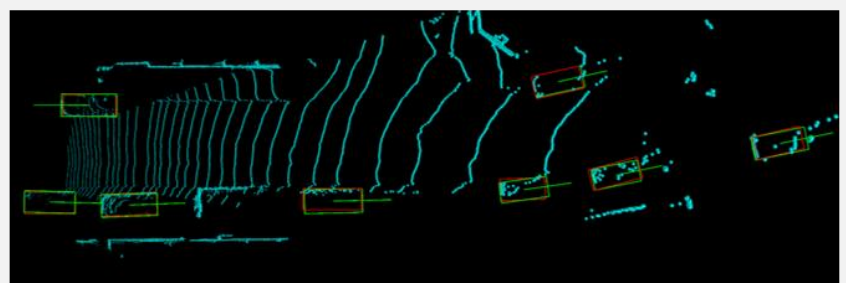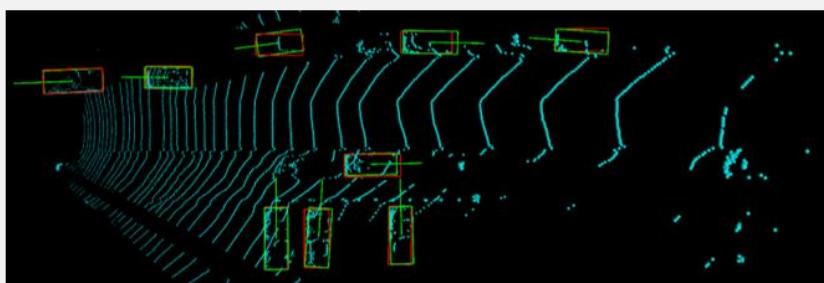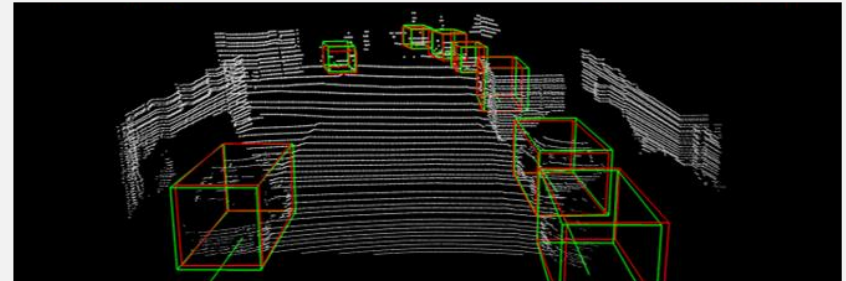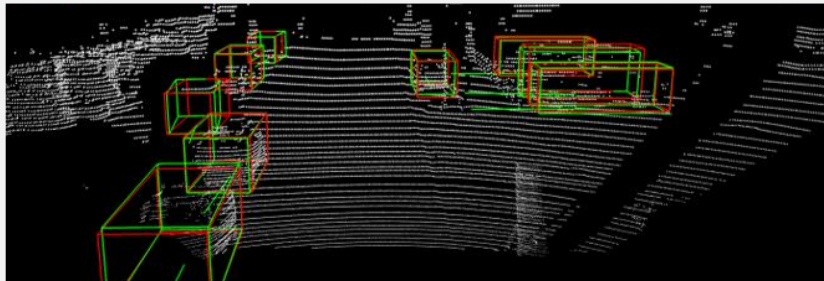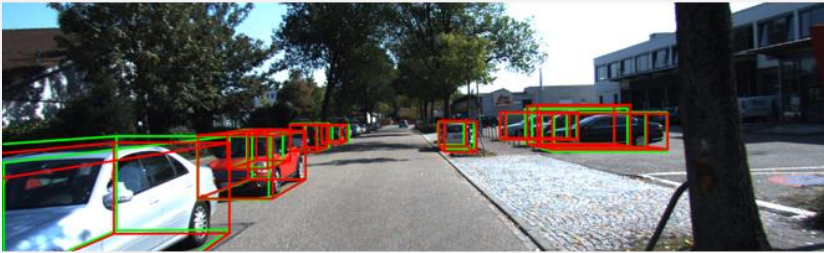
FAQs

FAQ Contents:

Q: Will there be any interview?

Q: Will there be any exchange opportunity?

Q: Will there be any scholarship or financial aid?

Q: What is ELITE Stream? How can I join it?

Q: How can I declare the specialized stream?

Q: What are the differences between AIST and CSCI?

Q: What are the career prospects of CSE graduates?

Q: Can I transfer to CSCI or other majors in Year 2?

Q: Can I declare AIST / CSCI / CENG as
     second major or minor?

Q: I am still struggling to choose
     AIST / CSCI / CENG. What can I do?

Q: Will AI replace us in the near future?

Q: Will there be any interview?

Interview Arrangement (JUPAS)

- We plan to arrange interviews in mid-/late June, 2022.

- We only consider Band A applications for shortlisting.

- Shortlisted applicants will receive an invitation email for the details, *e.g., date, time, format, etc.*

- Stay tuned! Check your email regularly for the latest update!

Interview Arrangement (Non-JUPAS & International)

- Interviews will be conducted in batches from ~Jan. every year.

- You are encouraged to attach adequate supporting documents, *e.g., transcripts, predicted grade, certificates, etc.,* in your application for our holistic review.

- Shortlisted applicants will receive an invitation email for the details, *e.g., date, time, format, etc.*

- Stay tuned! Check your email regularly for the latest update!

Q: Will there be any exchange opportunity?

Exchange to Overseas Universities

- You are encouraged to join the exchange programme to broaden your horizon and learn with peers from diverse background

- List of some overseas universities for the exchange
  » Macquarie University, Australia
  » University of Toronto, Canada
  » Shanghai Jiao Tong University, China
  » Telecom & Management SudParis, France
  » Royal Institute of Technology (KTH), Sweden
  » University of California, Davis, USA

  …

More information: https://www.oal.cuhk.edu.hk/exchange2021/

Q: Will there be any scholarship or financial aid?

Scholarships and Financial Aids

- The Government and the University offer various scholarships and financial aids depending on student's financial situation, or their outstanding performance in academic or other areas

- List of some scholarships and financial aids
  » Admission Scholarships
  » Scholarships for Overseas Studies
  » Government or University Financial Aid
  » Summer Subsistence and Travel Loan Scheme
  » Student Residence Bursary Scheme
  …

Check out more details at the
Office of Admissions and Financial Aid (OAFA)!

Q: What is ELITE Stream? How can I join it?

Engineering Leadership, Innovation, Technology and Entrepreneurship Stream (ELITE Stream)

- Offered by the Faculty of Engineering to students with excellent academic performance.

- Challenge yourself with additional coursework, invaluable extra-curricular activities, exclusive stimulating and inspiring courses, special exchange opportunities, *etc.*!

Check out more details at the Faculty of Engineering!

Stream Declaration

- You should check and **complete the required courses** of the respective stream.

- You will be invited for the stream declaration in the **final year** of study.

- You can declare in **at most one stream**

Major Electives (23 units)

Streams

1. **Biomedical Intelligence**
2. **Intelligent Multimedia Processing**
3. **Large-scale Artificial Intelligence – Theory and Systems**
4. **Intelligent Manufacturing and Robotics**

Non-Stream

5. General Artificial Intelligence: Systems and Technologies

Q: What are the differences between AIST and CSCI?

AIST vs CSCI ?

- AIST and CSCI have related foundation & basic theories

- AIST requires stronger Math foundation since it involves statistics, probability, calculus, linear algebra, etc., which are basis for machine learning and deep learning

- CSCI focuses more on software design and computing solutions, taking care of coding and software architecture

Q: What are the career prospects of CSE graduates?

Career Prospects

- Employers of our graduates include:
  - » Google
  - » Intel
  - » Microsoft
  - » IBM
  - » Apple
  - » Facebook
  - » Yahoo
  - » Deloitte
  - » Hong Kong Government
  - » Investment Banking Institutes

  … …

Many disciplines are changing

|		
A	–	Automotive
B	–	Bioscience
C	–	Creative Services
D	–	Data
E	–	Education
F	–	Finance
G	–	Gaming (note: G may also mean Government)
H	–	Healthcare
I	–	Internet of Things

Q: Can I transfer to CSCI or other majors in Year 2?

If you look for CSCI / other majors instead…

- You may submit application for change of major (to CSCI or other majors), subject to prevailing regulations stipulated by RES and approval by relevant unit(s).

- If you are determined to go for CSCI, you may choose Computer Science and Engineering (JS4412) as your choice and select CSCI in Major Allocation when promoting to Year 2.
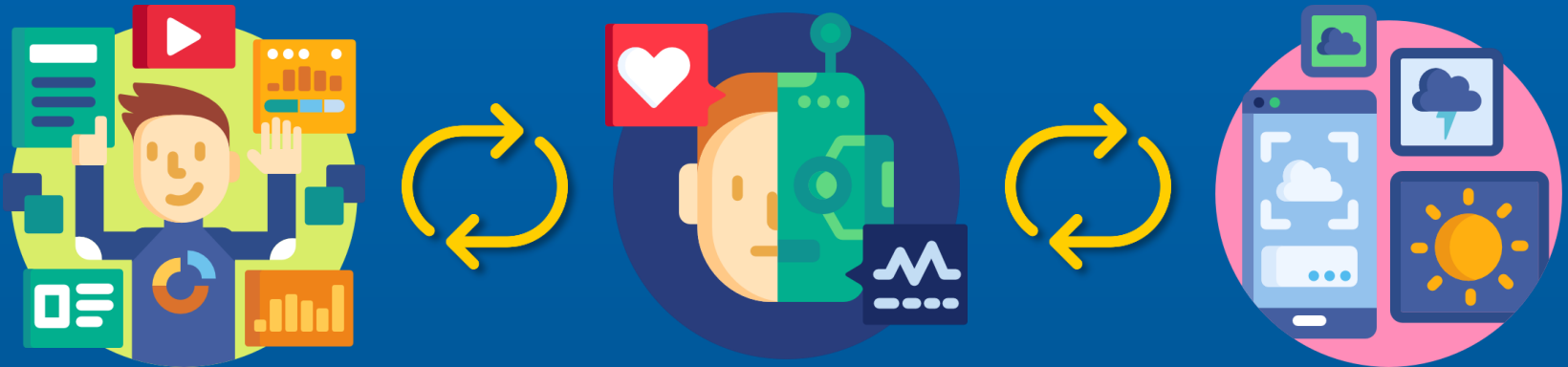
Q: Can I declare AIST / CSCI / CENG as second major or minor?

Declare Second Major / Minor

- You are not allowed to declare AIST / CSCI / CENG as your second major or minor if you are a CSE student.

- However, you are encouraged to broaden your horizons and declare second major / minor offered by other departments.

Q: I am still struggling to choose AIST / CSCI / CENG. What can I do?

If you are still struggling to choose...

- You can go through our website and admission materials for a better understanding before submission, and write to us via email to ug-admiss@cse.cuhk.edu.hk whenever you have any queries.

- You can join our outreach activities in the future and chat with our teachers and student ambassadors.

- You can also subscribe our social media channels to receive the latest updates from us! Stay tuned!

Q: Will AI replace us in the near future?

Humans in Future AI Era

- Umm... there may not be a perfect answer at the moment

- From what can be observed recently: **routine** jobs are more easily replaced by AI, while **others** are more likely to go into a "human-in-the-loop" model, where AI and humans work together to boost performance, *e.g.*, creative media

Reference: https://humansintheloop.org/what-is-a-human-in-the-loop/
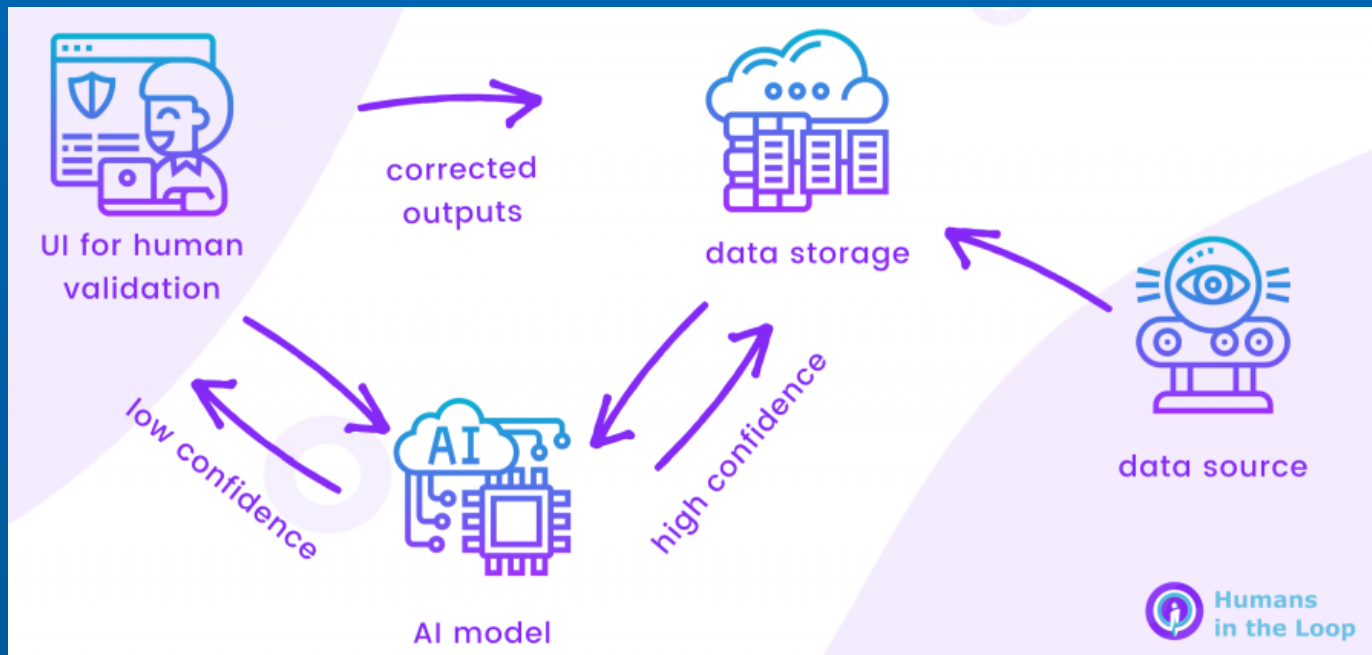
Contact Us

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✉️ ug-admiss@cse.cuhk.edu.hk

🖱️ www.cse.cuhk.edu.hk/aist

📷 cuhkcse

f CUHK.CSE.AIST

▶️ www.youtube.com/channel/UCl0dSTad1sZkh5W3rVE3A6w

See you in Fall 2022 !