



Department of Computer Science and Engineering
計算機科學與工程學系

Artificial Intelligence: Systems and Technologies (JS4468 / AIST)



In CUHK Technology Forum 2018...

‘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

What is AI ?

Which of the examples below use AI?

A – AR Face Filters?



C – Self-driving Car?



B – Scientific Calculator?

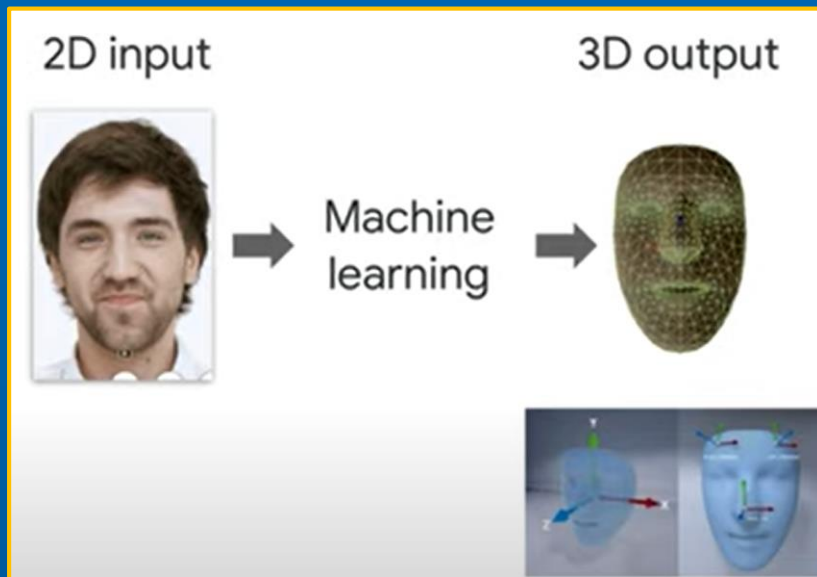
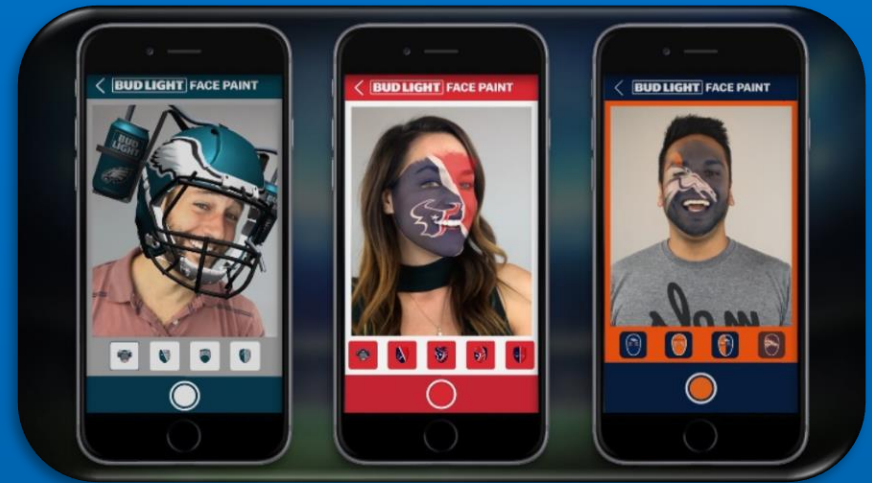


D – Virtual Assistant?



Is it AI? AR Face Filters?

Nowadays, it applies AI and **computer vision** technologies to **locate and track** features on our faces, such that it can **augment** our faces in videos



The AI method learns to detect the locations of face features

Reference:

<https://developers.google.com/ar/develop/ios/augmented-faces/overview>

Is it AI? Scientific Calculator?

Does not really use recent AI technologies

However, it does make use of many **computer science algorithms** and **software engineering techniques** to make it happen.



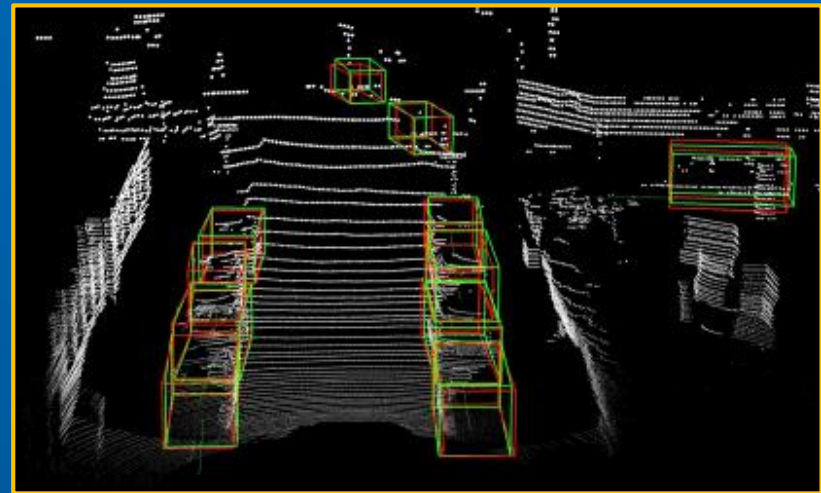
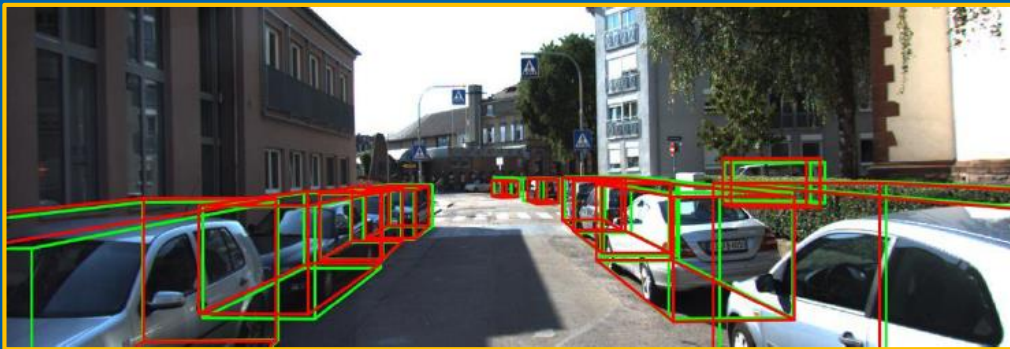
Is it AI? Self-driving Car?

Computer vision methods for:

- 2D Image & 3D Point Cloud Sensing
- Road Line Detection
- Traffic Sign Recognition
- Vehicle / Pedestrian Detection



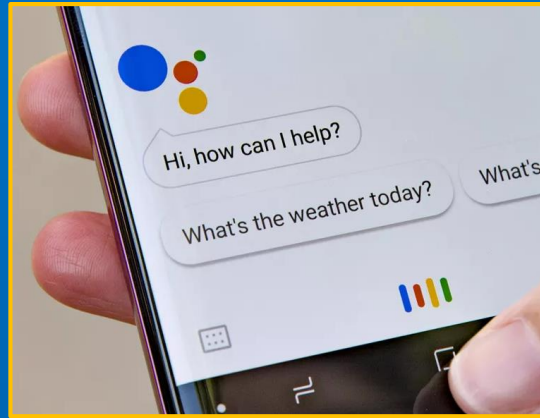
... ..



Reference:

http://www.cvlibs.net/datasets/kitti/eval_object.php?obj_benchmark=3d (KITTI Dataset)

Is it AI? Virtual Assistant?



It involves various AI technologies, *e.g.*,

- **Speech Recognition** to recognize what we say,
- **Natural Language Processing (NLP)** to understand the transcription and respond to the user's request,
- **Speech Synthesis** to generate human-like voice, *etc.*

For more natural user interaction (NUI) with computers...

What does Artificial Intelligence mean?

Human Intelligence



To learn



To reason



To feel



To perceive



To understand

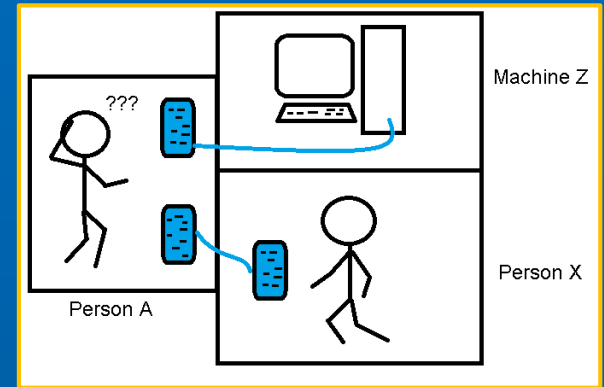
...

Artificial Intelligence

AI is the science and engineering of making intelligent machines



Turing Test (1950)



Boston Dynamics: Atlas



Turing Test

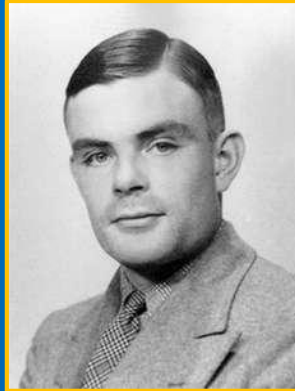
A. M. Turing (1950) *Computing Machinery and Intelligence. Mind 49: 433-460.*

COMPUTING MACHINERY AND INTELLIGENCE

By A. M. Turing

I. The Imitation Game

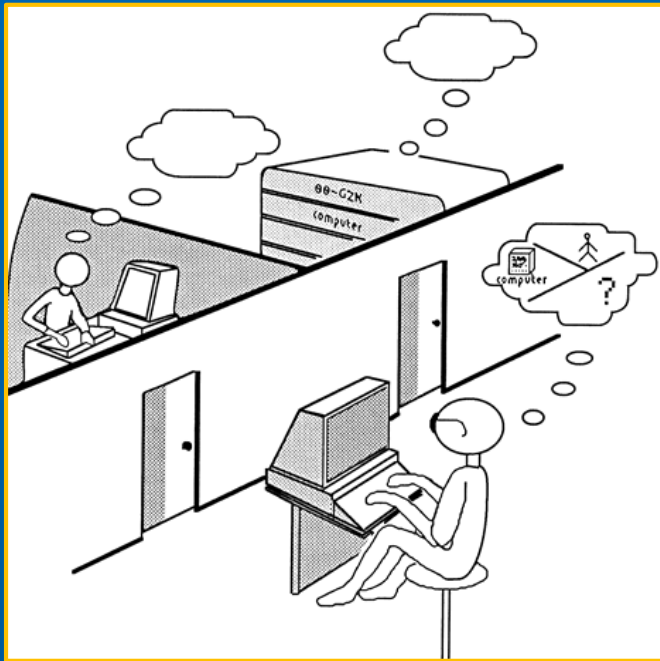
I propose to consider the question, "Can machines think?" This should begin with definitions of the meaning of the terms "machine" and "think." The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words "machine" and "think" are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, "Can machines think?" is to be sought in a statistical survey such as a Gallup poll. But this is absurd. Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words.



Alan Turing (1950) :

“Can machines think?”

Test machine's ability is to exhibit intelligent behavior indistinguishable from humans.



The Imitation Game:

Human questioner converses with two respondents (text only). If the questioner cannot distinguish between the human and the machine, the machine is said to pass the Turing test.

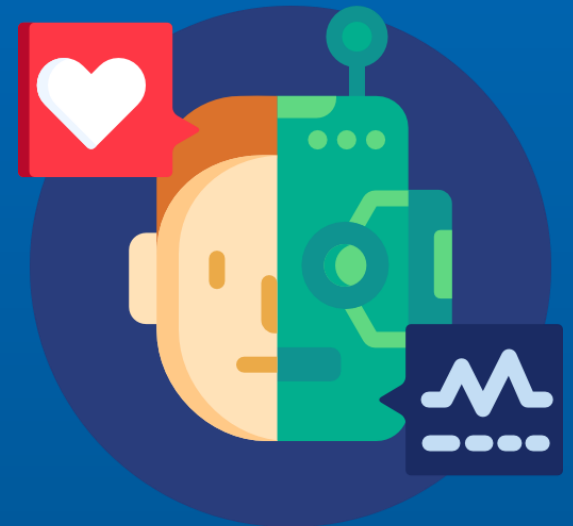
What does Artificial Intelligence mean?

Definition:

- A **simulated intelligence in computing systems**, in particular, the computing systems **are programmed** to “**think**” like a human, and **mimic** the behavior of a human

History of AI:

- Founded in 1956
- Went through waves of **optimism** and **disappointment**
- Now recently, it becomes hot again



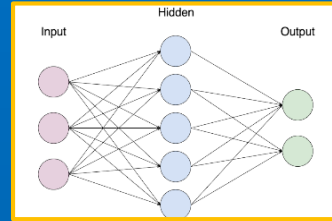
A Brief History of AI Development



Birth of "AI"



Representation
Language of Logic



Basic Structure



Deep Blue VS
Kasparov



Go Game

1950 1956 1965 1974 Mid 80's 1990-2000 2010 2011 2016 Now

Turing Test

Artificial
Intelligence

Logic
Programming

Expert
Systems

Neural
Network

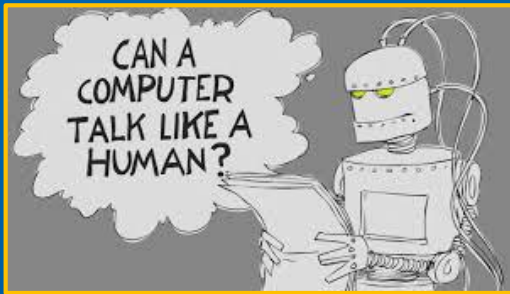
Breakthrough

Big Data

IBM Watson
wins on Jeopardy

Alpha Go beats
Lee Sedol

The Age
of AI



What is "Intelligence"?



Symbolic Machine



IBM's Watson

Breakthrough in Last Decade

Computation Power
(TeraFLOPS)

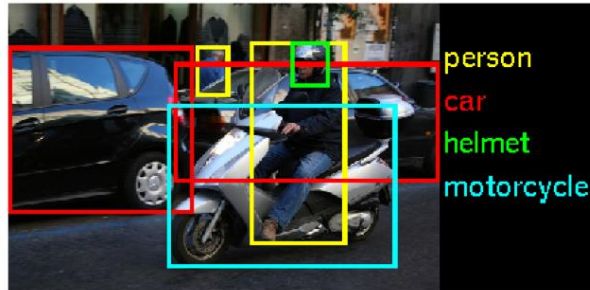
1000

100

10

1.0

0.1



GPU-based
CNN

Stack
LSTM

MNIST
0.95%

Max-Pooling

ImageNet
25.8%
AlexNet

ImageNet
11.0%

ImageNet
6.7%
GoogleNet

ImageNet
3.57%
ResNet

AlphaGo beats
Lee Sedol

AlphaZero

720



2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

Single GPU
(TeraFLOPS)

G80
0.3

C1060
0.6

M2090
1.3

K40
4.0

K80
5.5

M40
6.0

P100
8.0

V100
15

TPU
45

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

... ..

Reference:

<https://www.businessinsider.com/sc/artificial-intelligence-companies?IR=T>

AI in Bioscience



◀ 王平安教授致力研究在人工智能在醫學方面的應用

Pathology (病理)

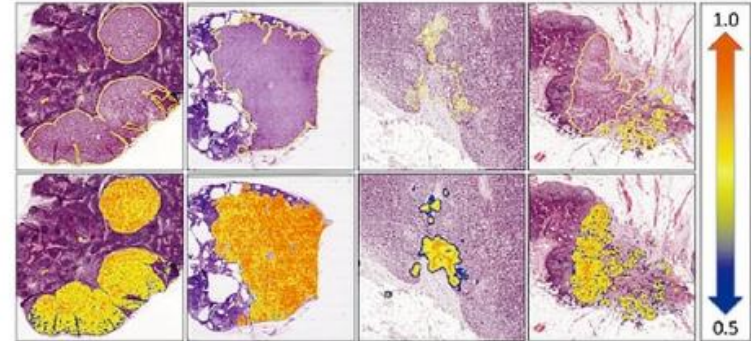
**不用耗時識別癌症
醫生可專注治療**

Prof. P.-A. Heng

化等，否則未必有理想的效果。

中大計算機科學與工程學系葉旭立教授指出，在人工智能的協助下，可找出許多疾病的「隱藏規則」，如預測病情走勢、用藥效果及推測病人的存活率等。「以糖尿病為例，由於有不同的治療方法，如口服藥或注射胰島素等，在人工智能的協助下，便可準確判斷出最有效且符合病人生活及經濟情況的治療方法，因為注射費用較高，且有較多工具，對生活亦有較大影響。」

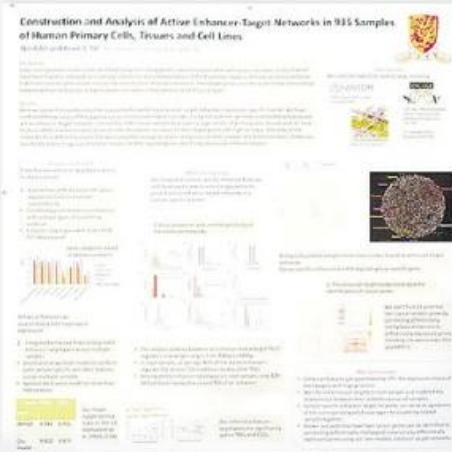
葉教授解釋，要收集這些數據須很專門的知識與技術，數據雖然是愈多愈好，如學系與中大醫學院及多間醫院等合作，也有一些機構把數據公開，但未必全部合用。「我們主要的對象是華人，特別是中國南部的華人，一些外國機構公



▲ 利用深度學習技術檢測癌細胞轉移情況

相關的數用在醫學的DNA，用的藥物，惟收集活飲食文

人工智能分析DNA 對症下藥



Prof. Kevin Yip

開的數據屬歐美人士，所以我們要有華人及歐美患有個別疾病及健康人士，才能得到準確的數據，否則比較出來的結果可能只是華人與歐美人士在體格上的分別，數據便不夠準確。」

Reference:

http://www.cse.cuhk.edu.hk/aist/wp-content/uploads/2019/05/news1_l.jpg (2019年5月10日明報大學道專題)

AI in Creative Services

AI執筆創作「手塚」味漫畫 本月下旬面世

02月08日(六) 18:00

推介 6 分享

Tweet

分享

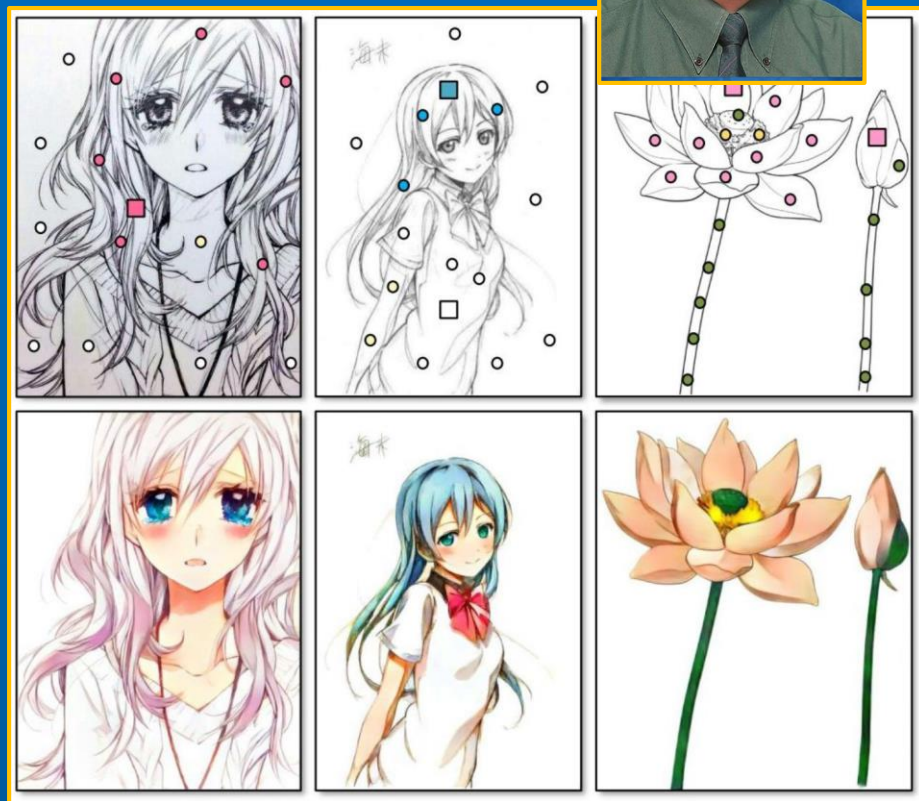


AI執筆創作具「手塚治蟲」（左圖）味的漫畫。

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》。

AI helps to color your sketch automatically by Prof. T.-T. Wong



References:

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

<https://www.cse.cuhk.edu.hk/~ttwong/papers/colorize/colorize.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?

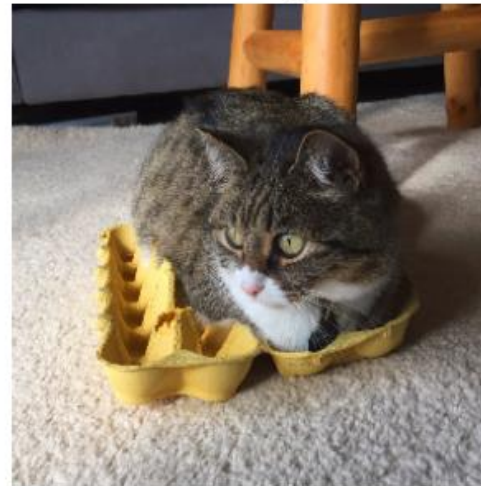


Prof. Michael Lyu



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



Reference:

<https://www.cse.cuhk.edu.hk/lyu/students/phd>

AI in Finance

金管局：近九成零售銀行應用人工智能

文章日期：2019年12月24日

Like 0 | Share      

【明報專訊】金管局昨日發表題為「Reshaping Banking with Artificial Intelligence」研究報告，其中一項主要的調查結果顯示，今年第三季有接近90%的本地受訪零售銀行，已經或計劃採用人工智能（AI）經營業務，目前主要應用於反洗黑錢、網絡安全、自動化營運、身分識別等，預計未來將更多應用在聊天機械人（Chatbots）、生物認證及遙距開戶。

該報告指出，受訪銀行應用AI技術至明年，預計未來5年銀行整體投資AI技術的資金將增加，另有95%表示將與其他科技合作。報告亦指出，目前推行AI的3個最主要障礙，有70%認為缺乏AI的專業人才，而AI的倫理及智能的道德考慮是業界推行AI的主要障礙。

【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      

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。

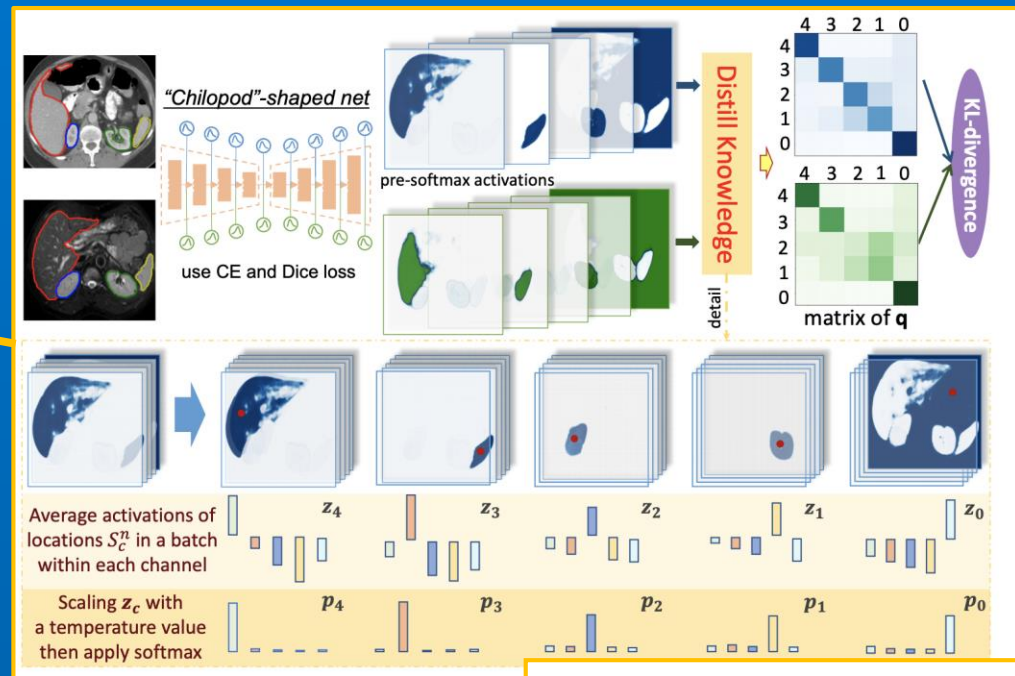
References:

<https://www.mpfinance.com/fin/daily2.php?node=1577127330046&issue=20191224>

<https://www.mpfinance.com/fin/instantf2.php?node=1578982602897&issue=20200114>

AI in Healthcare

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



AI helps to increase the precision of medical imaging by Prof. Dou Qi and Prof. P.-A. Heng



References:

[http://www.cse.cuhk.edu.hk/~qdou/papers/2020/\[TMI\] Unpaired Multi-modal Segmentation via Knowledge Distillation.pdf](http://www.cse.cuhk.edu.hk/~qdou/papers/2020/[TMI] Unpaired Multi-modal Segmentation via Knowledge Distillation.pdf)
<https://inews.hket.com/article/2572760/>

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>

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, according to LinkedIn 2020 Emerging Jobs Report

Reference:

https://business.linkedin.com/content/dam/me/business/en-us/talent-solutions/emerging-jobs-report/Emerging_Jobs_Report_U.S._FINAL.pdf

#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

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
 - » ...



Tools of AI

- Logic
- Probability
- Optimization
- Linear Algebra
- Statistics
- Stochastic Modeling
- Programming
- Deep Neural Networks
- Reinforcement Learning

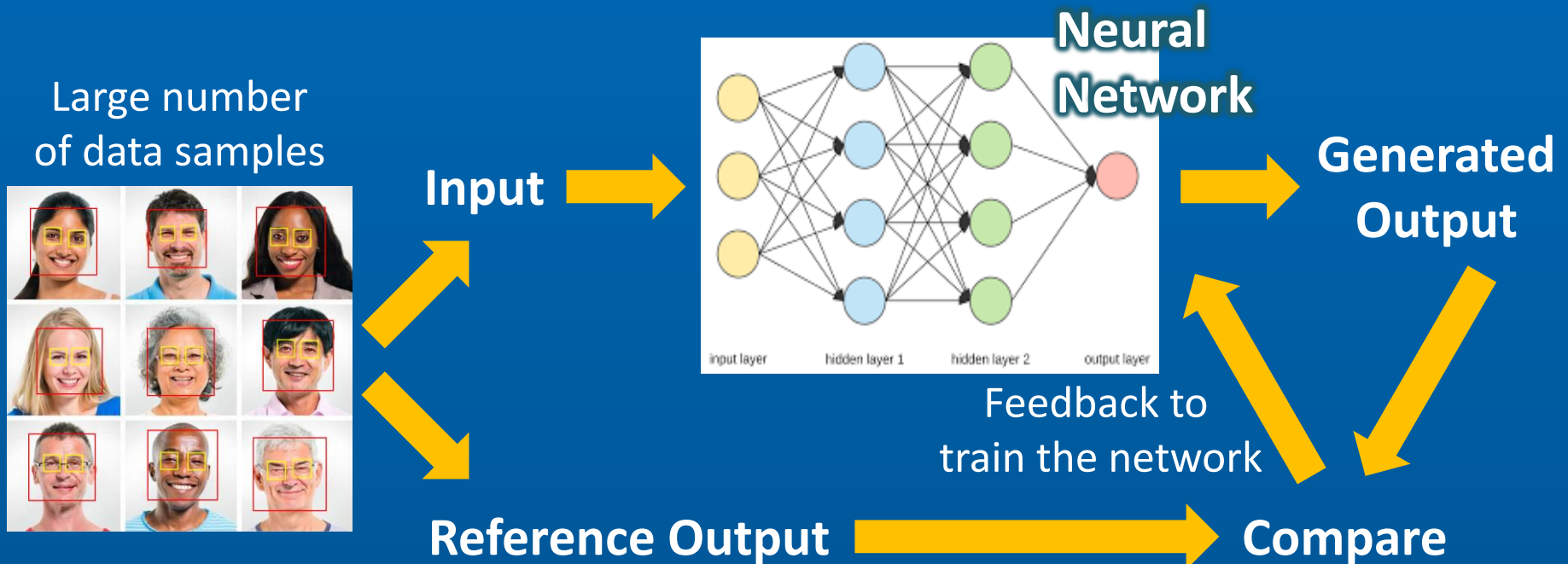
.....



Need to have
good background
in mathematics!

What is Neural Network?

- A common model to learn features for problem solving
- A set of **connected units called neurons**, which loosely model the neurons in a biological brain
- Each neuron may have a large amount of parameters, such that **training NN to learn** → **parameter updates**

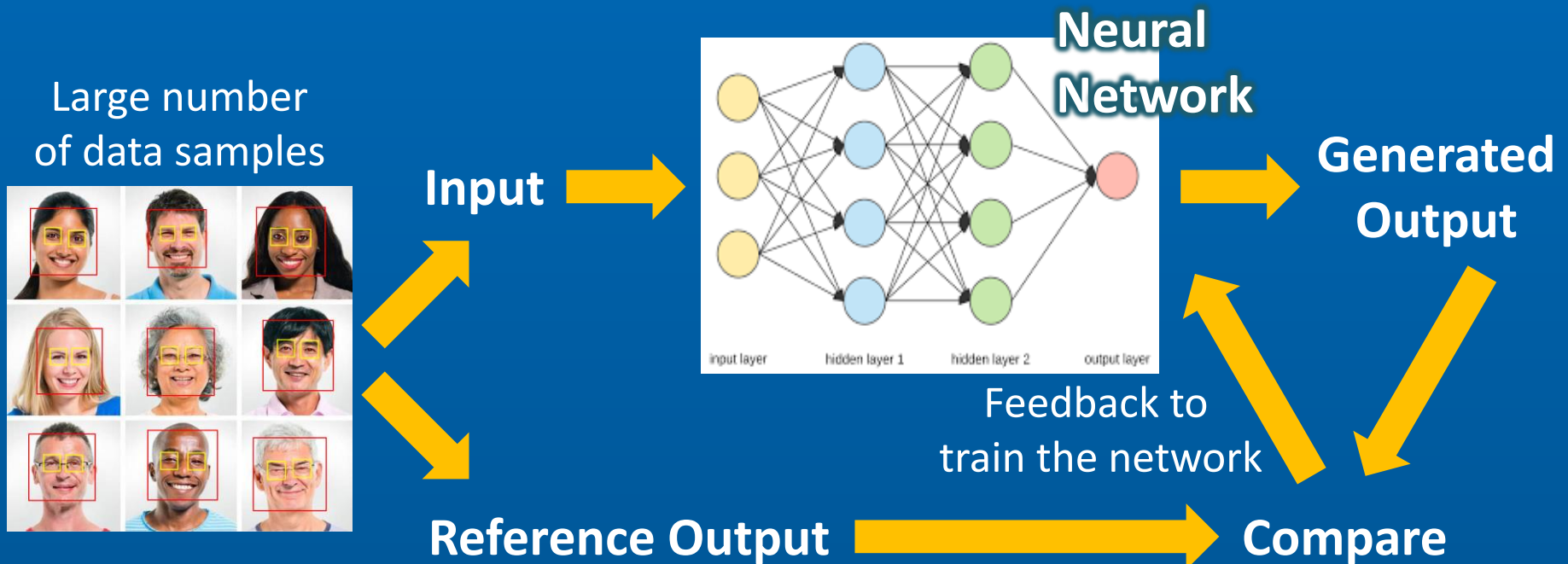


Limitations & Challenges...

Many existing AI solutions are **data dependent**, *e.g.*,

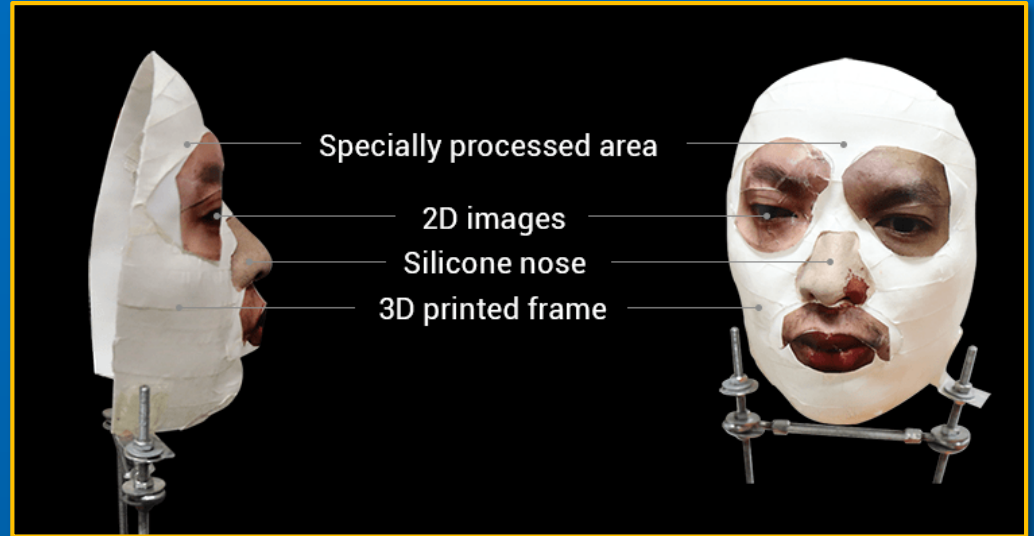
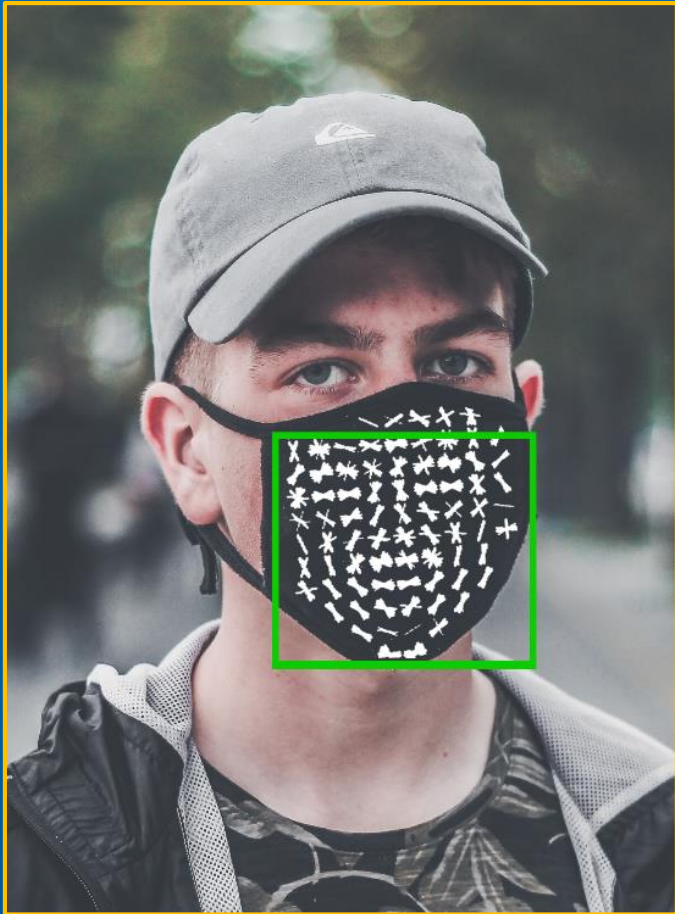
- **Unseen data** – Data not seen by NN in the training
- **Bias** towards to the data used in the training

.....



Limitations & Challenges...

- Adversarial attack – Fool the network!



Face ID Security:

A security firm successfully unlocked the phone using a mask with a **3D-printed base**

Limitations & Challenges...

- AI is **powerful but not perfect**

Case 1



In 2016, a Tesla driving in autopilot mode failed to distinguish a large white 18-wheel truck against a bright spring sky, resulting in a fatal car accident.

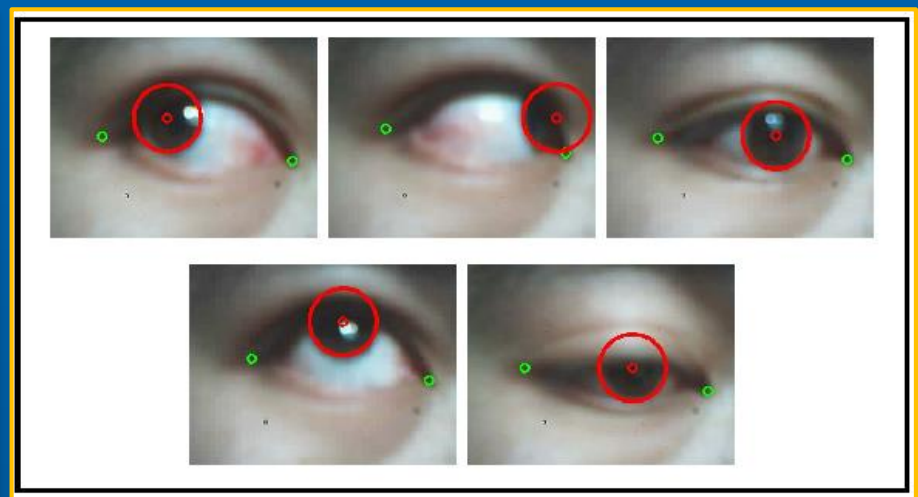
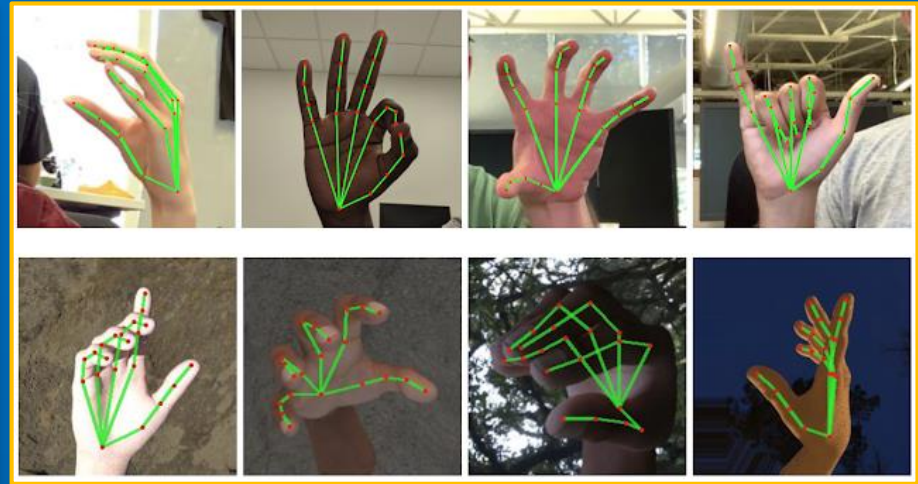
Case 2



In 2018, an Uber self-driving car struck and killed a pedestrian because it misidentified the woman and its emergency brakes were disabled.

Limitations & Challenges...

- Existing AI solutions are typically **problem-specific**...



Summary

Good Prospective:

- AI, as well as information technology (IT), is a **fascinating field!**
- A **wide range of applications** and problems to be explored

Many Challenges:

- Will AI be another hype?
- Some methods, *e.g.*, deep learning, is hard to know why it works or why it doesn't
- AIST is a **demanding curriculum**



The AIST Programme



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

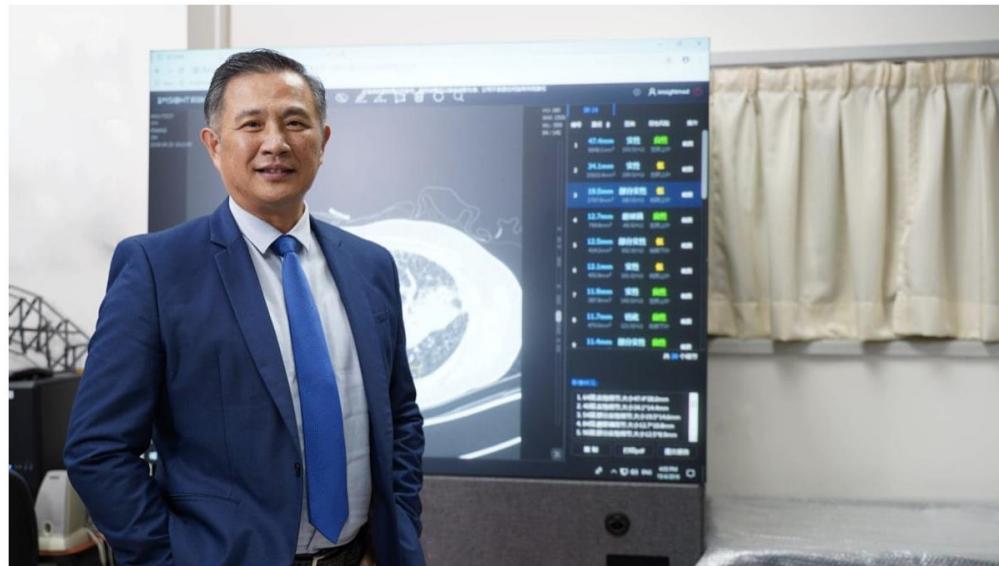
f FACEBOOK

t TWITTER

G GOOGLE +

in LINKEDIN

讚好 分享 315 人對此讚好。趕快註冊來看看朋友對哪些內容讚好。



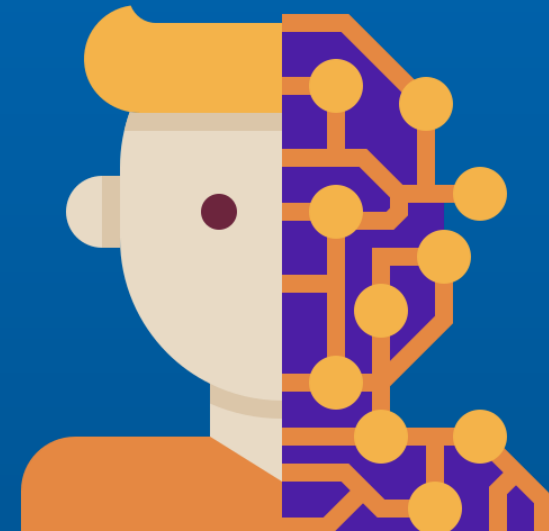
人工智能無疑是近年非常熱門的新科技潮流，其應用範圍之廣，甚至可以取代真人的工作，影響就業市場。不過也有意見認為人工智能的普及會為求職市場增加需求，在香港新增達五萬個職位。香港中文大學就看準這個機會，開辦人工智能課程培育相關人才。

Reference:

<https://unwire.pro/2019/06/05/cuhk-ai-course/> (2019年6月5日Unwire.pro業界專訪)

Introduction

- **1st Bachelor of Engineering programme in AI** in Hong Kong
- **4 specialized streams**
 - » Biomedical Intelligence
 - » Intelligent Multimedia Processing
 - » Large-scale Artificial Intelligence – Theory and Systems
 - » Intelligent Manufacturing and Robotics
- **AIM:** We target **elite students**, in other words, we expect the admission score to be **MUCH HIGHER** than students who have been admitted via the broad-based engineering admission.



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

Topics in AIST

Include

- Machine Learning
- Deep Learning
- Large Scale Distributed Computing
- Intelligent Embedded Systems
- Knowledge Representation/Inference
- Human-computer Interactions
- Natural Language Processing
- Big Data Analytics

... ..



Department of Computer Science and Engineering

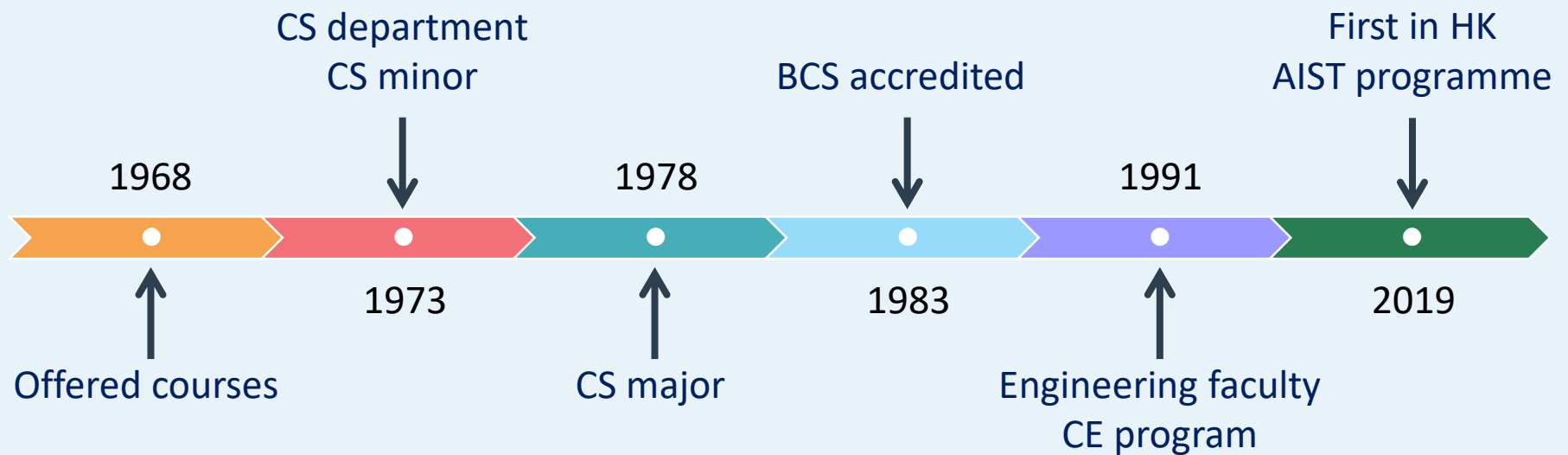




<https://www.youtube.com/watch?v=fTq4tUMftw0&t=51s>

The First BEng in “AI Programme” in HK

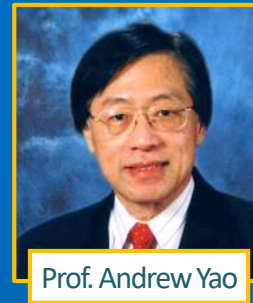
- The first “Computer Science” department in Hong Kong
- Offering **AIST**, **CENG** and **CSCI** programmes
- A strong alumni network



Excellence in Teaching and Research

AI 2000 Most Influential Scholar Annual List

Prof. Michael Lyu, Prof. Irwin King and several professors in our CSE dept are named in the list, recognizing their research excellence in AI fields



Prof. Andrew Yao



Prof. Benjamin Wah



Prof. Martin Wong



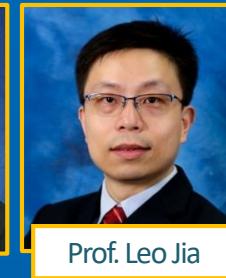
Prof. Michael Lyu



Prof. Irwin King



Prof. John Lui



Prof. Leo Jia

ACM Fellows

Prof. Andrew Yao, Prof. Benjamin Wah, Prof. Martin Wong, Prof. Michael Lyu and Prof. John Lui

IEEE Fellows

Prof. Benjamin Wah, Prof. Martin Wong, Prof. Michael Lyu, Prof. Irwin King, Prof. John Lui and Prof. Leo Jia

CUHK University Education Award 2017

Prof. Jimmy Lee received this award for his outstanding commitment to teaching excellence



Prof. Jimmy Lee

Recent Achievements in International Competitions

International Collegiate Programming Contest (ICPC)

(formerly named as ACM Programming Competition)

2019: ranked 12th
(over 3000 universities)

2012: ranked 8th

2011: ranked 13th

2001: ranked 8th

Asia Student Supercomputer Challenge

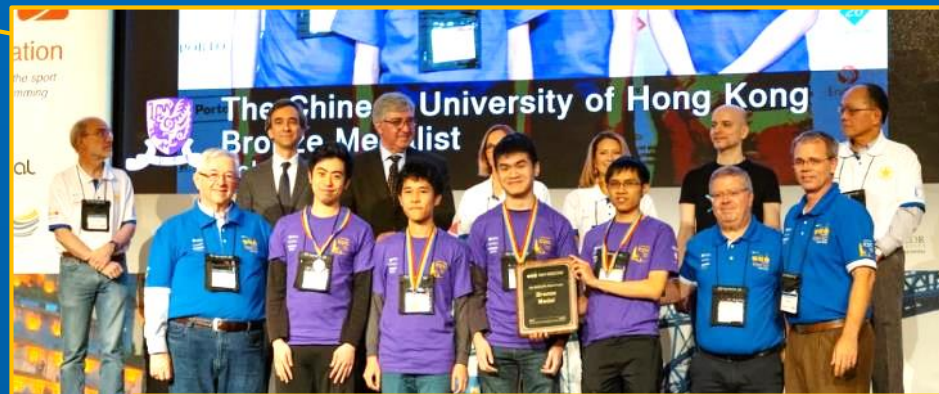
2015: won the 1st prize

2013: ranked 7th out of 43

Intel Cup Undergraduate Electronic Design Contest

2012: won the champion

2010: won the top two prizes



Student Training

CUHK Amazon Deep Learning Workshop 2019

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

IT Industry

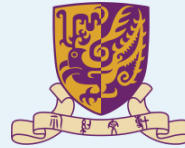


NOKIA



facebook

Education



NUS
National University
of Singapore



**Georgia
Tech**

Banking



citibank

Morgan Stanley



Deutsche Bank

Deloitte.

**Goldman
Sachs**

Sharing from Our CSE (CSCI) Student

The CSCI programme allowed a high degree of flexibility in learning. I could have a try in different fields, such as artificial intelligence, database, rich media, network security, etc., to explore my study interest and strengthen the relevant technical skills. I could then proceed to the more advanced topics for in-depth learning. The courses were challenging and demanding, yet helped me to build up a problem-solving mindset and self-confidence.



Maxwell CHAN,
CSCI Graduate of 2019

Sharing from Our CSE (CENG) Student



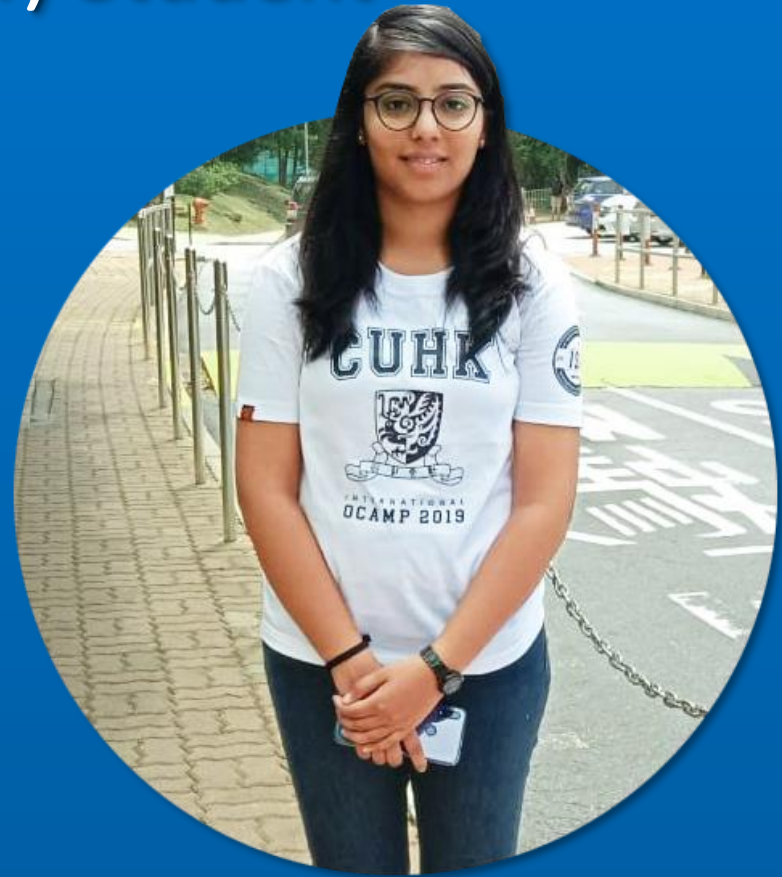
Alvin LUK,
CENG Graduate of 2019

The CENG programme helped me to build up a solid foundation in logic, systems, and theories. It also places equal emphasis on providing practical experience. I am able to implement the knowledge and create my own projects. In my final year project, after repeated trials and adjustments in both the algorithm and hardware design, I am able to find out an optimized way to improve the precision and efficiency of an obstacle avoidance motor car.

Sharing from Our CSE (AIST) Student

I feel extremely grateful to join the CUHK and AIST family with utmost grace and positivity. I am thankful to the professors, who have been very supportive throughout the year and are the reason behind my academic success.

Also, I have participated in many career guidance programmes, such as the CUHK Mentorship Programme, which helped me to grow professionally and understand the industry in Hong Kong. The experience and ongoing learning will definitely continue to widen my horizons.



Aditi SINGH,
AIST Year 2 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?



Office 秀
X W P
Ps
Google Suite
暑期課程
CS Society

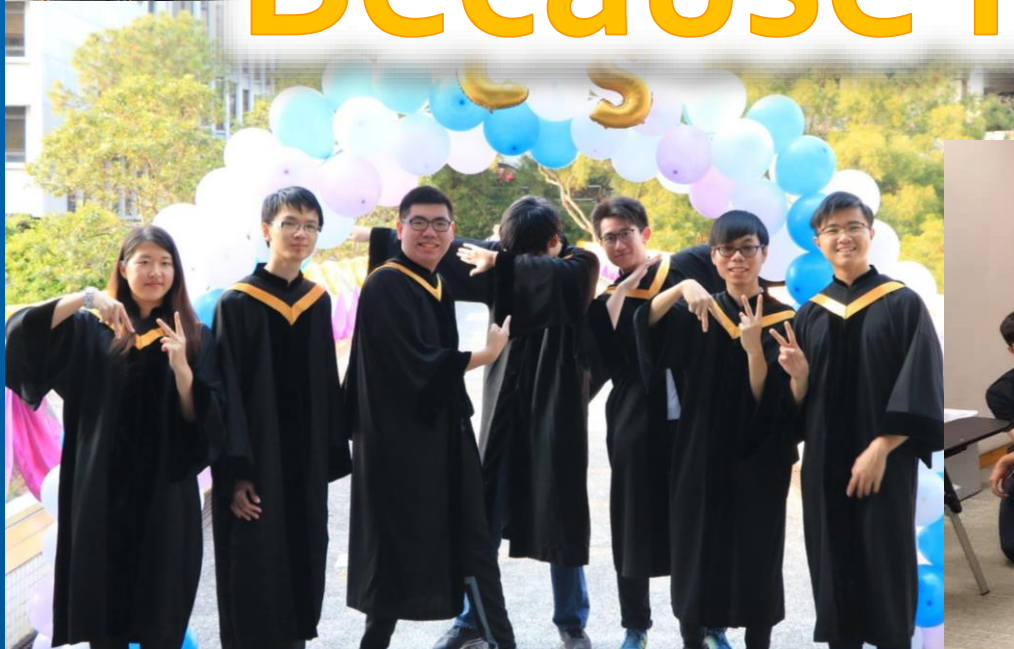
如有疑問請聯絡
67689694 (Wings)

COURSE 1
GOOGLE SUITE & MICROSOFT OFFICE
17 · 18 · 24 · 25 JUN
@SHB924

COURSE 2
PHOTOSHOP & 美國秀秀
16:30-18:15
想相片更有特色？
更好看？
想弄個天使臉孔魔鬼身材的女神頭像？

\$480/2

Because it is fun!



Admission Requirements for JUPAS Applicants



AIST Admission Requirements (2021 Entry)

<i>HKDSE Subject</i>	<i>Minimum Level</i>	<i>Subject Weighting</i>
<i>HKDSE Core Subjects</i>		
English Language	4	1.25
Chinese Language	3	1.25
Mathematics (Compulsory Part)	5 [^]	1.75
Liberal Studies	3	1
<i>HKDSE Elective Subjects</i>		
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 (2020 Entry)

Percentile	CHI	ENG	MATHS	LS	1 st Elective	2 nd Elective	3 rd Elective	Total Reference Score [^]
Upper Quartile	4	5	5**	5	5**	5*	5	30
Median	4	5	5**	5**	5*	5	5	30
Lower Quartile	4	4	5**	4	5*	5*	4	27

[^] 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 & International 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!

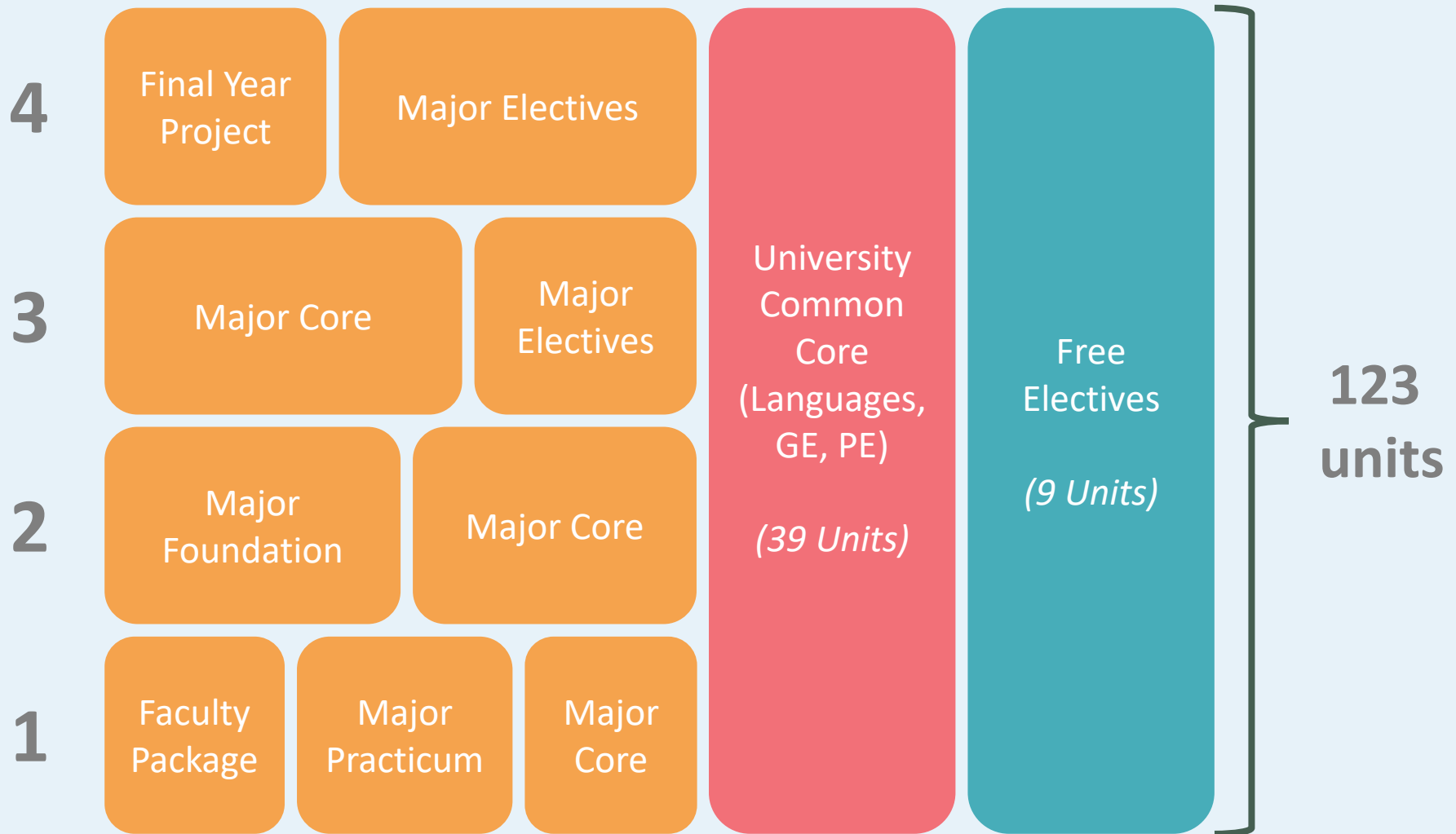
Non-JUPAS Applications: <http://admission.cuhk.edu.hk/non-jupas-yr-1/requirements.html>

International Applications: <http://admission.cuhk.edu.hk/international/requirements.html>

Curriculum Structure



Curriculum – Overview



Curriculum – Major Requirements

4

Final Year
Project

Major Electives

3

Major Core

Major
Electives

2

Major
Foundation

Major Core

1

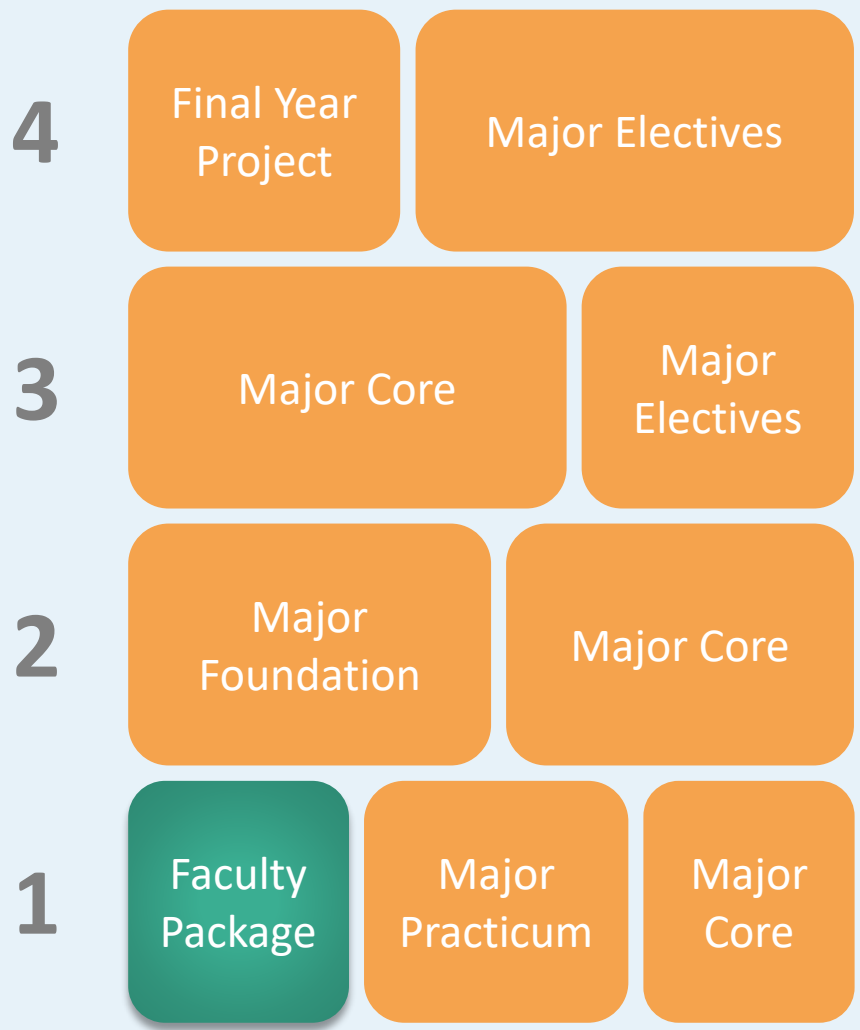
Faculty
Package

Major
Practicum

Major
Core

75 units

Curriculum – Faculty Package and Foundation



Faculty Package and Foundation (15 units)

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

- » Intro to Computing Using Python (AIST1110)
- » Discrete Maths (ENGG2440)
- » Probability (ENGG2760)
- » Statistics (ENGG2780)

ROLL	DICE CHART	PROBABILITY
2		1/36
3		2/36
4		3/36
5		4/36
6		5/36
7		6/36
8		5/36
9		4/36
10		3/36
11		2/36
12		1/36



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)

- » Intro to AI and Machine Learning (AIST1000)
- » Numerical Optimization (AIST3010)
- » Intro to Computer Systems (AIST3020)



Curriculum – Major Core

4

Final Year Project

Major Electives

3

Major Core

Major Electives

2

Major Foundation

Major Core

1

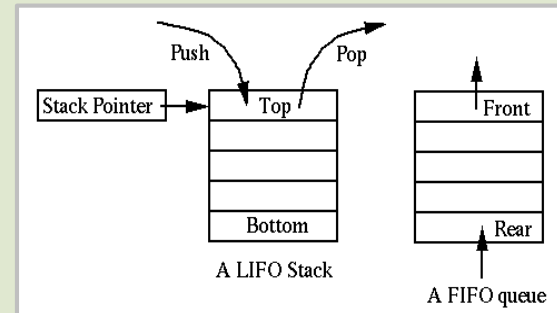
Faculty Package

Major Practicum

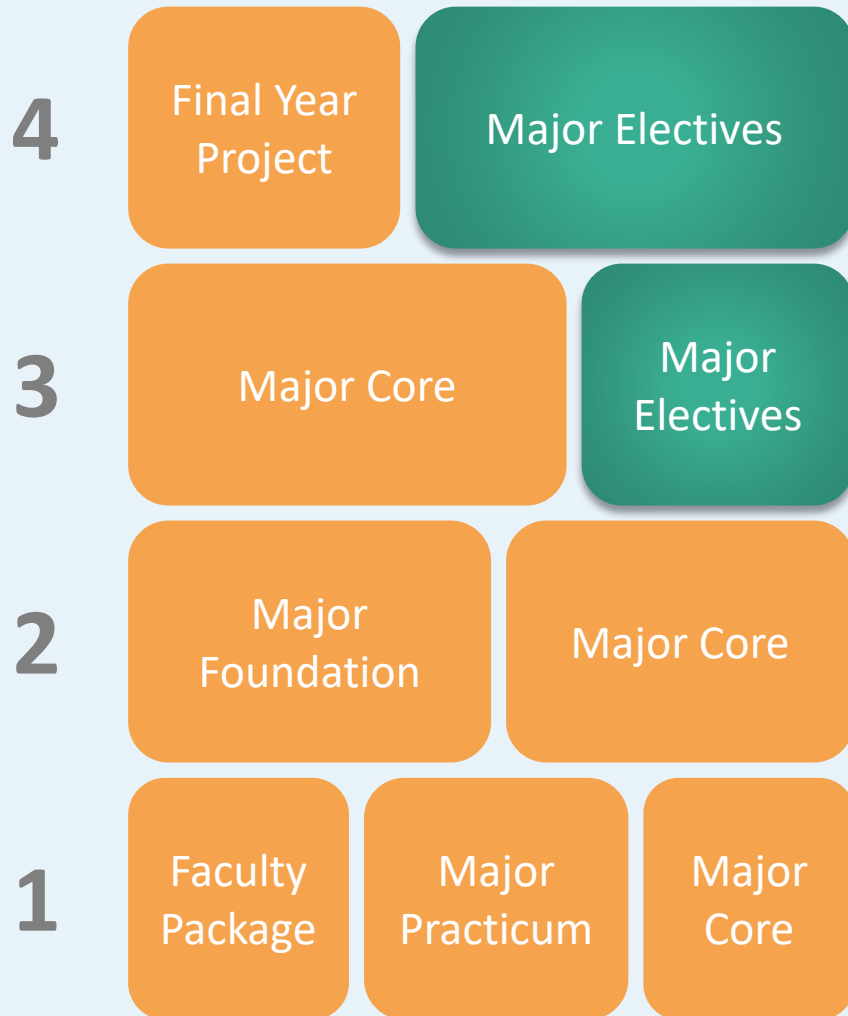
Major Core

Major Core (18 units)

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



Curriculum – Major Electives



Major Electives (23 units)

Streams

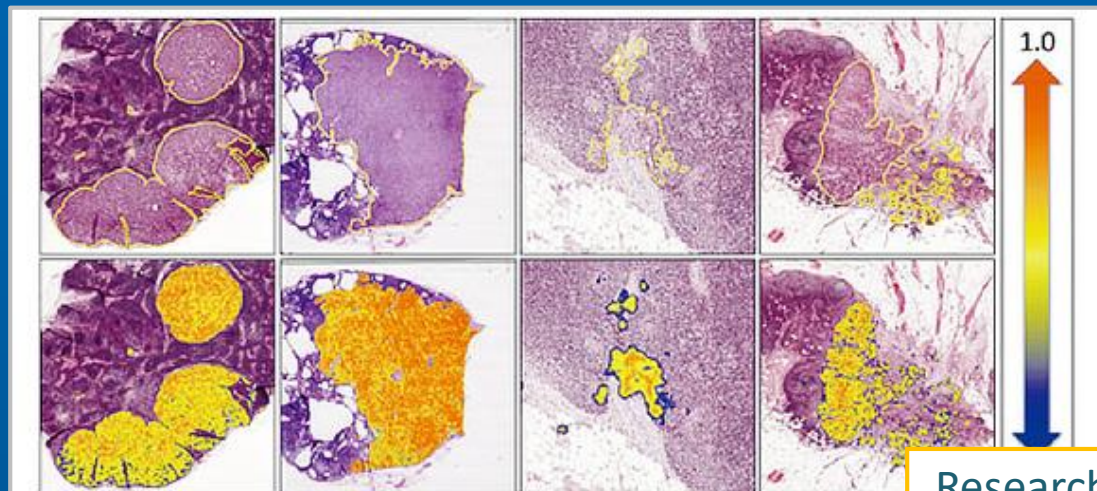
1. Biomedical Intelligence
2. Intelligent Multimedia Processing
3. Large-scale Artificial Intelligence – Theory and Systems
4. Intelligent Manufacturing and Robotics

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)



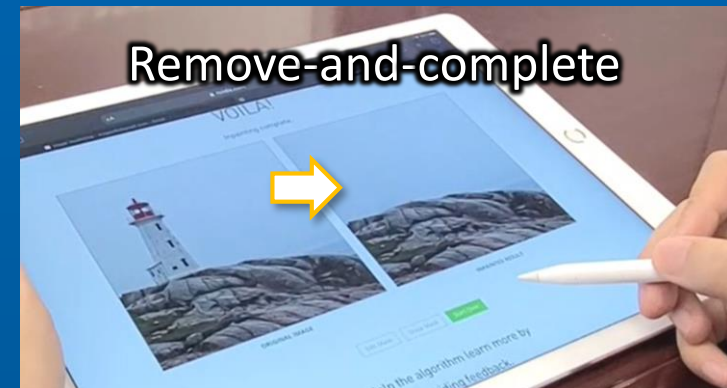
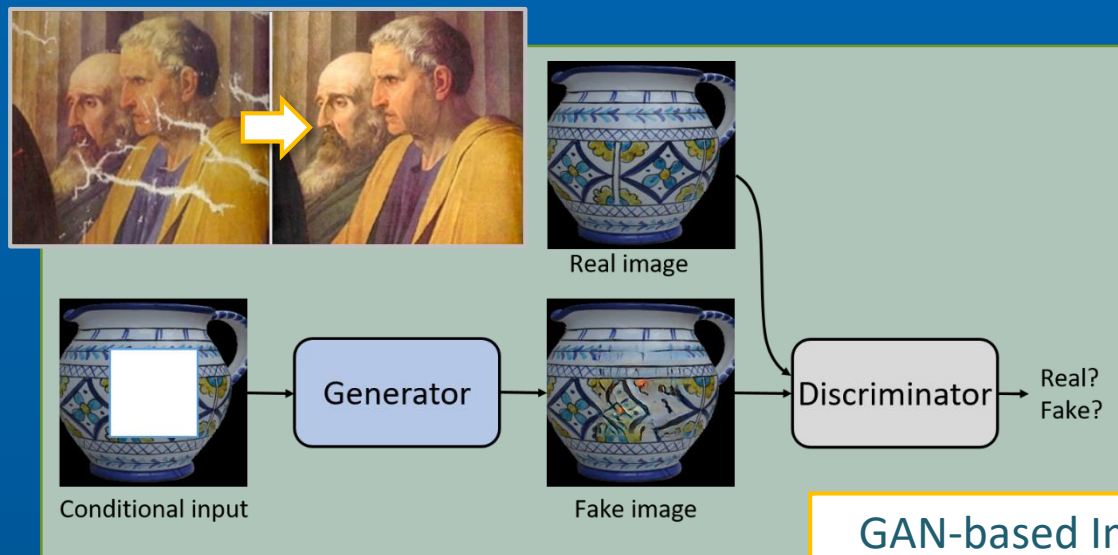
▲ 利用深度學習技術檢測癌細胞轉移情況



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**, computer linguistics



GAN-based Image inpainting by Prof. Leo Jia

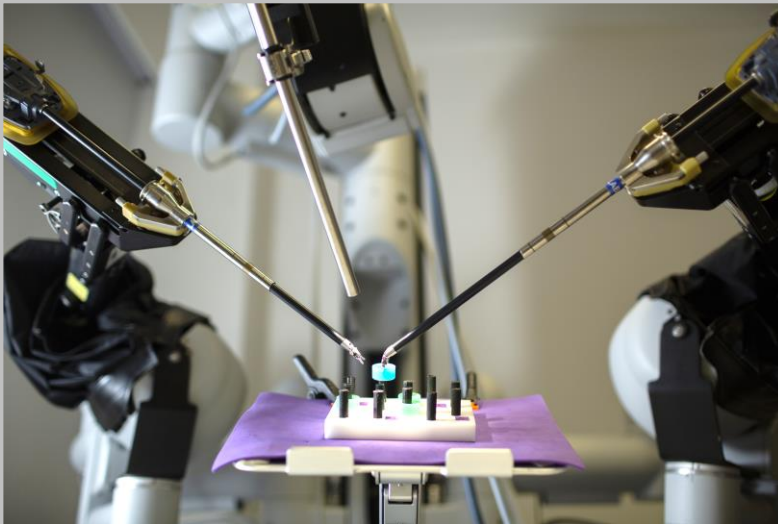
Stream 3: Large-scale AI – Theory and Systems

- Study the **advanced techniques** of realizing large-scale artificial intelligence from both theory and system perspectives
 - » **Theory:** **machine learning**, 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.*



AICOR DASHBOARD

Surgical Phases | Surgical Instruments | Anatomical Structures | Database Retrieval

View More | View More | View More | View More

Current Phase: Section of round ligament

Current activity: Reaching for needle with right hand

Instruments: 1. Monopolar Curved Scissor, 2. Fenestrated Bipolar Forceps

Anatomies: 1. Uterous, 2. Round ligament, 3. Left ovary, 4. Left uterine tube

Next phase: Section of round

10s | 30s | 60s

Certainty

Clinical Information: Patient ID: 200521xx, Age: 50, Gender: Male, Date: 11/23/20

Instruments: Overlay, Anatomy: Un-overlay

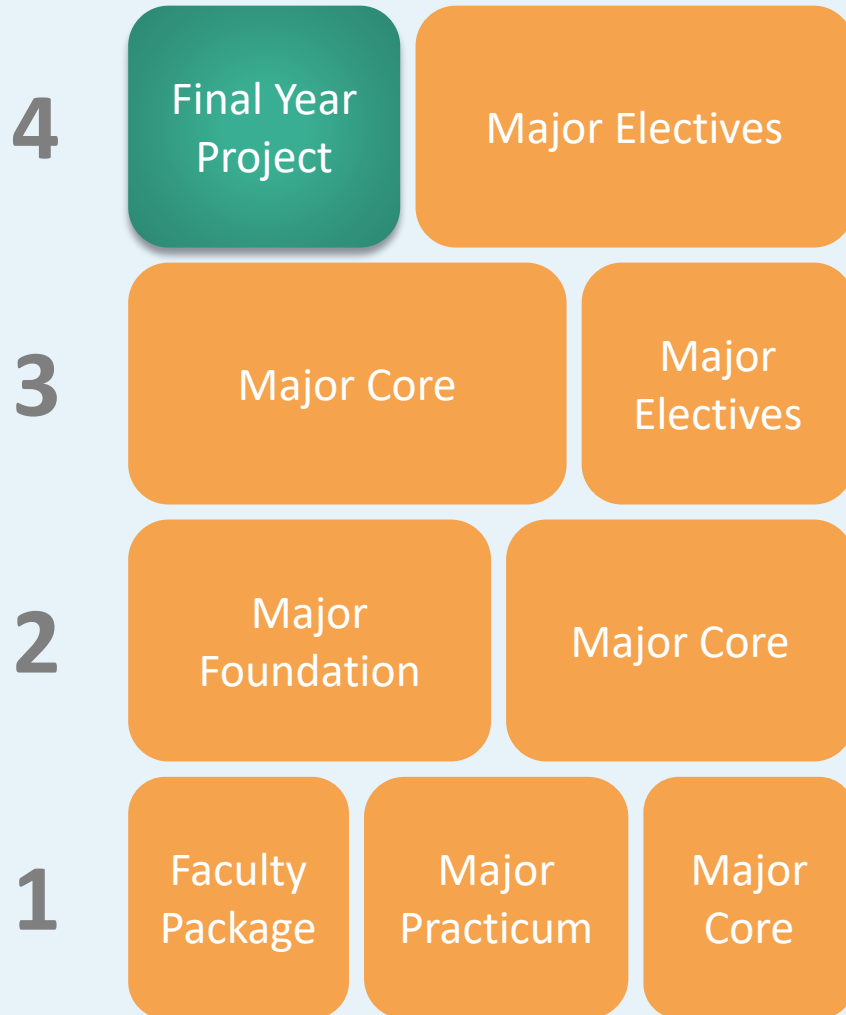
0:00 / 32:45

Research on surgical robotics by Prof. Dou Qi

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)



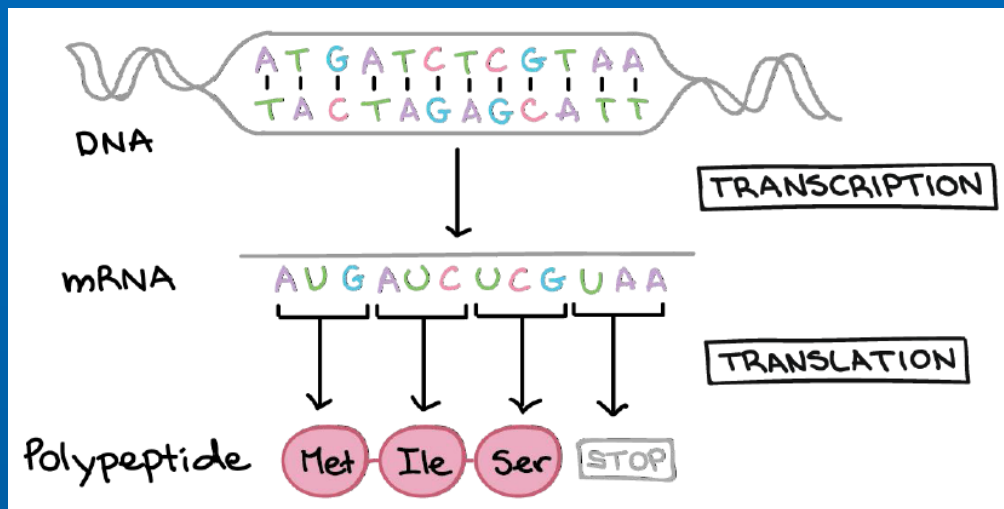
Final Year Project (6 units)

- » 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

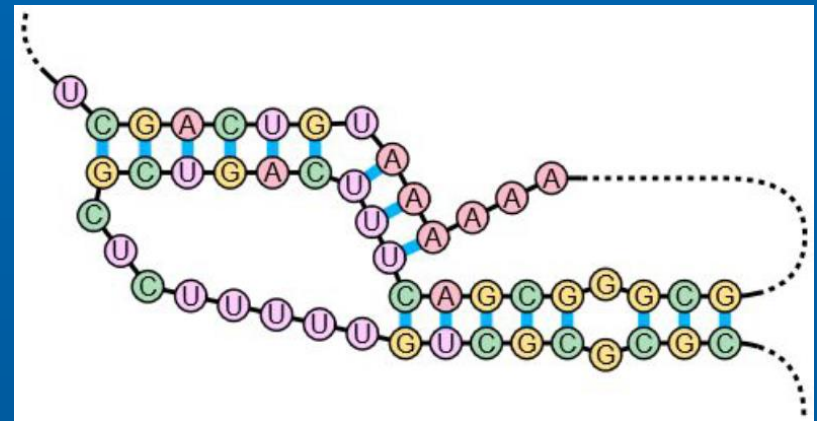
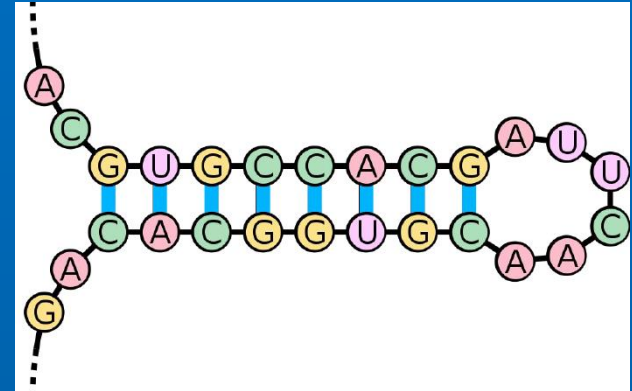
Open topic FYP – you may also propose a project to a professor

FYP (AI + Bioinformatics)

- Apply machine learning to predict RNA-protein interaction



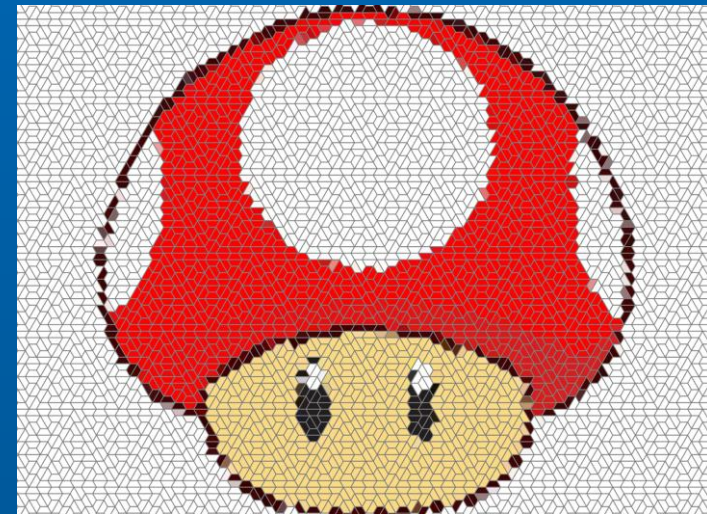
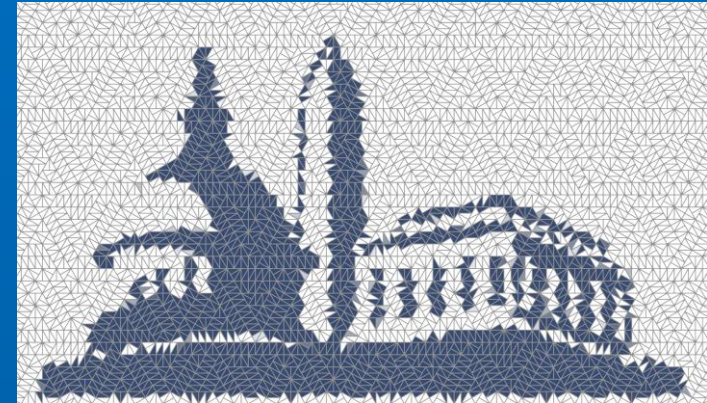
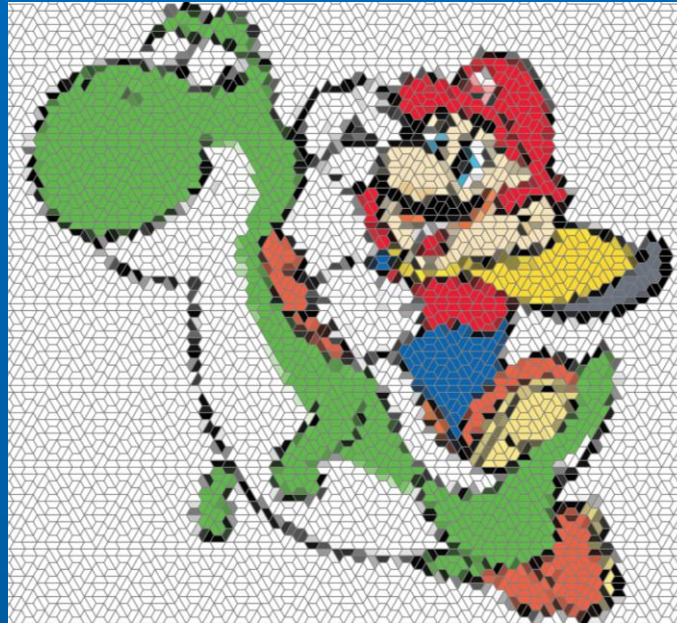
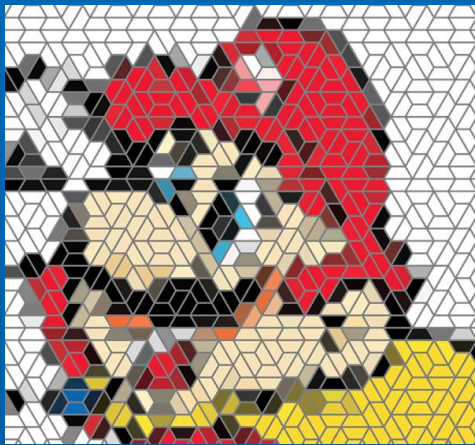
RNA-binding protein (RBP)



RNA folds to a specific structure to fit into the protein binding site

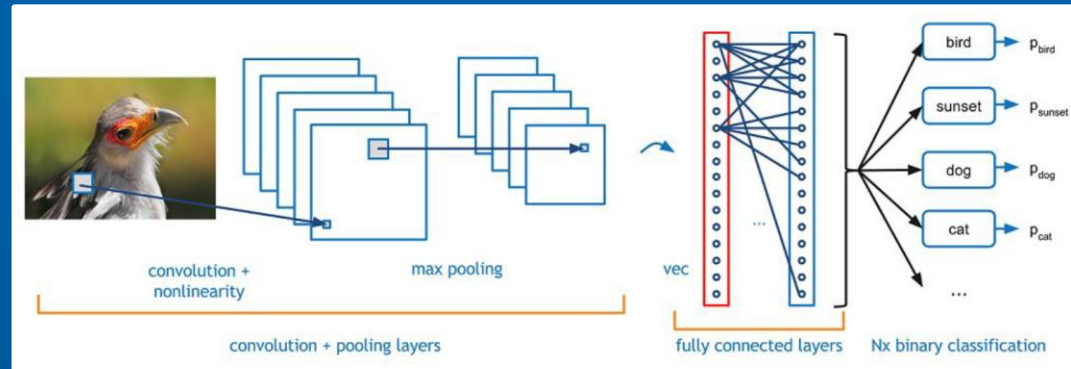
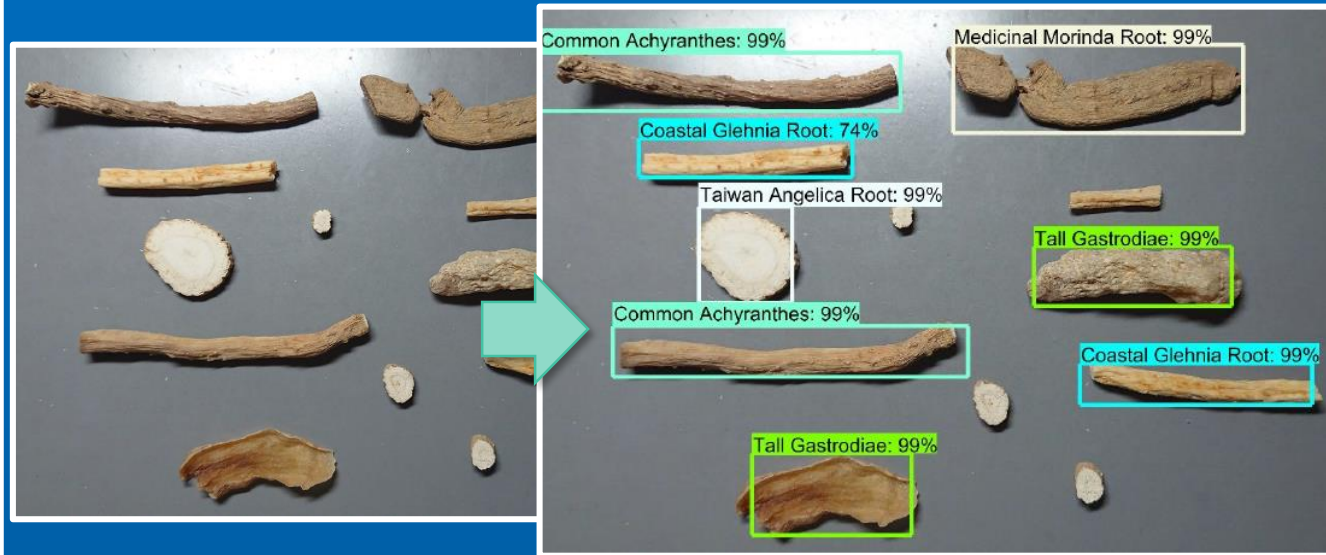
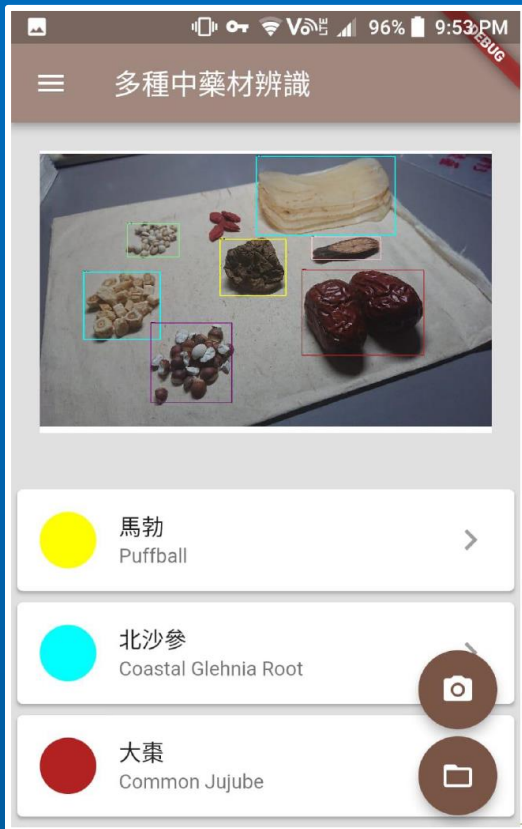
FYP (AI + Multimedia)

- Design a neural network that learns to produce a tiling



FYP (AI + Computer Vision)

• Chinese Medicinal Herb Recognizer



FAQs



**Q: Will there be any
interview?**



Interview Arrangement (JUPAS)

- We plan to arrange interviews in **around late June, 2021**.
- 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. 2021.**
- 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
 - ...



Submit your application via [Office of Academic Links \(OAL\)](#)!

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!](#)



**Q: How can I declare
the specialized stream?**



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 share **related foundation & basic theories**.
- **AIST** is a “**multi-disciplinary**” programme by design. After building up the foundation, students in 3rd year **may choose a different stream to focus on** (which could be non-CS, *e.g.*, the “Biomedical Intelligence” stream).
- **CSCI** focuses more on **software design and computing solutions**, taking care of coding and software architecture. Students can choose to declare in the “Intelligence Science” stream for the AI-related topics.



AIST vs CSCI ?

Since AIST and CSCI are related...

- **AIST students** may choose the CS-based stream (*i.e.*, the “Large-scale Artificial Intelligence – Theory and Systems” stream),
whereas
- **CSCI students** may also take AI-related courses and FYP topics in their studies.
- The curriculum design allows certain **flexibility**.

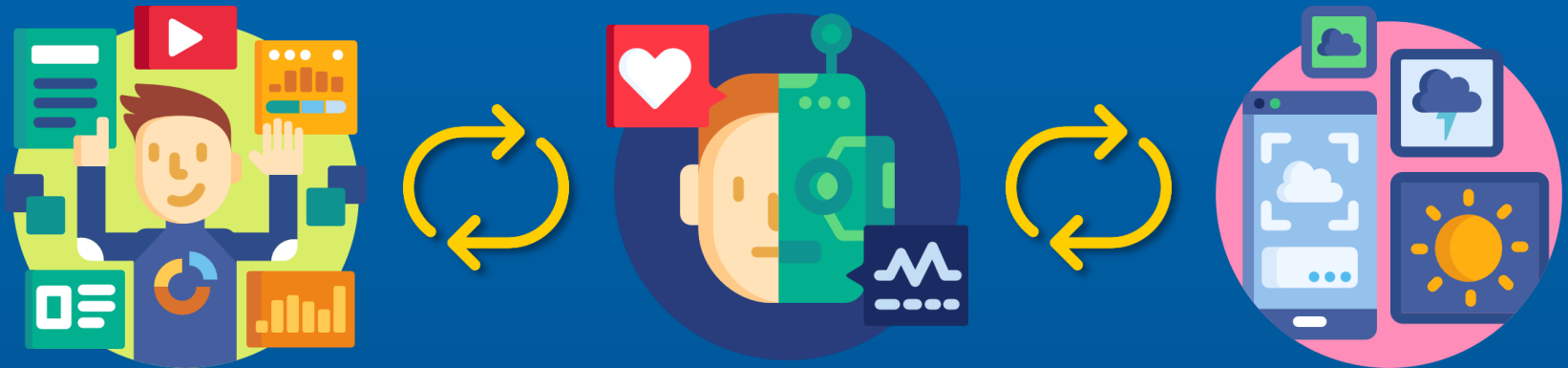


**Q: Can I transfer to CSCI
or other majors in Year 2?**



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 **Engineering (JS4401 / BERGN)** 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!

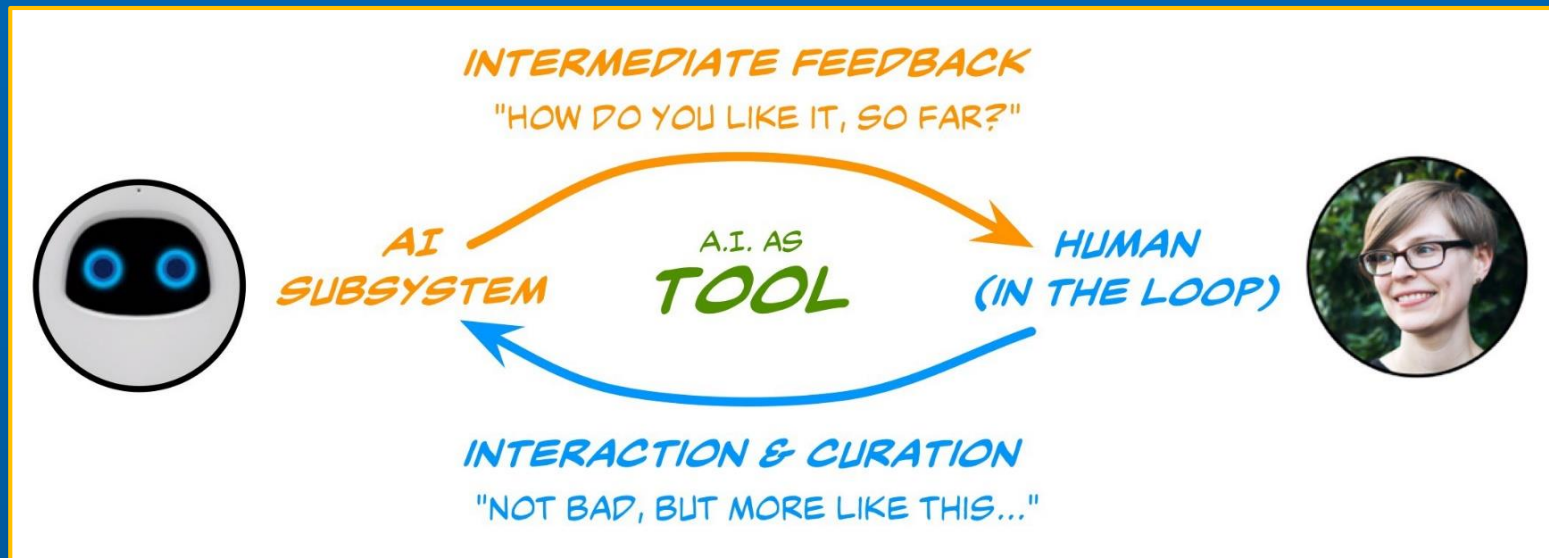


**Q: Will AI replace us
in the near future?**



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



Contact Us



(852) 3943 4269



ug-admiss@cse.cuhk.edu.hk



www.cse.cuhk.edu.hk/aist



[cuhkcse](https://www.instagram.com/cuhkcse)



[CUHK.CSE.AIST](https://www.facebook.com/CUHK.CSE.AIST)



www.youtube.com/channel/UCI0dSTad1sZkh5W3rVE3A6w



See you in Fall 2021 !

