

HONG KANG

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EDUCATION

The Chinese University of Hong Kong, Shenzhen (CUHK-Shenzhen) Sep. 2021- Nov. 2023

Master of Philosophy

- **Major:** Computer and Information Engineering
- **Overall GPA:** 3.786/4.000

University of Glasgow

Sep. 2017-Jul. 2021

Bachelor of Engineering with Honors of the First Class

- **Major:** Electronics and Electrical Engineering
- **Overall GPA:** 17.31/22.00

University of Electronic Science and Technology of China (UESTC)

Sep. 2017-Jul. 2021

Bachelor of Engineering

- **Major:** Electronic Information Engineering, Department: Glasgow College
- **Overall GPA:** 3.53/4.00, **Junior-Senior GPA:** 3.76/4.00
- **Honors:** Outstanding Student Leader Scholarship, UESTC, 2020
Model Student Scholarship, UESTC, 2019, 2020

ACADEMIC PAPER

- Sun Jinghan, Long Hou-Wan, **Kang Hong**, Fang Zhixuan, Abdulmotaleb El Saddik and Cai Wei, "Contract Design for SCaaS with Multi-dimensional Private Information", *IEEE Transactions on Computational Social Systems*. (under review)
- Zhao Rong, Liu Yunshu, **Kang Hong**, and Cai Wei, "A Transaction Fee Mechanism for Resource Allocation in Resource-constrained Blockchain-based IoT Systems", *IEEE Transactions on Systems, Man and Cybernetics: Systems*. (under review)
- **Kang Hong**, Li Minghao, Lin Lehao, Fan Sizheng, and Cai Wei, "Bridging Incentives and Dependencies: An Iterative Combinatorial Auction Approach to Dependency-Aware Offloading in Mobile Edge Computing", *IEEE Transactions on Mobile Computing*, 2024.
- Lin Lehao*, **Kang Hong***, Sun Xinyao, and Cai Wei, "SemNFT: A Semantically Enhanced Decentralized Middleware for Digital Asset Immortality", In *32nd ACM International Conference on Multimedia (MM'24)*, Melbourne, Australia, October 28-November 1, 2024.
- Zhao Rong, **Kang Hong**, Zhang Qiyue, Fan Sizheng, and Cai Wei, "LocPoS: A Location-based Proof-of-Stake Mechanism for Industrial Digital Twins", *IEEE Transactions on Systems, Man and Cybernetics: Systems* (under review)
- **Kang Hong**, Li Minghao, Fan Sizheng, and Cai Wei, "Combinatorial Auction-enabled Dependency-Aware Offloading Strategy in Mobile Edge Computing", *IEEE Wireless Communications and Networking Conference (WCNC 2023)*.
- **Kang Hong**, Zhang Zaixin, Dong Junyi, Xu Hao, Valente Klaine Paulo, and Zhang Lei "Blockchain-enabled COVID-19 Contact Tracing Solutions", *Wireless Blockchain: Principles, Technologies and Applications*, Wiley-IEEE Press.
- **Kang Hong***, Zhang Zaixin*, Dong Junyi, Ji Yinghao, Xu Hao, and Zhang Lei. "BeepTrace for COVID-19 Pandemic: a Demo.", *3rd Conference on Blockchain Research & Applications for Innovative Networks and Services (BRAINS 2021)*

RESEARCH EXPERIENCE

Building a decentralized framework addressing NFT storage and verification challenges, CUHK-Shenzhen

May. 2023 – Sep. 2023

Instructor: Prof. Wei Cai, The Chinese University of Hong Kong, Shenzhen

- Investigated the NFT market and identified storage inefficiencies, with only 9% of NFTs stored

on-chain and the rest risk asset linkage losses on private servers or IPFS;

- Proposed a decentralized NFT storage and verification framework leveraging deep learning (autoencoders) and blockchain, aiming for efficient storage and reduced dependency on IPFS/private servers;
- Designed and implemented the framework to be compatible with existing NFT standards like ERC721, ensuring seamless integration into the current ecosystem;
- Validated the proposed framework through performance evaluations, showcasing its superiority in terms of reconstruction, storage costs, and integration capabilities.

Mechanism Design for Computation Partitioning and Offloading in Mobile Edge Computing (MEC) (Supported by National Natural Science Foundation of China) Feb. 2022 – Jun. 2023

Instructor: Prof. Wei Cai, The Chinese University of Hong Kong, Shenzhen

- Recognized the absence of an incentive mechanism in current offloading methods for dependent tasks in MEC and highlighted the potential of integrating auction theory as a solution;
- Proposed a novel multi-stage iterative combinatorial double auction (MICDA) mechanism. This integrates dependency-aware task offloading with combinatorial auction dynamics under the Cloud-Edge-End cooperative computing paradigm;
- The MICDA mechanism, underpinned by a concurrent provider and consumer (CPC) model, employs a two-stage approach:
 - Stage 1: Utilizes a winner determination algorithm, informed by market clearing bid densities, to determine auction winners and compute payments/revenues for mobile devices and service providers, respectively;
 - Stage 2: Applies linear relaxation with the ellipsoid method, employing a hypergraph-based proxy cost model for efficient demand oracle queries. This ensures polynomial time complexity for the winner determination problem. Post-processing utilizes the Lavi-Swamy decomposition technique and adopt the Vickrey–Clarke–Groves (VCG) payment rule to achieve a truthful-in-expectation mechanism;
- Demonstrated through theoretical analysis that the MICDA mechanism satisfies essential economic properties like truthfulness, individual rationality, weak budget balance, and polynomial time complexity;
- Experimental evaluations indicate MICDA's superiority against non-dependency-aware offloading strategies and its competitive edge over other dependency-aware algorithms in performance metrics.

Decentralized Application Development for COVID-19 contact tracing Sep. 2020-Jun. 2021

Instructor: Prof. Lei Zhang, University of Glasgow

- Develop a mobile APP for Covid-19 cases tracing while ensuring the users' privacy;
- Set up the Ethereum environment on several AWS distributed nodes and connect them to establish the private chain;
- Applied solidity to assist the users to upload and load Hash encrypted data information;
- Applied JAVA language and Ethereum Web3J API to realize the interaction process between users and blockchain remotely through Http port;
- Emerged block chain with the APP to complete the function of BeepTrace and verified the performance and handling capacity of the blockchain;
- Interviewed and broadcast by BBC.

Deep Density-based clustering for images, UESTC

September 2020-May 2021

Instructor: Prof. Yazhou Ren, UESTC

- A two-stage deep density clustering model is proposed to solve three problems: feature drift problem in feature extraction of large image, high computational complexity of density calculation, and robustness of clustering performance;
- Two deep feature extraction methods are proposed for images with different sizes: generative model (autoencoder) for small image and contrastive model (MoCo v2) for large image;
- Reproducing and improving density-based clustering algorithm (DenMune) by a cluster merge process, enhancing the robustness and accuracy of the algorithm;
- Without supervision and the number of classes in advance, the accuracy of the model in MNIST-test exceeds 99.6%, 98.4%, 86.1% for USPS and STL-10 respectively.

Development of a Smart Contract for Route Recommendation Service on Ethereum by Solidity

Summer Research of University of Glasgow

Jun. 2020-Aug. 2020

Instructor: Prof. Lei Zhang, University of Glasgow

- Applied blockchains to write a smart contract for route recommendation Ethereum by Solidity;
- Established a private Ethereum chain locally (Ganache+Remix IDE) to verify the feasibility of the smart contract;
- Verified the smart contract could recommend the most time-efficient route for users to travel, meanwhile, it solves the problems of privacy leakage and data reliability of traditional third-party mapping application.

Water Segmentation of Remote Sensing Image Based on Machine Learning, RADI (Chinese Academy of Sciences)

Aug. 2019-Sep. 2019

Instructor: Dr. Weijia Cao, Assistant Research Fellow from Chinese Academy of Sciences

- This project is about the segmentation of the water body extraction from remote sensing image, one of China's 13th Five-Year Plan Civil Space Pre-Research Projects;
- Studied the knowledge of image processing, including color models, image formats, image morphology, remote sensing image with shapefile, projection, etc.;
- Conducted experiments on image processing, such as image denoising (smoothing filter), image enhancement (gamma transformation, Laplace transformation), and image segmentation (threshold segmentation) by Matlab;
- Designed two feasible schemes by respectively using supervised learning (SVM) and unsupervised learning (K-Means) methods to implement the water body extraction from remote sensing image based on Matlab, and completed the project report.

Smart Contract Development for Toshiba Europe

Sep. 2020

- Developed a smart contract in Solidity to interact data from sensors and scanners with the blockchain platform;
- Designed the structure of data storage within the contract to make the data in the block chain be accessed more clearly and efficiently;
- Realized the conversion between the timestamp and the regular time of Ethereum to make recorded time could be read directly.

Academic Services

- **Reviewer:** IEEE Transactions on Cloud Computing (TCC).
- **Reviewer:** IEEE Transactions on Mobile Computing (TMC).
- **Reviewer:** IEEE International Conference on Communications (ICC 2022, 2023)
- **Reviewer** ACM International Symposium on Blockchain and Secure Critical Infrastructure (BSCI 2022)

EXTRACURRICULAR ACTIVITIES

Trainee, University of California-Los Angeles, Extension

Feb. 2019-Mar. 2019

- Participated in the intensive English Communication Program of UCLA extension for ESL courses training.

Monitor, Class Committee, UESTC

Sep. 2018-Present

- Assisted counselors to coordinate the communication between students and the college and implement all tasks, leading the class committee to carry out class activities, regularly organizing class meetings and class buildings;
- Won the honors of 2017-2018 Characteristic Class and 2018-2019 Excellent Class.

Member, Outreach Department, Student Union, Glasgow College, UESTC

Aug. 2017-Aug. 2018

- Participated in planning and organizing the Chinese and Foreign Leaders Forum of the UESTC, receiving attendants and arranging the venue of the forum.

ADDITIONAL INFORMATION

- **Language Skills:** Chinese Mandarin (Native), English (IELTS: 7.0)
- **Computer Skills:** Python, MATLAB, Solidity, Latex, Java, etc.