香港中文大學計算機科學與工程學系
Department of Computer Science and Engineering
The Chinese University of Hong Kong

香港中文大學統計學系
Department of Statistics
THE CHINESE UNIVERSITY OF HONG KONG

Joint Programme:
Computational Data Science (CDAS)
(JS4416)

(This new programme to be introduced in 2022-23 is subject to confirmation of the University Senate)

What's Computational Data Science?

Distributed system
Online algorithms
Computer vision
Mobile computing
Big Data
Bayesian Learning
Large-scale Inference
GPU Programming
Artificial Intelligence
Risk management
Statistical Learning
Parallel computing
Machine Learning
Actuarial Science
High-performance computing
Inference
Cloud computing
Deep Learning
Modeling
Text mining
Cyber Security
Recommender systems
Database System
Econometrics
Sampling
Nonparametric Inference

Computer Science

Statistics

Power of Computational Data Science

How can we know the average salary in Hong Kong?

$$\frac{1}{7\ Million}\sum_{i=1}^{7\ Million} X_i$$

- **Computer Science Approach:**

Distribute to m computers $\rightarrow \frac{1}{7\ Million}\left(\sum_{i\in\text{Group 1}} X_i + \sum_{i\in\text{Group 2}} X_i + \cdots + \sum_{i\in\text{Group } m} X_i\right)$

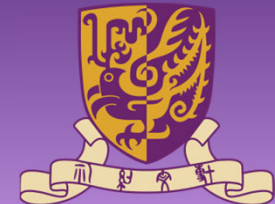Skills: Parallel computing, cloud computing, distributed system

- **Statistics Approach:**

Strategically sample $X_{(1)}, \ldots, X_{(m)} \quad \rightarrow \quad \frac{1}{m}\sum_{i=1}^{m} X_{(i)}$

Skills: Sampling theory

- **Computational Data Science Approach:** Statistics + Computer Science

Ranking

➢QS World University

CUHK: **#7** (#30) in QS 2020 in
Computer Science in Asia (World)

CUHK: **#14** (#51-100) in QS 2020 in
Statistics & Operational Research in Asia (World)

➢U.S. News Best Global Universities

#4 (#11) in Best Global Universities for
Computer Science in Asia (World)

Recent News

Thursday, January 28, 2021, 19:45

Data Technology Hub debuts as cornerstone of data economy

By Oswald Chan in Hong Kong

The iconic Charles K Kao Auditorium stands among buildings in Hong Kong Science Park. The Science Park is a hub for innovation in the city. (JUSTIN CHIN / BLOOMBERG)

Hong Kong Science and Technology Parks Corp launched its Data Technology Hub on Thursday in a bid to fortify the development of the data economy, which is crucial for implementing the government's reindustralization initiative.

5大最有前景行業2020 網絡保安、大數據分析缺人才 轉工薪酬可高3成!

職場 | Jan 12 2020 - 10:43

2020年伊始,打工仔當然期望升職加薪,惟近期遇上經濟不穩,大圍環境未必樂觀,雖然如此,始終有某些行業無懼經濟起跌,勢頭依然良好。今期找來安俊人力資源顧問有限公司董事總經理周綺萍及合眾人事顧問有限公司總經理蘇偉忠,為讀者解構2020年數個最有前景的行業,分析來龍去脈,讓打工仔審視度勢,看看自己現時工作前景如何,或者有沒有機會跳槽至前景更佳的行業。

References:
https://www.chinadailyhk.com/article/156335
https://www.edigest.hk/article/136089/職場/最有前景行業-網絡保安-大數據分析-缺人才/

Recent News

InnoHK Clusters Being Developed by the Government

POSTED ON: **1st April 2020**
CATEGORIZED IN: **News and Happenings**

According to The 2020-21 Budget, the Government is developing two InnoHK research clusters at the Hong Kong Science Park (Science Park), one focusing on healthcare technologies and the other on artificial intelligence and robotics technologies.

InnoHK is a major initiative of the Hong Kong Special Administrative Region Government to develop Hong Kong as the hub for global research collaboration. This involves the establishment of world-class research clusters at the Hong Kong Science Park with research laboratories set up by world renowned institutions and / or commercial entities to conduct collaborative researches.

Health@InnoHK and **AIR@InnoHK** will be the first two research clusters to be established progressively in the next few months.

Health@InnoHK will focus on all types of healthcare-related technologies, including for instance drug discovery, personalized medicine, molecular diagnostics, bioengineering, chemical biology, bioinformatics, vaccine development, medical instrumentation, alternative medicine etc.

AIR@InnoHK will focus on the development of Artificial Intelligence and Robotics technologies, as applied to areas like financial services, smart city and advanced manufacturing. Research focuses may cover big data analytics, machine learning, cognitive systems, intelligent agents, classification for diagnosis, medical robotics, mobile robots and assistive / service / construction robots etc.
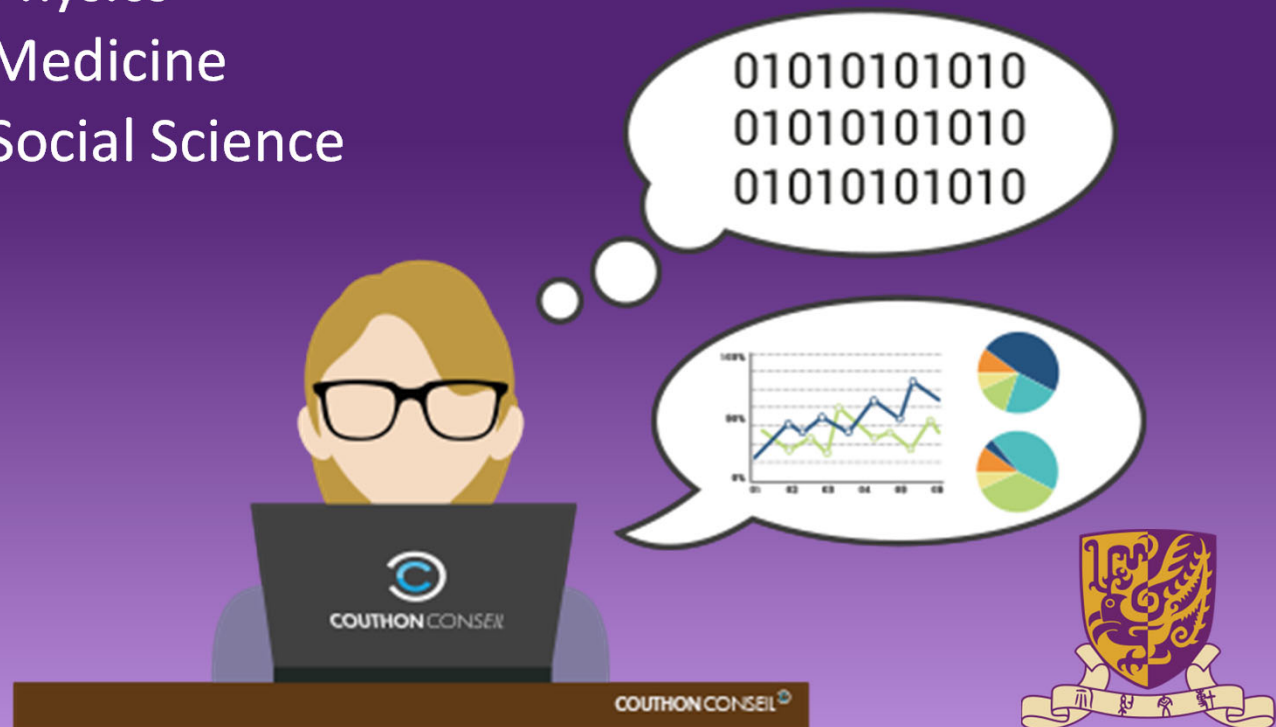
Reference:
https://www.startmeup.hk/zh-hant/innohk-clusters-being-developed-by-the-government/

Special Features

- **A** "Computer Science/Statistics + X" programme (i.e., the X component)

- 3 specialized streams
  - » Computational Physics
  - » Computational Medicine
  - » Computational Social Science

Mission

- Enable students to develop cutting-edge massive data analytics and management solutions that are of practical interest to academics, industry, and society

- Nurture local talents in computational statistics related applications to meet rising demand for data driven in the Information Age

Programme Objective

- Equip students with the capabilities of developing mathematical, analytical and technical skills to create solutions to guide data-driven decision making from massive information

- Backed by rigorous foundations like data structures, algorithms, statistical modeling and analysis and distributed computing system programming.
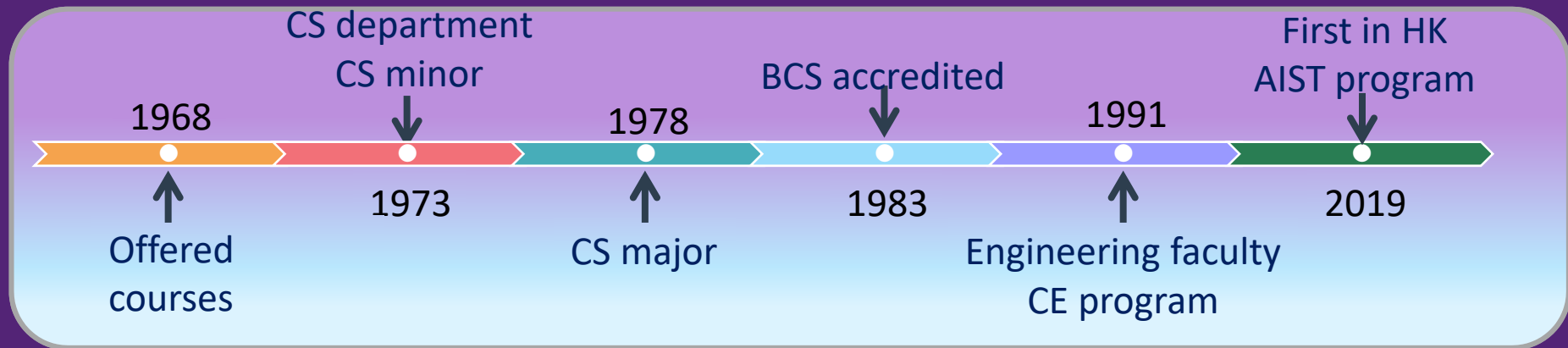
Department of Computer Science and Engineering

Department of Statistics
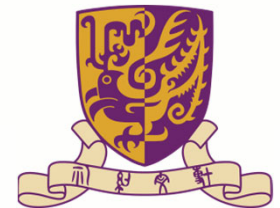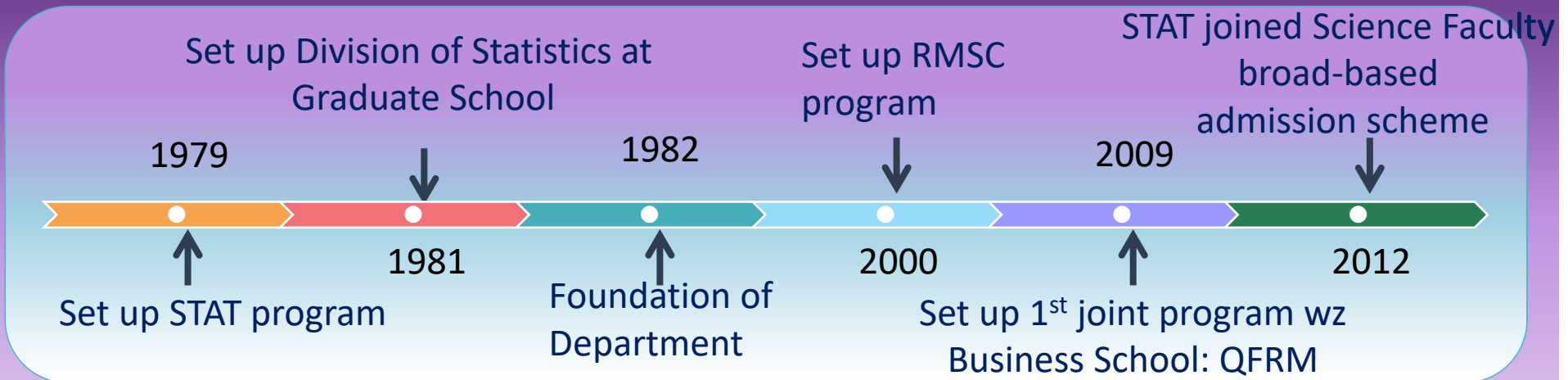
Department of Computer Science and Engineering

- The first "Computer Science" department in Hong Kong
- Offering AIST, CENG and CSCI programmes

CS department
CS minor → (1973)

BCS accredited → (1983)

First in HK
AIST program → (2019)

1968 • — 1973 • — 1978 • — 1983 • — 1991 • — 2019 •

Offered courses ↑ (1968)

CS major ↑ (1978)

Engineering faculty
CE program ↑ (1991)

Department of Statistics

- Statistics (STAT) was set up as an individual programme of study in 1979
- Offering STAT, RMSC and QFRM programmes

Set up Division of Statistics at Graduate School → (1981)

Set up RMSC program → (2000)

STAT joined Science Faculty broad-based admission scheme → (2012)

1979 • — 1981 • — 1982 • — 2000 • — 2009 • — 2012 •

Set up STAT program ↑ (1979)

Foundation of Department ↑ (1982)

Set up 1st joint program wz Business School: QFRM ↑ (2009)

Excellence in Research and Teaching

Turing Award Recipient

Prof. Andrew Yao

State Natural Science Award (Second class)

Prof. Qiman Shao

ACM Fellows

Prof. Martin Wong, Prof. Irwin King, Prof. Michael Lyu, Prof. John Lui, Prof. Yufei Tao, etc.

ASA Fellows

Prof. Ngai Hang Chan

IEEE Fellows

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

IMS Fellows

Prof. Ngai Hang Chan, Prof. Qiman Shao

AI 2000 Most Influential Scholar Annual List (2021)

Prof. Irwin King, Prof. Jiaya Jia, Prof. Yufei Tao, and some professors are named in the list, recognizing their research excellence in AI fields

Outstanding Fellow of the Faculty of Science

Prof. Isabella Wai Yin Poon

Prof. Hoi Ying Wong

Outstanding Fellow of the Faculty of Engineering

Prof. Yip Yuk Lap

UGC - Early Career Award 2019/20

Prof. Kin Wai Chan

Excellence in Research and Teaching

Journal of Time Series Analysis Distinguished Author Award
Prof. Ngai Hang Chan (2020)

The IMA Journal of Management Mathematics Best Paper of 2018
Prof. Hoi Ying Wong

W. J. Youden Award in Interlaboratory Testing in JSM 2019
Prof. Yingying Wei

Vice-Chancellor's Exemplary Teaching Award
Prof. Hoi Ying Wong (2015, 2020)
Mr. Michael Fung, Senior Lecturer (2019)
Prof. Yuanyuan Lin (2016)
Prof. Irwin King (2016)
Prof. Jimmy Lee (2015)
Prof. Isabella Wai Yin Poon (2013)

CUHK University Education Award 2020
Prof. Irwin King

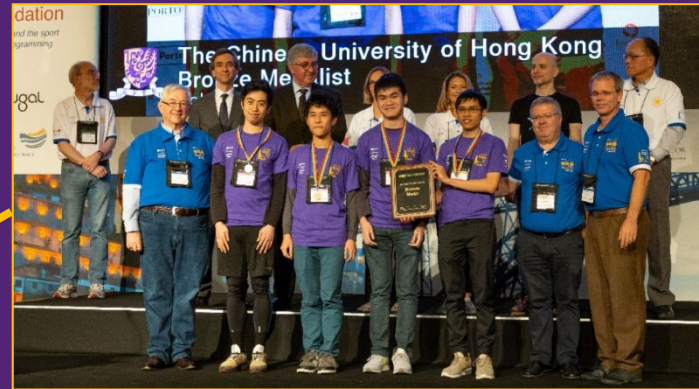**University Education Award 2017**
Prof. Jimmy Lee

Recent Achievements in Intl'/local 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

PwC's HackaDay 2019

- 2nd place

International Quant Championship 2018

- National Winner
- competed in the Global Final in Singapore

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

Student Internship

Internship

- Census and Statistics Department, HKSAR
- Centre for Clinical Research and Biostatistics
- New Media Group
- Beta Labs under
  The Lane Crawford Joyce Group
- Hong Kong Monetary Authority
- Office of the Government Chief Information Officer
- HSBC
- The Bank of East Asia Limited
- IBM China/Hong Kong Limited
- Information Technology and Health Informatics Division, Hospital Authoity
- Cisco Systems, Inc.
- Fujitsu Hong Kong Limited
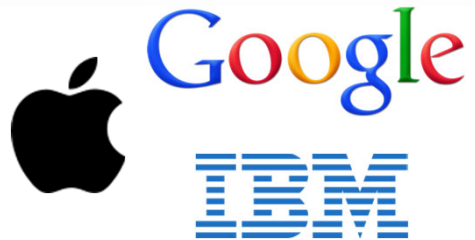- SenseTime Group Limited
- Solomon Systech Limited
- Madhead Limited

Industrial Visits

- Visit to companies / relevant Government Departments to learn latest market development

Strong Alumni Network

IT Industry

Education/
Government

Banking

What's More?

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

- Exchange opportunities to world-class universities

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

- CSE and STA teachers usually have the highest teaching evaluation scores

Admission Requirements for JUPAS Applicants

Admission Requirements (2022 Entry) of CDAS
Planned number of students Intake: 20

HKDSE Subject	Minimum Level	Subject Weighting
HKDSE Core Subjects		
English Language	4	1.5
Chinese Language	3	1
Mathematics (Compulsory Part)	4	2
Liberal Studies	2	1
HKDSE Elective Subjects		
Any two subjects	3	#

\# The CDAS programme accepts any subject as elective,

\# The programme accepts any subject as elective. The preferred subjects (with a subject weighting of "2") include Mathematics Extended Module 1 or 2, Physics, Chemistry, Economics, Information and Communication Technology, Biology, Combined Science; "1" is given to any other subjects.

Selection is based on the Best 5 HKDSE subjects with subject weighting applied.

Admission Requirements for JUPAS applicants

Grade Point Conversion

Level	5**	5*	5	4	3	2	1
Score	8.5	7	5.5	4	3	2	1

Example: Weighted Best 5 Score

HKDSE	CHI	ENG	MATH	LS	M1/M2	Best Elective	2nd Elective
Candidate's grade	4	5	5**	4	5*	5**	5*
Weighting	1	1.5	2	1	2	2 (Physics, Chemistry, Economics, Biology, Combined Science, ICT)	1
Weighted Score	4	8.25✓	17✓	4	14✓	17✓	7✓

Programme Best 5 Score:

$$\frac{5.5 \times 1.5 + 8.5 \times 2 + 7 \times 2 + 8.5 \times 2 + 7 \times 1}{1.5 + 2 + 2 + 2 + 1} = 7.44 \text{ (Admission Score)}$$

(Maximum possible total weighting)

Admission Grades of our other elite programmes (2021 Entry)

## Artificial Intelligence: Systems and Technologies (AIST)

JUPAS Catalogue No.	Program	Target Percentile	CHI	ENG	MATH	LS	M1/ M2	Best Elective	2nd Best Elective	3rd Best Elective	Total Ref. Score
JS4468	AIST	UQ	4	5**	5**	4	5*	5*	5*	5*	32
		M	3	5	5**	3	5**	5*	5	5	30
		LQ	3	5	5**	4	5	5*	5*	5	29

Quantitative Finance and Risk Management Science (QFRM)

JUPAS Catalogue No.	Program	Target Percentile	CHI	ENG	MATH	LS	M1/ M2	Best Elective	2nd Best Elective	3rd Best Elective	Total Ref. Score
JS4276	QFRM	UQ	5	5	5**	4	5**	5**	5**	5*	34
		M	4	4	5**	4	5*	5**	5**	5**	34
		LQ	3	4	5**	4	5**	5**	5*	5*	33

Source: Office of Admissions and Financial Aid, CUHK

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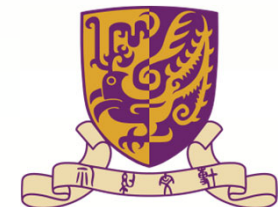
Admission Requirements
(for Non-JUPAS & International Applicants)

- 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

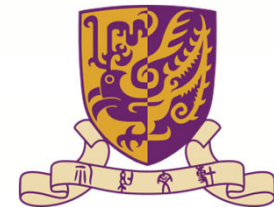- Will be expected to demonstrate outstanding abilities in English, mathematics and science subjects

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

CDAS Curriculum – Overview

Year			University Common Core (Languages, GE, PE) (39 Units)	Free Electives (9 Units)	
4	Final Year Project	Major Electives			**123 units**
3	Major Core	Major Electives			
2	Major Foundation	Major Core			
1	Faculty Package	Major Foundation			
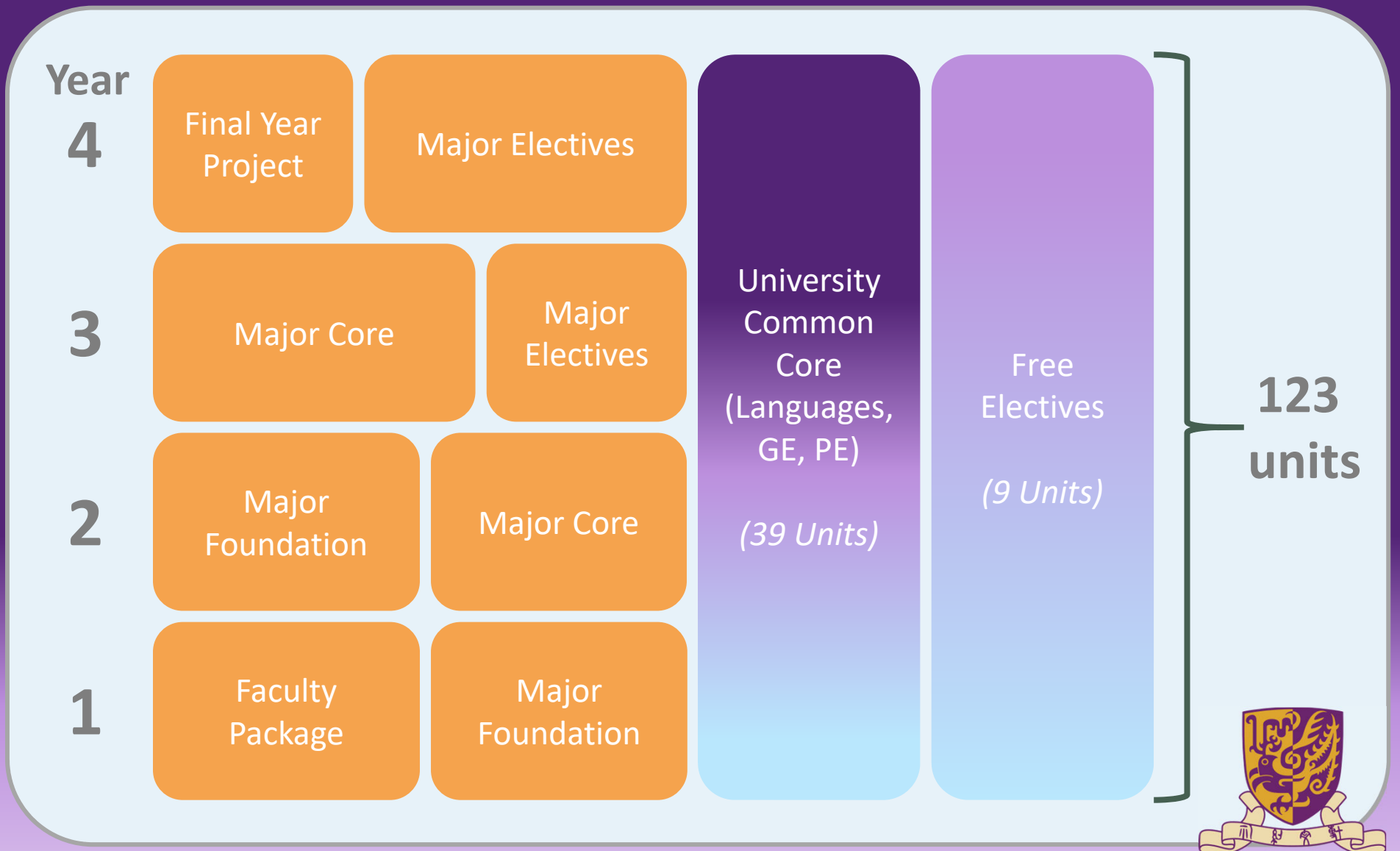
CDAS Curriculum – Major Requirements

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

75 units
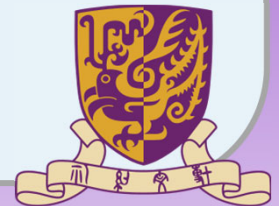
CDAS Curriculum – Faculty Package and Foundation

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

Faculty Package (9 units):

⭐ **Advanced Calculus**

⭐ **Linear Algebra**

⭐ **Programming**

» Programming (ENGG1110 / ESTR1002)

» Linear Algebra (ENGG1120 / ESTR1005 / MATH1030)

» Calculus for Engineers (MATH1510) or University Mathematics (MATH1010)
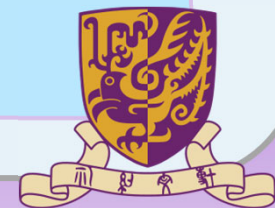
CDAS Curriculum – Major Foundation

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

Major Foundation (18 units)

- ★ **Python**
- ★ **R, SAS**
- ★ **C++**
- ★ **Statistics**
- ★ **Mathematics**
- ★ **Data Structure**

- » Intro to Computing Using C++ (CSCI1120 / ESTR1100)
- » Data Structures (CSCI2100 / ESTR2102)
- » Discrete Mathematics (ENGG2440 / ESTR2004)
- » Basic Concepts in Statistics and Probability I & II (STAT2001 & STAT2006)
- » Programming Languages for Statistics (R and SAS) (STAT2005)
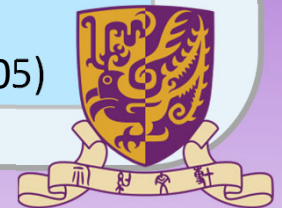
CDAS Curriculum – Major Core

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

Major Core (27 units)

- ⭐ **Parallel Computing**
- ⭐ **Artificial Intelligence**
- ⭐ **Machine Learning**
- ⭐ **Statistical Learning**
- ⭐ **Data Mining**

» Algorithms and computer systems
» Machine learning
» Operating systems
» Sampling
» Statistical Inference
» Statistical Modeling
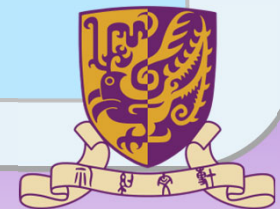
CDAS Curriculum – Major Electives

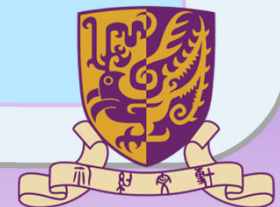| Year		
4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Major Core

Major Electives (15 units)

Streams

1. **Computational Data Science (General stream)** ⭐
2. **Computational Physics** ⭐
3. **Computational Medicine** ⭐
4. **Computational Social Science** ⭐

CDAS Curriculum – Final Year Project (FYP)

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

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
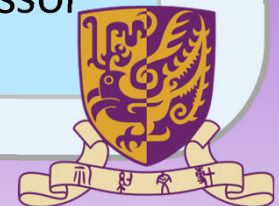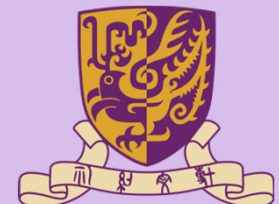
Curriculum Comparison Between AIST, CDAS and QFRM

Table 1(a): Typical course structures in the general streams

		Faculty of Engineering			Faculty of Science				Faculty of Business Administration				
		AIST	ENGG	CSCI	PHYS	MATH	STAT	RMSC	FINA	ECON/ DSME	ACCT	Other	
AIST	Faculty		9										
	Required	18	7	12	3	6							
	Elective	v	v	v			v					v	18
CDAS	Faculty		3			6							
	Required	6	3	27		3	18						
	Elective			v			v	v				v	15
QFRM	Faculty					3				6			
	Required			6		6	12	9	12		3		
	Elective			v		v	v	v	v	v	v	v	27
Mainly about		Computer science & programming			Statistics & mathematics				Finance & business				

AIST: Artificial Intelligence: Systems and Technologies
CDAS: Computational Data Science
QFRM: Quantitative Finance and Risk Management Science
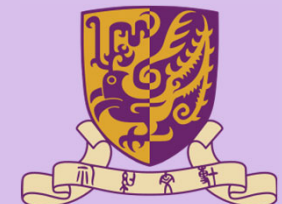
Curriculum Comparison Between AIST, CDAS and QFRM

Table 1(b): Course summary

		ENGG	SCI	BA
AIST	Faculty & Required Elective	46 Mainly	0 Some	0
CDAS	Faculty & Required Elective	6 Mainly	0 Mainly	0
QFRM	Faculty & Required Elective	6 Some	0 Mainly	0 Mainly

Table 2: Administrative department(s) and degree

	Administrative department(s)			Degree
	Department of Computer Science and Engineering	Department of Statistics	Department of Finance	
AIST	v			Bachelor of Engineering
CDAS	v	v		Bachelor of Science
QFRM		v	v	Bachelor of Science

AIST: Artificial Intelligence: Systems and Technologies
CDAS: Computational Data Science
QFRM: Quantitative Finance and Risk Management Science

Curriculum Comparison Between AIST, CDAS and QFRM

Legend:
- Computer Science
- Programming
- Statistics
- Risk Mangement Science
- Mathematics
- Finance
- Business
- Others

	AIST	CDAS	QFRM
Faculty Package	Programming	Programming	Mathematics
	Linear Algebra	Linear Algebra	Economics for Business Studies
	Multivariable Calculus	Advanced Calculus	
Major Foundation	Discrete Mathematics	Discrete Mathematics	
	Advanced Calculus	Data Structure	
	Probability	Probability	
	Statistics	Statistics	
	Python	Python	
	Physics	R, SAS	
		C++	

AIST: Artificial Intelligence: Systems and Technologies
CDAS: Computational Data Science
*QFRM: Quantitative Finance and Risk Management Science*

Curriculum Comparison Between AIST, CDAS and QFRM

	Computer Science
	Programming
	Statistics
	Risk Mangement Science
	Mathematics
	Finance
	Business
	Others

|	AIST	CDAS	QFRM
Required courses	Algorithms & Computer Systems	Algorithms & Computer Systems Artificial Interlligence	Financial Management Financial Markets Investment Analysis and Portfolio Management Risk Management and Insurance
	Artificial Intelligence	Operating Systems	Risk Mangement Simulation Methods for Risk Management Science and Finance Statistical Modelling in Financial Markets
	Machine Learning	Machine Learning / /Data Mining / Statistical Learning	Financial Accounting
	Data Structure	Survey Methods / Statistical Computing / Bayesian Learning	Statistics Probability Stochastic Processes Applied Regression Analysis
	Numerical Optimization	Statistical Inference / Applied Regression Analysis	Linear Algebra Advanced Calculus
			Programming C / C++ / Java
		Nonparametric Statistics / Categorical Data Analysis	Data Structures / Business Information Systems / Information Systems

AIST: Artificial Intelligence: Systems and Technologies
CDAS: Computational Data Science
QFRM: Quantitative Finance and Risk Management Science

Curriculum Comparison Between AIST, CDAS and QFRM

	AIST	CDAS	QFRM
Research	Final Year Project	Final Year Project	Capstone / Research / Practicum
Practicum	Practicum		
	Stream	**Stream**	
Elective courses	General Artificial Intelligence: Systems and Technologies	Computational Data Science	Business: Courses from Accountancy, Finance, Management, Marketing
	Biomedical Intelligence	Computational Physics	Quantitative Finance: Courses from Finance
	Intelligent Multimedia Processing	Computational Medicine	Risk Management Science: Courses from Risk Management Science, Computer Science, Economics, Mathematics, Statistics
	Large-scale Artificial Intelligence - Theory and Systems	Computational Social Science	
	Intelligent Manufacturing and Robotics	*Engineering Leadership, Innovation, Technology and Entrepreneurship (ELITE) Stream (Faculty of Engineering)	
	*Engineering Leadership, Innovation, Technology and Entrepreneurship (ELITE) Stream (Faculty of Engineering)		

AIST: Artificial Intelligence: Systems and Technologies
CDAS: Computational Data Science
QFRM: Quantitative Finance and Risk Management Science
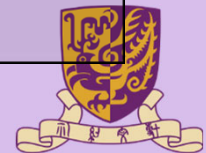
FAQs
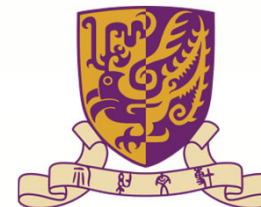
FAQ Contents:

Q: Will there be any interview?

Q: Will there be any exchange opportunity?

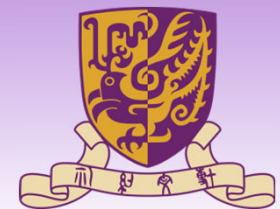Q: Will there be any scholarship or financial aid?

Q: How can I declare the specialized stream?

Q: What are the differences between CDAS, AIST and QFRM?

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

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)

- Interviews will be conducted in batches from ~Jan. 2022.

- 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 you application via Office of Academic Links (OAL) !
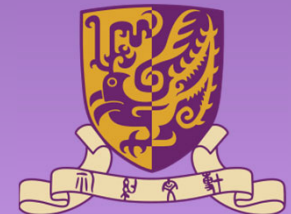
Q: Will there be any scholarship or financial aid?
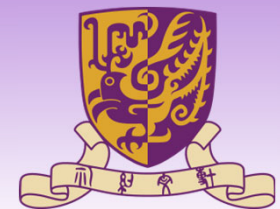
# Scholarships and Financial Aids

- 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 via
Office of Admissions and Financial Aid (OAFA)!

Q: How can I declare the specialized stream?
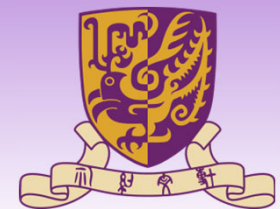
# Stream Declaration

- 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 (15 units)

Streams

1. Computational Data Science (General stream)
2. Computational Physics
3. Computational Medicine
4. Computational Social Science
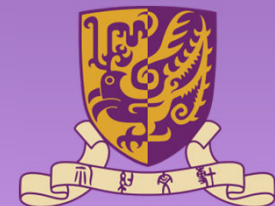
Q: What are the differences between CDAS, AIST and QFRM?

CDAS vs AIST vs QFRM ?

		AIST	CDAS	QFRM
Administrated by	Department of Computer Science and Engineering	V	V	
	Department of Statistics		V	V
	Department of Finance			V
Major Knowledge	AI & Machine Learning	V	V	
	High-performance computing	V	V	
	Statistical Modelling		V	V
	Data Analytics		V	V
	Risk Management		V	V
	Quantitative Finance			V
	Business			V
Courses offered by	Faculty of Engineering	V	V	
	Faculty of Science		V	V
	Faculty of Business Administration			V
	Degree	B.Eng.	B.Sc.	B.Sc.

Q: I am still struggling to choose AIST / CSCI / CENG / RMSC / QFRM

What can I do?

If you are still struggling to choose...

- You can go through our websites and admission materials for a better understanding before submission, and write to us via email to statdept@cuhk.edu.hk or 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.

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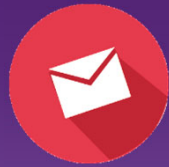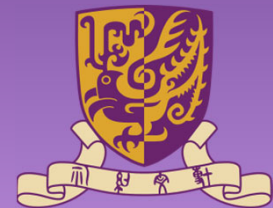
Contact Us

📞 (852) 3943 7931

(852) 3943 4269

✉️ statdept@cuhk.edu.hk

ug-admiss@cse.cuhk.edu.hk

🖱️ www.sta.cuhk.edu.hk/CDAS

www.cse.cuhk.edu.hk/admission/cdasn/

See you in Fall 2022 !

香港中文大學計算機科學與工程學系
Department of Computer Science and Engineering
The Chinese University of Hong Kong

香港中文大學統計學系
Department of Statistics
THE CHINESE UNIVERSITY OF HONG KONG