



香港科技大學
THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY



計算機科學及工程學系
THE DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING

Introduction to Department & Strategic Plans

DEPARTMENT OF Computer Science and Engineering (CSE)

Prof Xiaofang Zhou

5 April 2024



HKUST – CSE rankings



World's Top 700 Universities in
Computer Science
(#1 in Hong Kong for 11 times in 13 years)
QS World University Rankings 2023

No. 40



(retained the No.1 place in Hong Kong for 8 years in a row)
Times Higher Education World
University Rankings (2024)

No. 31



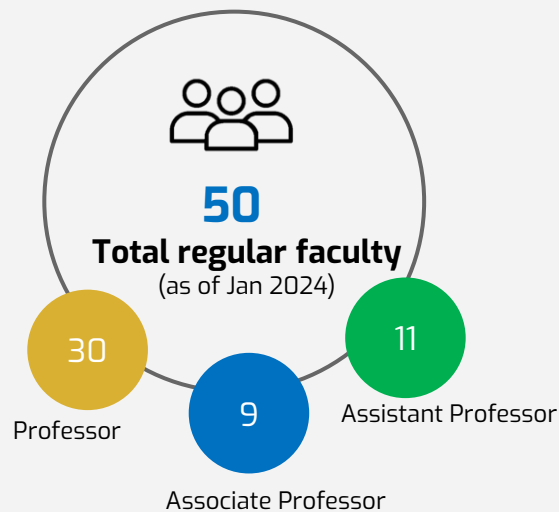
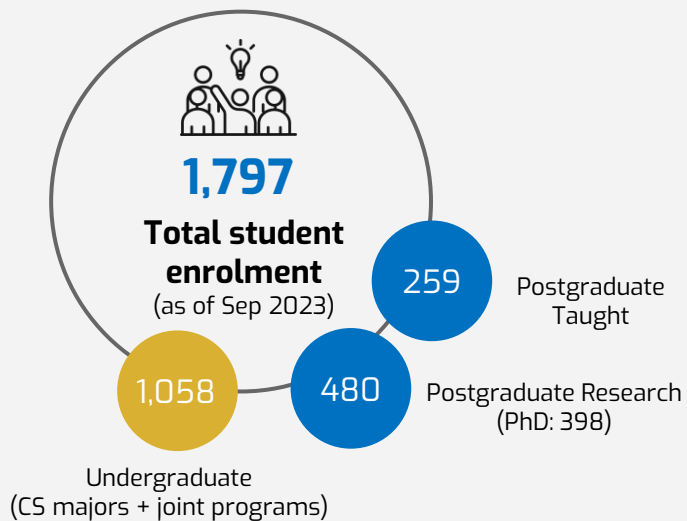
CS Rankings (2024)

No. 18



CSE FACTS AND FIGURES

Established in 1991



Teaching focused: 7
Research Assistant Professor: 6
Postdoc/Research Associate: 29
Research Assistant: 37
Non-academic: 24

CSE Faculty

 Xiaofang ZHOU Ota Pean Professor of Engineering and Chair Professor and Head Data, Knowledge and Information Management	 Raymond Chi-Wing WONG Professor and Associate Head Data, Knowledge and Information Management	 Xiaoqian MA Associate Professor and Associate Head Human-Computer Interaction	 Lei CHEN Chair Professor Data, Knowledge and Information Management	 Shing-Chi CHEUNG Chair Professor Software Engineering and Programming Languages	 Gary Shueang-Han CHAN Professor Networking and Computer Systems	 Kai CHEN Professor Networking and Computer Systems	 Siu-Wing CHENG Professor Theoretical Computer Science	 Albert Chi-Shing CHUNG Professor Vision and Graphics; Artificial Intelligence	 Cunsheng DING Professor Theoretical Computer Science, Cybersecurity	 Qiong LUO Professor Data, Knowledge and Information Management, Software Engineering and Programming Languages	 Dimitris PAPADIAS Professor Data, Knowledge and Information Management	 Ting-Chuen PONG Professor Vision and Graphics; Human-Computer Interaction	 Long QUAN Professor Vision and Graphics	 Pedro SANDER Professor Vision and Graphics					
 Yike GUO Chair Professor Data, Knowledge and Information Management	 Bo LI Chair Professor Networking and Computer Systems	 Huamin QU Chair Professor Human-Computer Interaction, Vision and Graphics	 Dit-Yan YEUNG Chair Professor Artificial Intelligence	 Qian ZHANG Tencent Professor of Engineering and Chair Professor Networking and Computer Systems	 Song GUO Professor Networking and Computer Systems	 Andrew B. HORNER Professor Human-Computer Interaction	 James Tin-Yau KWOK Professor Artificial Intelligence	 Mo LI Professor Networking and Computer Systems	 Fangzhen LIN Professor Artificial Intelligence, Software Engineering and Programming Languages	 Chiew-Lan TAI Professor Vision and Graphics; Human-Computer Interaction	 Chi-Keung TANG Professor Vision and Graphics	 Dekai WU Professor Artificial Intelligence; Human-Computer Interaction	 Ke YI Professor Theoretical Computer Science, Data, Knowledge and Information Management	 Charles ZHANG Professor Software Engineering and Programming Languages, Cybersecurity					
 Nevin Lianwen ZHANG Professor Artificial Intelligence	 Sunil ARYA Associate Professor Theoretical Computer Science	 Brahim BENSOU Associate Professor Networking and Computer Systems	 Sunghun KIM Associate Professor Software Engineering and Programming Languages, Artificial Intelligence	 Brian Kan-Wing MAK Associate Professor Artificial Intelligence	 Long CHEN Assistant Professor Vision and Graphics, Artificial Intelligence	 Qifeng CHEN Assistant Professor Vision and Graphics, Artificial Intelligence	 Amir GOHARSHADY Assistant Professor Software Engineering and Programming Languages, Theoretical Computer Science, Cybersecurity	 Junxian HE Assistant Professor Artificial Intelligence	 Lionel PARRAUX Assistant Professor Software Engineering and Programming Languages	 Wilfred Siu-Hung NG Associate Professor Data, Knowledge and Information Management	 Dimitris PAPAIOPOULOS Associate Professor Cybersecurity	 Yanggu SONG Associate Professor Artificial Intelligence	 Wei WANG Associate Professor Networking and Computer Systems	 Hao CHEN Assistant Professor Vision and Graphics, Artificial Intelligence	 Dongdong SHE Assistant Professor Software Engineering and Programming Languages	 Jiali SHEN Assistant Professor Software Engineering and Programming Languages	 Shaui WANG Assistant Professor Software Engineering and Programming Languages	 Dan XU Assistant Professor Vision and Graphics	 Binhang YUAN Assistant Professor Data, Knowledge and Information Management

Current: 50
Target: 65

Female: 5 (10%)

HK background: 12 (24%)
Mainland background: 27 (54%)
Other background: 11 (22%)

CSE Research Themes and Areas

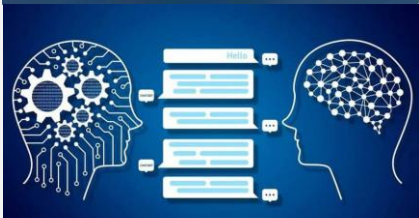
Artificial Intelligence (AI)



Artificial Intelligence (AI)



Vision and Graphics (VG)



Natural Language Processing (NLP)

Data Science (DS)



Data, Knowledge and Information Management (DB)



Human-Computer Interaction (HCI)



Theoretical Computer Science (TH)

Systems (SY)



Cybersecurity (SEC)



Software Engineering and Programming Languages (SEPL)



Networking and Computer Systems (NE)

HKUST CSE

UG and PG Programme

Undergraduate Programs

Major Programs

- [BEng in Computer Science \(COMP\)](#)
- [BSc in Computer Science \(COSC\)](#)
- [BEng in Computer Engineering \(CEPG\)](#)
- [BSc in Data Science and Technology \(DSCT\)](#)
- [BSc in Risk Management and Business Intelligence \(RMBI\)](#)
- [Dual Degree Program in Technology and Management](#)
- [Extended Major in Artificial Intelligence \(AI\)](#)
- [Extended Major in Digital Media and Creative Arts \(DMCA\)](#)
- [Additional Major\(s\)](#)

Minor Programs

- [Minor Program in Big Data Technology](#) (for non-IT Minor students)
- [Minor Program in Information Technology](#) (for non-CSE students)

UG

- From school-based admission to department-based admission
- New BEng in AI program from Fall 2025

TPG

- Increased number of students in MSc IT and MSc BDT from Fall 2024
- New MSc IT concentration in Cybersecurity from Fall 2024
- New MSc in AI from 2025

Postgraduate Programs

Research Programs

- [Master of Philosophy \(MPhil\)](#)
- [Doctor of Philosophy \(PhD\) Programs](#)

Taught Programs

- [Master of Science \(MSc\) Program in Big Data Technology](#)
- [Master of Science \(MSc\) Program in Information Technology](#)

(2022)

CSE Computing Infrastructure



CSE Labs

- UG teaching labs x 4
- PG Communal Lab x 2
- PG Lab. x 7
- Special lab.
- PG server room
- RPg Hub

Individual Research Group Servers pool for PG Students:

Total no. of servers: 124 nodes
Total no. of CPU: 248 nodes
Total no. of GPUs: 700 nodes
Total storage: 3 PB
Total memory: 40 TB

Departmental Servers:

1. GPU Cluster for teaching:
 - . 7-node cluster
 - 2 x 10 cores Intel Xeon Gold 5115 (2.4GHz) processors
 - 256GB physical memory
 - Inter-connected with 10Gb Ethernet
 - . Nvidia RTX 2080Ti GPUs x 56.
 - . OS: Linux
2. General GPU server for UG students:
 - . 7 servers with a total of 32 GPUs
 - (Nvidia GeForce RTX 2080/3090/3090Ti)

Many Area-based Labs



GPU server (Dell DSS 8440) x (5+2)

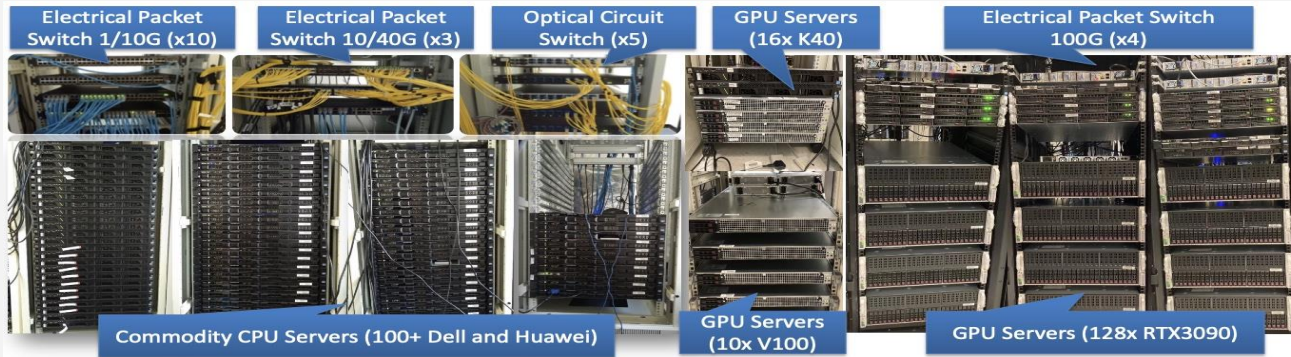
- 2 CPU, 8 GPU A100 80GB, 512GB RAM, 54TB SSD
- 2x8 RTX4090 with 24GB

CPU server (Dell PowerEdge R940) x 6

- 4 CPU, 1.5TB RAM, 26TB HDD

Storage server (Dell PowerEdge R740xd2) x 2

- 2 CPU, 256GB RAM, 1.6TB SSD + 480TB HDD



2012

2013

2015

2017/18

2020/21

Big Data and Cloud Systems

Deep Learning and AI infrastructure

* New strategies to establish centralized computing infrastructure at HKUST

HK Generative AI (HKGAI)



An InnoHK project led by HKUST

- With HKU, CUHK, PolyU, CityU, plus NUS
- To build open-source foundation models
- Vertical applications in legal, medical and creative arts areas, plus X (finance, telecommunications...)



HKGAI Establishment

Our Establishment

- Established in October 2023 with government funding ~USD100 million
- A new InnoHK R&D Center, one of the important initiatives in AI committed by HK Government
- Included in the Chief Executive's 2023 Policy Address Policy Measure

Our Position

- Hong Kong as an international innovation and technology hub
- A cornerstone to support Hong Kong AI ecosystem
- Promote innovation & collaboration & application
- Shape future efficiency, intelligence and interconnection
- Talent cultivation and retention

The Chief Executive's 2023 Policy Address

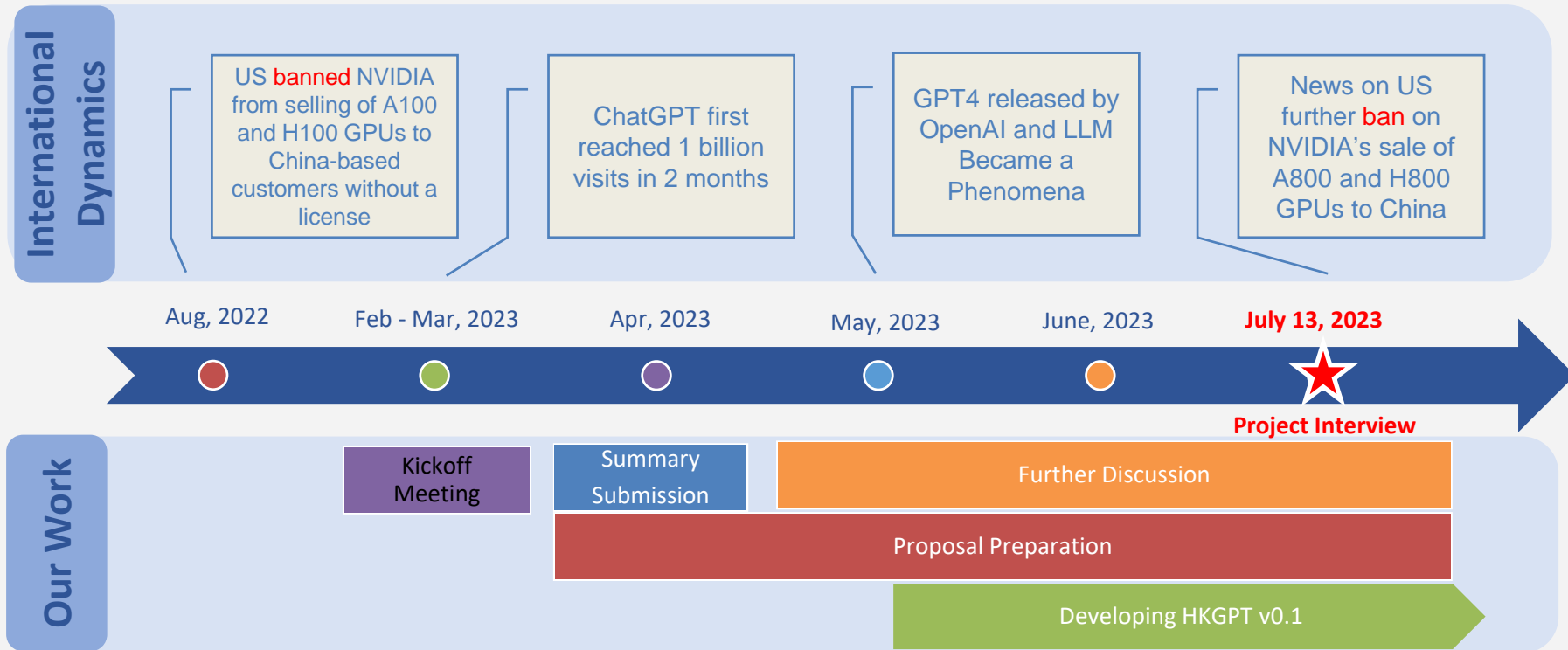
Policy Measures

2023.10.25

Promoting R&D

- Establish the Hong Kong Microelectronics Research and Development Institute within 2024 to lead and facilitate the collaboration among universities, R&D centres and the industry on the R&D and application of microelectronics, including joint exploration of the third-generation semi-conductor core technology, as well as fully leveraging the well-developed manufacturing industry chains and enormous market in the GBA. (ITIB)
- Make preparations for the establishment of the third InnoHK research cluster which focuses on advanced manufacturing, materials, energy and sustainable development, with a view to expanding our world-class R&D collaboration and enhancing the R&D development of Hong Kong. (ITIB)
- Establish a new InnoHK R&D Centre specialising in R&D in generative AI technology, and conduct studies on the appropriate rules and guidelines for the application of AI technology. (ITIB)

Timing is Everything



Timing is Everything

International
Dynamics

US Government
restricts exports
of NVIDIA's
China-Exclusive
H800 & A800 AI
GPUs To China

OpenAI released
text-to-video
model Sora in
Feb, 2024.

Jul 20, 2023

Sept, 2023

Oct 12, 2023

Dec, 2023

Jan, 2024

Feb, 2024.

Mar, 2024

Jun, 2024

Master Agreement

Budget Approved

Our Work

Signed
Master
Agreement
with ITC,
project
approval

NVIDIA
H800 GPUs
arrived in
Hong Kong

ITC
approved
the budget
for HKGAI

NVIDIA
H800
GPU
Cluster
installed

LLM
training
project
started while
building the
learning infra

First 7B
Model
delivered

7B
Based
MoE will
finish
training

HKGPT v1.0 will
be released

Applications to
release:
- HK GPTs Store
(with end user
applications)
- HK Gov Co-Pilot
- HK Legal AI

HKUST
ordered 1016
NVIDIA H800
GPUs

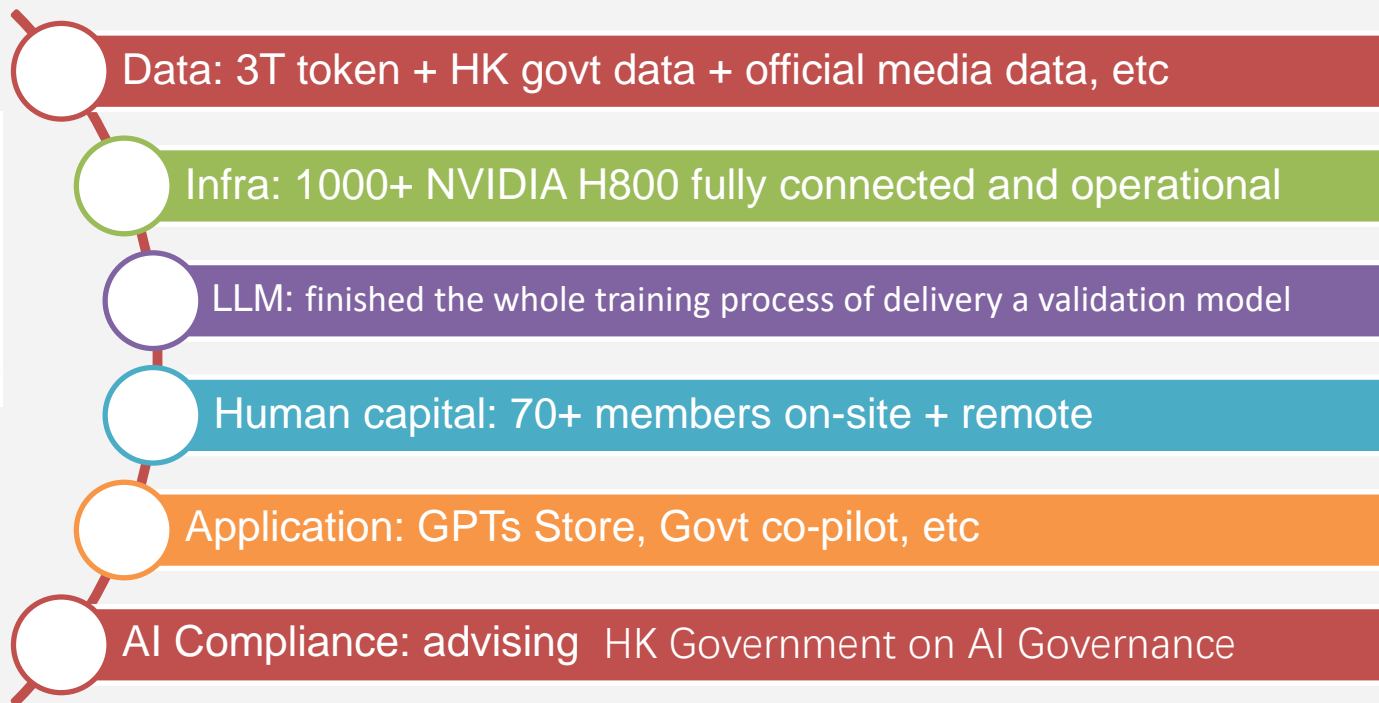


What we have done



香港生成式人工智能研發中心
Hong Kong Generative AI | Research & Development Center

- ✓ Open-source state-of-the-art FM
- ✓ Meet diverse local and national needs



Alpha Version

English	600
Chinese	300
Code	300
Other	100
Total	1300

B tokens

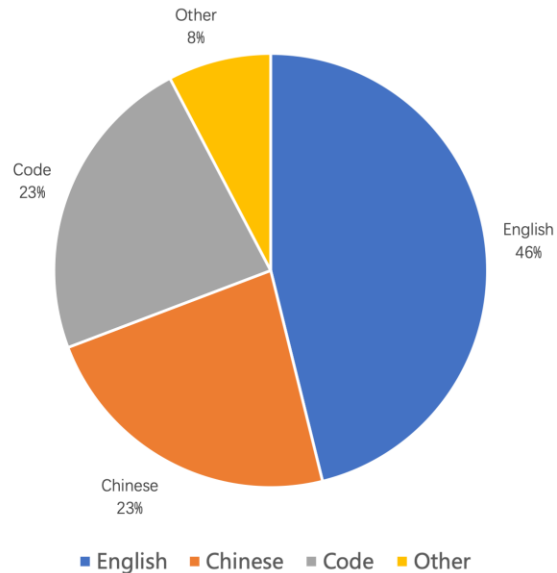
English: red-pajama v2/slimpajama/dolma/refinedweb

Chinese: CWP/CCI/skyPile/Wanjuan-text/Yayi/Wudao/ChineseWeb/TeleChat

Code: Starcoder1

Other: Math (Math23K, etc)

Data Ration After Cleaning (Alpha)

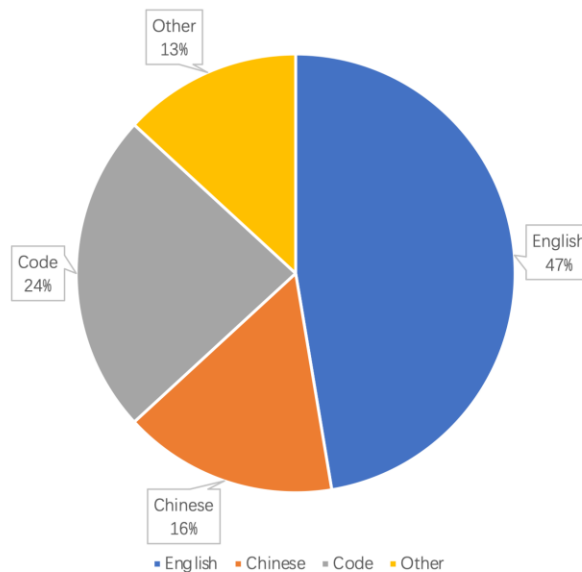


V1.0

English	1800
Chinese	600
Code	900
Other	500
Total	3800

B tokens

Data Ratio after Cleaning (v1.0)



English: red-pajama v2/slimpajama/dolma/refinedweb
Chinese: CWP/CCI/skyPile/Wanjuan-text/Yayi/Wudao/ChineseWeb/TeleChat
Code: Starcoder-2
Other: Papers, math, Arxiv, wiki, Math23K, NSSD (after OCR), FLAN, COIG

Prof. Tim Cheng 's Research

Efficient Edge LLM

➤ The Research Goal:

- i. Meeting the Size, Weight, Power Constraints (SWaP) of edge AI for LLMs

➤ The Research Topic:

- i. Quantization of LLM
 - ii. Efficient finetuning of LLM
 - iii. Context pruning for LLM reasoning
 - iv. Model/hardware architecture co-design and co-optimization
- Some of these research tasks are part of his InnoHK ACCESS centre's research agenda



Prof. Tim Cheng 's Research

Specific Projects on LLM

LLM Quantization (published in EMNLP 2023):

- Introduce LLM-FP4, a post-training quantization framework which for the first time is capable of quantizing both the activation and weight of LLM to 4 bits without substantial loss in accuracy, outperforming previous methods by up to 13.1%.

Context Pruning for LLM Reasoning (submitted for publication):

- Propose CoT-Influx, a context pruner trained with reinforcement learning which automatically removes redundant tokens to incorporate more high-quality examples in prompt.

Efficient Finetuning of LLM (submitted for publication):

- Introduce DoRA, a new parameter-efficient fine-tuning approach, which consistently outperforms LoRA in fine-tuning LLM without incurring additional inference cost.



Prof. Lei Chen's Research



Data Management for Deep learning (DL)

- Significant progress and found wide application in various fields, like ChatGPT
- The success and efficiency of DL models depend on **proper data management**
- Training deep learning-based image classifiers is challenging
 - i. Without properly labeled data
 - ii. Efficiency is hindered by large datasets, complex models, and numerous hyperparameters
 - iii. Lack of validation and explanation limits model applicability

**In the later session — Prof. Chen will discuss more:

- 1) Effective data preparation for DL, including extraction, integration, labeling and selection
- 2) DL training optimization, involving data compression and computation graph optimization
- 3) Importance of model explanation for robustness and transparency
- 4) Demonstrate the important industry collaboration and the future research directions

Prof. S C Cheung's Research

Large Language Models (LLM)

- Enterprises are exploring the use of these models to help detect software faults and vulnerabilities in their systems
- LLMs have demonstrated promising results in popular coding benchmarks like HumanEval

**In the later session – Prof. Cheung will discuss more:

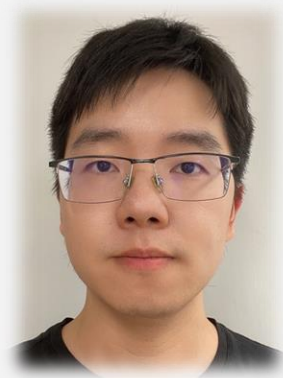
- Using LLMs for test generation and briefly introduce recent research efforts



Dr. Junxian He's Research

Large Language Models (LLM)

- Such as: **Reasoning**, **Data selection**, and **Evaluation**
- He works on :
 - i. Improving the complex reasoning abilities of LLMs
 - ii. how to select the best data to train LLMs
 - iii. how to evaluate LLMs in general



C-Eval - Very first evaluation benchmark for Chinese LLMs

- Developed by Dr. He and his students in 2023 May
- The most commonly used Chinese benchmark for LLMs
- Dataset has been downloaded over 1 millions times in less than a year
- Played an important role during the explosive development of LLMs in China over the past year

Highlights of CSE Faculty and Alumni



Prof Qiang YANG
Co-founder
Chair Professor



Professor Jiaya JIA
Founder and Chairman
PhD (Computer Vision)



Mr Jianxiong XIAO
Founder, CEO
MPhil, CSE



Mr Tat LEE
Chief Executive
and Executive
Director



BEng (Comp Sci)



Mo Li (李默)

**Professor
Assistant Chair (Research)**

*School of Computer Science and Engineering,
Nanyang Technological University (NTU)*

Office: N4-02B-61, 50 Nanyang Avenue, Singapore, 639798
Phone: +65 6790 4604
Fax: +65 6792 6559
Email: limo@ntu.edu.sg

Welcome to Dr. Bingsheng He's



**Professor,
Vice Dean (Research), NUS School of Computing,
Department of Computer Science,
School of Computing,
National University of Singapore**
Office: #COM3-02-12, COM3 Building, 11 Research Link, NUS,
Singapore 119391[map]
Ph.D. HKUST, 2008
Email: hebs(at)comp.nus.edu.sg



Jianliang Xu

Head and Professor

[Department of Computer Science \(Map\)](#)
[Hong Kong Baptist University](#)
Kowloon Tong, Hong Kong

Tel: +852 3411 5808 Fax: +852 3411 7892
Email: xujl@comp.hkbu.edu.hk

CONNECTORS

As a regular promotion program, each year we feature several alumni as the HKUST CSE Connectors. They will be invited to communicate with our students, researchers and faculties and share their experiences. If you are interested in having a connector or know anyone interested, please contact us.



James Tin Yau KWOK
(PhD 1998)
Professor, The Hong Kong University of Science and Technology

[Read more](#)



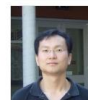
Paul LEUNG
(MPhil 1998)
Head of Financial Markets Operations, Standard Chartered Bank

[Read more](#)



Nikos MAMMOULIS
(PhD 2000)
Associate Professor, University of Ioannina, Greece

[Read more](#)



Nicholas Tsz-Wo SZE
(MPhil 2001)
Researcher, Hortonworks

[Read more](#)



Nufei TAO
(PhD 2002)
Professor, Chinese University of Hong Kong

[Read more](#)



Jiangchuan LIU
(PhD 2003)
Professor, Simon Fraser University, Canada

[Read more](#)



Baihua ZHENG
(PhD 2003)
Associate Professor, Singapore Management University

[Read more](#)



Xiaoping CHAI
(MPhil 2005)
Sr Architect, Team Lead, Walmart Labs, USA

[Read more](#)



Jessie Jie YIN
(PhD 2008)
Senior Lecturer, The University of Sydney, Australia

[Read more](#)



Jianling PAN
(PhD 2007)
Executive Director in Quantitative Research China Center, JPMorgan Chase & Co., Hong Kong

[Read more](#)



Dou SHEN
(PhD 2007)
Executive Vice President, Baidu Inc, Beijing, China

[Read more](#)



Huamen Qiu
(PhD 2007)
Executive Director in Quantitative Research China Center, JPMorgan Chase & Co., Hong Kong

[Read more](#)



Yongxin Tong 童焄昕

Yongxin Tong is a Professor in the [State Key Laboratory of Software Development Environment \(SKLSDOE\)](#) of the [School of Computer Science and Engineering](#) at [Beihang University \(BUAA\)](#). He received a Ph.D. degree in Computing Science and Engineering from the [Department of Computer Science and Engineering, The Hong Kong University of Science and Technology \(HKUST\)](#), under [Prof. Lei Chen](#)'s supervision. He also received a Master degree in Software Engineering at [Beihang University](#) and a Double Bachelor degree in Economics from [China Centre for Economic Research \(CCEER\)](#) at [Peking University](#).



CHU Xiaowen (褚晓文)

Professor, Acting Head

Data Science and Analytics Hub

Information Hub

The Hong Kong University of Science and Technology (Guangzhou)

Email: xwchu@ust.hk

The HKUST VISLab is dedicated to advancing the frontiers of visual analytics, driven by a passion for transformative research with far-reaching impact.

HOME PEOPLE PUBLICATIONS AWARDS PHOTOS CONTACT

HIGHLIGHT
We are looking for Postdoc, PhD, MPhil, and Visiting Interns for potential PhD, MPhil, MSc, and UROP students

OUR PROJECTS
Explorable AI Urban Computing/Smart City E-Learning Future/IST FitTech Multimodal Analysis AUVIS AUVIS

RECENT NEWS
2023-4| Our team attended CHI 2023 in

12 university professors from this group (4 this year, UC Davis, Minnesota x 2, Texas A&M)

Research Funding in the Past Five Years

	#Grants	HK\$
RGC-GRF	119	96.6M
RGC/UGC Others	6	20M
ITF/External Industry	54	129M
Contract research	103	82.5M
International funding bodies	54	26.5M
Internal	256	39M
		393.6M

Large-scale, collaborative research:

- Systems (SY): One RGC - Theme-based Research Scheme grant (iSING Lab, 2020), and one RIF - Research Impact Fund (2021).
- Data Science (DS): one CRF - RGC - Collaborative Research Fund (2019-2022) and has one ongoing RIF project (2020).
- Artificial Intelligence (AI): one RIF project (2022) and one NSFC-RGC grant (2021).

* New strategies for more large-scale projects

(August 2023)

Joint Research Labs with Companies



What's Important to CSE

- 1) Research
 - RAE (next round 2026) and impact stories
 - Funding, especially RGC large grants
 - New research areas
 - Collaboration – (i) inside CSE/HKUST, (ii) internationally, (iii) with industry
- 2) Teaching
 - New UG and PG programs: BEng in AI and MSc in AI
 - Enhanced TPG programs: more students, more industry collaboration, and a new cybersecurity concentration
 - Student quality
 - Student satisfaction
- 3) Faculty
 - Quality, size, and diversity, in all areas with priority in AI and cybersecurity
 - More teaching-track faculty and industry lecturers