

Chung Chan

Curriculum Vitæ

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*Education is not the filling of a pail,
but the lighting of a fire.*

— William Butler Yeats

Education

Sep 2010 **PhD**, *Massachusetts Institute of Technology (MIT), Electrical Engineering and Computer Science (EECS)*, Cambridge, MA, USA

Jun 2005 **MEng**, *MIT, EECS*, Cambridge, MA, USA

Jun 2004 **BSc**, *MIT, EECS*, Cambridge, MA, USA

Research Interests

- areas
- AI-assisted Collaborative E-Learning
 - Combinatorial Optimizations
 - Information Theory
 - Machine Learning
 - Security and Network Coding

summary Chung Chan's research interest is to develop general information measures and flow models from network information theory that are applicable to practical problems. His research topics include the development of network link models using matroids, the derivation of theoretical limits and optimal strategies for the problems of multiterminal source coding, data exchange, and secret generation. His most significant work is the extension of Shannon's mutual information to the multivariate case, and the discovery of its connections to various problems in information theory and machine learning.

Work Experience

- Jun 2025 – **Teaching Fellow**, *Department of Computer Science (CS Dept.), City University of Hong Kong (CityU)*
- Jan 2018 – Jun 2025 **Assistant professor**, *Department of Computer Science (CS Dept.), City University of Hong Kong (CityU)*
- Jan 2013 – Dec 2017 **Research assistant professor**, *Institute of Network Coding (INC), The Chinese University of Hong Kong (CUHK)*
- Sep 2010 – Dec 2012 **Postdoctoral fellow**, *INC, CUHK*
- Dec 2009 – Jun 2010 **Research assistant**, *Shun Hing Institute of Advanced Engineering, CUHK*
- Jun 2004 – Jan 2005 **Internship**, *Qualcomm Inc., San Diego, CA, USA*
Project: Single antenna interference cancellation in asynchronous GSM/GPRS networks.
- Jun 2003 – Aug 2003 **Internship**, *Qualcomm Inc., San Diego, CA, USA*
Project: GPS time-tracking loop.

Professional Services

Professional Appointments/Memberships

Jan 2019 – Dec 2022 **Chairman**, *IEEE Information Theory Society, Hong Kong Chapter*

Apr 2016 – Dec 2018 **Secretary**, *IEEE Information Theory Society, Hong Kong Chapter*

2015 – **Member**, *IEEE*

Conference Committees

- 2024 **Tutorial Co-Chair**, *Information Theory Workshop (ITW 2024)*, Tutorial, IEEE
- 2023 **Session Chair**, *Croucher Summer School in Information Theory (CSCIT 2023)*, Morning Session on Aug 18, Croucher Foundation
- 2022 **Track Co-Chair**, *TENCON 2022*, Information sciences track, Technical Program Committee, IEEE
- 2022 **Organizer**, *Huawei – IEEE ITSoc HK Joint Workshop on Semantic Information Theory 2022*, Organizing Committee, Huawei, CityU CS Depart., and IEEE Information Theory Society Hong Kong Chapter
- 2021 **Session Chair**, *International Symposium on Information Theory (ISIT 2021)*, D3-T3-S1: Neural Estimation, IEEE
- 2020 **TPC Member**, *International Symposium on Information Theory (ISIT 2020)*, Technical Program Committee, IEEE
- 2020 **TPC Member**, *The 18th International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt)*, Technical Program Committee, IEEE
- 2019 **TPC Member**, *The 17th International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt)*, Technical Program Committee, IEEE
- 2018 **Session Chair**, *International Symposium on Information Theory (ISIT 2018)*, D3-T3-S1: Neural Estimation, IEEE
- 2018 **Session Chair**, *2018 Symposium on Big Data Challenges for Predictive Modeling of Complex Systems*, Fr-PM-1-5: Key Agreement, IEEE
- 2016 **Session Chair**, *International Symposium on Information Theory (ISIT 2016)*, Mo-PM-1-3: Coded Caching, IEEE

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- Campus Service/Committee at CityU**
- Aug 2025 – **College Digital Learning Lead of CS, College of Computing**
Assist in mobilising digital learning across the college.
- Aug 2025 – **Departmental Digital Learning Lead of CS, CS Depart.**
Assist in mobilising digital learning across the department.
- Sept 2024 –Dec 2025 **College Representative, Academic Conduct Committee**
Representing College of Computing to serve on the central pool of academic staff of ACC.
- July 2019 – **Deputy Admissions Tutor for BScCS Program, CS Depart.**
Assist in conducting admission interviews for JUPAS and non-JUPAS applicants.
- Oct 2018 – **Member of MSCS Programme Committee, CS Depart.**
Provide advice on course selection for the data science stream students. Review and address student feedback on the graduate courses.
- June 2019 – **Departmental Administrator for Research Information Management, CS Depart.**
Communicated with faculty members and supporting units to manage new research information, including validating and approving new grant records and research output.

Awards/Recognitions

- 2025/26 **Finalist, Teaching Excellence Award, CityU**
Finalist of the CityUHK Teaching Excellence Award.
- 2022/23 Sem. B **Outstanding Teaching Performance, Office of the Provost and Deputy President, CityU**
One of the top 5% of teachers according to the Teaching and Learning Questionnaire scores.
- 2022 **Department Nominee for Teaching Excellence Award, CS, CityU**
- 2021 **Outstanding Teaching Award, College of Engineering, CityU**
- 2007 **Frederick C. Hennie III Teaching Award for Teaching Excellence, MIT, Cambridge, MA**
For amazing work as a TA in 6.441, information theory, where all 15 students who filled out evaluations gave him a 7/7.
- 2007 **Cisco Graduate Fellowship in Electrical Engineering and Computer Science, MIT, Cambridge, MA**

Grants

Teaching Grants and Funded Educational Innovation Projects

- 2026 – 2027 **CityUHK Teaching Development Grant (TDG25B047), Scaling the Socratic Method: Automating Pedagogical Feedback in Large-Scale Programming Courses**, PI, Project No. 6000990, HK\$239,010
Ethics approval HU-STA-00002367.
- 2025 – 2028 **UGC TDLEG-IICA Project, IDEAL-Gen.AI Platform Enhancement: Integrating Global Collaboration, Resource Sharing, Customisation and User Feedback Features**, CityUHK Representative and Project Partner, Project No. 6000942, HK\$200,000
Lingnan University Lead Institution.
- 2025 – 2026 **Preparatory Grant for Simultaneous Implementation of Large Team-Based Learning Classes, City University of Hong Kong, DIVE for Team-Based Learning**, PI, Project No. 6953002, HK\$999,665
Successfully completed.
- 2025 – **Huawei Donations for Research Projects, Socratic AI: AI-Enhanced T&L with Hints but Not Answers**, PI, Project No. 9220151, HK\$330,000
- 2021 – 2023 **UGC Strategy Grants for Generic and Targeted Virtual Teaching and Learning for Self-Access Learning, DIVE Environment for DEC**, PI, HK\$1,180,400
- 2021 – 2023 **UGC Strategy Grants for Generic and Targeted Virtual Teaching and Learning for Self-Access Learning, Institute-Level Deployment of E-Quiz System for Improving Online Assessments**, co-PI, HK\$1,120,600

Research Grants

- 2022 – 2023 **ITFC Seed Projects**, *Development of Massive Data Analytics for Rumor Source Detection and Faked News Invalidation against Infodemic*, PI (transferred), effective on July 25, 2022, HK\$1,399,550
- 2018 – 2021 **Early Career Scheme**, *The effort to Discuss: Theoretical Limits and Practical Discussion Schemes*, PI, effective on June 30, 2018, HK\$750,000
- 2015 – 2018 **General Research Fund**, *Matroidal Network Link Model*, PI, effect on June 30, 2014, HK\$500,000
- 2015 – 2016 **Micro-Module Courseware Development Grant, CUHK**, *HTML Slides*, PI, HK\$100,000

Major Grant Proposals

- 2026 **UGC Fund for Innovative Technology-in-Education (FITE)**, *DIVE into Agentic Coding*, PI
Shortlisted institutional proposal.

Research staff supervision

- Staff at CityU **Research Fellow:** Ali AL-BASHABSHEH
Postdoc Fellow: ZHOU Qiaoqiao
Research Assistants: HANG Ching Nam, ZHAO Chao, WANG Zimeng, TANG Ruoqin, ZHU Xiaoyu, LIANG Qihang, YE Chunxiao, TAM Da Sun Handason, HUANG Hing Pang Thomas, WEI Yihuan
Technical Assistants: TSOI Ka Ying, TAUMERGENOV Nurdaulet, HU Jinhe, TAN Ananda Indra, THOSATRIA Alvin, Ms WU Shanshan, XU Yuan, LIU Zihan, ALDEKEN Nur, YERMEKOV Beket, LI Chun Kit Kenton, KOZHIN Assan, SALTER Glenn, LIM Michael, LI Jiaqian, GONENC Asaf Sergen, SHEN Zhenda, BEHARDI Patrick Yosafat, ZHENIS Alibi
- Staff at CUHK **Research Assistant:** NI Ding

Publications

*Representative work. †First author. ‡Corresponding author. JIF: Journal Impact Factor.
#Recommended rank.

Journal Papers

- [1] Z. Wang, C. Zhao, Q. Zhou, C. W. Tan, and **C. Chan**[‡], “Infodemic source detection with information flow: Foundations and scalable computation,” *Entropy*, vol. 27, no. 9, 2025, ISSN: 1099-4300. DOI: 10.3390/e27090936
- [2] C. Zhao, A. Al-Bashabsheh, and **C. Chan**[‡], “Game theoretic clustering for finding strong communities,” *Entropy*, vol. 26, no. 3, p. 268, 2024
- [3] P. K. Vippathalla, **C. Chan**[‡], N. Kashyap, and Q. Zhou, “Secret key agreement via secure omniscience,” *IEEE Transactions on Information Theory*, pp. 1–1, 2023, accepted in Oct 2023, preprint available at arXiv:2112.00394. DOI: 10.1109/TIT.2023.3327151
- [4]* X. Wang, A. Al-Bashabsheh, C. Zhao, and **C. Chan**[‡], “Smoothed noise contrastive mutual information neural estimation,” *Journal of the Franklin Institute*, Sep. 2023. DOI: 10.1016/j.jfranklin.2023.08.047
- [5] **C. Chan**[‡], A. Al-Bashabsheh, and Q. Zhou, “Agglomerative info-clustering: Maximizing normalized total correlation,” *IEEE Transactions on Information Theory*, vol. 67, no. 3, pp. 2001–2011, Mar. 2021. DOI: 10.1109/tit.2020.3040492
- [6] Q. Zhou and **C. Chan**[‡], “Secret key generation for minimally connected hypergraphical sources,” *IEEE Transactions on Information Theory*, vol. 66, no. 7, pp. 4226–4244, Jul. 2020. DOI: 10.1109/tit.2020.2971215
- [7]* **C. Chan**[‡], M. Mukherjee, N. Kashyap, and Q. Zhou, “Upper bounds via lamination on the constrained secrecy capacity of hypergraphical sources,” *IEEE Transactions on Information Theory*, vol. 65, no. 8, pp. 5080–5093, Aug. 2019. DOI: 10.1109/tit.2019.2897129
- [8] **C. Chan**[‡], M. Mukherjee, N. Kashyap, and Q. Zhou, “On the optimality of secret key agreement via omniscience,” *IEEE Transactions on Information Theory*, vol. 64, no. 4, pp. 2371–2389, Apr. 2018. DOI: 10.1109/tit.2018.2802546
- [9] N. Ding, **C. Chan**, Q. Zhou, R. A. Kennedy, and P. Sadeghi, “Determining optimal rates for communication for omniscience,” *IEEE Transactions on Information Theory*, vol. 64, no. 3, pp. 1919–1944, Mar. 2018. DOI: 10.1109/tit.2017.2761390
- [10] **C. Chan**[‡], A. Al-Bashabsheh, and Q. Zhou, “Change of multivariate mutual information: From local to global,” *IEEE Transactions on Information Theory*, vol. 64, no. 1, pp. 57–76, Jan. 2018. DOI: 10.1109/tit.2017.2749372

- [11] **C. Chan**[†], “Compressed secret key agreement: maximizing multivariate mutual information per bit,” *Entropy*, vol. 19, no. 10, p. 545, Oct. 2017. DOI: 10.3390/e19100545
- [12]* **C. Chan**[†], A. Al-Bashabsheh, Q. Zhou, T. Kaced, and T. Liu, “Info-clustering: A mathematical theory for data clustering,” *IEEE Transactions on Molecular, Biological and Multi-Scale Communications*, vol. 2, no. 1, pp. 64–91, Jun. 2016. DOI: 10.1109/tmbmc.2016.2630054
- [13] **C. Chan**[†], A. Al-Bashabsheh, Q. Zhou, N. Ding, T. Liu, and A. Sprintson, “Successive omniscience,” *IEEE Transactions on Information Theory*, vol. 62, no. 6, pp. 3270–3289, Jun. 2016. DOI: 10.1109/tit.2016.2555923
- [14] F. Wang, O. A. Dobre, **C. Chan**, and J. Zhang, “Fold-based kolmogorov–smirnov modulation classifier,” *IEEE Signal Processing Letters*, vol. 23, no. 7, pp. 1003–1007, Jul. 2016. DOI: 10.1109/lsp.2016.2572666
- [15]* **C. Chan**[†], A. Al-Bashabsheh, J. B. Ebrahimi, T. Kaced, and T. Liu, “Multivariate mutual information inspired by secret-key agreement,” *Proceedings of the IEEE*, vol. 103, no. 10, pp. 1883–1913, Oct. 2015. DOI: 10.1109/jproc.2015.2458316
- [16] **C. Chan**[†] and L. Zheng, “Multiterminal secret key agreement,” *IEEE Transactions on Information Theory*, vol. 60, no. 6, pp. 3379–3412, Jun. 2014. DOI: 10.1109/tit.2014.2313566
- [17] Q. T. Sun, S.-Y. R. Li, and **C. Chan**, “Matroidal characterization of optimal linear network codes over cyclic networks,” *IEEE Communications Letters*, vol. 17, no. 10, pp. 1992–1995, Oct. 2013. DOI: 10.1109/lcomm.2013.13.131558

Conference papers

- [18] **C. Chan**[†], B. Suvernev, C. Zhao, and Z. Wang, "CE-Quiz: AI-assisted debugging in exams," in *INTED 2026: 20th International Technology, Education and Development Conference*, IATED, 2026. DOI: 10.21125/inted.2026.1724
- [19] B. Suvernev, C. Zhao, Z. Wang, and **C. Chan**, "SocraticAI: On training models that make students think," in *Proceedings of EDULEARN 2026: 18th International Conference on Education and New Learning Technologies*, IATED, 2026. DOI: 10.21125/edulearn.2026.1345
- [20] **C. Chan**[†], B. Suvernev, Z. Wang, Q. Liang, and C. Zhao, "Making GenAI socratic for computational thinking," in *2025 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE)*, IEEE, 2025. DOI: 10.1109/TALE66047.2025.11346691
- [21] C. Zhao, A. Al-Bashabsheh, and **C. Chan**[‡], "Detecting informationally-dense subsets," in *2024 IEEE Information Theory Workshop (ITW)*, 2024, pp. 771–776. DOI: 10.1109/ITW61385.2024.10806913
- [22] C. Zhao, Z. Wang, Q. Zhou, C. W. Tan, and **C. Chan**[‡], "Infodemic source detection: Enhanced formulations with information flow," in *2024 IEEE International Symposium on Information Theory (ISIT)*, IEEE, 2024, pp. 3291–3296
- [23] **C. Chan**[†], C. Zhao, W. T. Chau, Y. Zhou, Q. Liang, and M. Lim, "E-quiz: Empowering educators with a self-contained and programmable online exam system," in *2023 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE)*, 2023, pp. 1–8. DOI: 10.1109/TALE56641.2023.10398402
- [24] **C. Chan**[†], A. Kozhin, Q. Liang, G. Salter, R. Tang, C. Ye, and C. Zhao, "DIVE: Make online learning diversified, interactive, versatile, and engaging," in *2022 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE)*, IEEE, Dec. 2022. DOI: 10.1109/tale54877.2022.00085
- [25] Q. Liang and **C. Chan**[‡], "Improved adversarial robustness by hardened prediction," in *2022 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2022. DOI: 10.1109/isit50566.2022.9834822
- [26] P. K. Vippathalla, **C. Chan**[‡], N. Kashyap, and Q. Zhou, "Positivity of secret key capacity for hypergraphical sources with a linear wiretapper," in *2022 IEEE Information Theory Workshop (ITW)*, IEEE, Nov. 2022. DOI: 10.1109/itw54588.2022.9965830
- [27] X. Wang, A. Al-Bashabsheh, C. Zhao, and **C. Chan**[‡], "Smoothed InfoNCE: Breaking the log N curse without overshooting," in *2022 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2022. DOI: 10.1109/isit50566.2022.9834751

- [28] X. Wang, A. Al-Bashabsheh, C. Zhao, and **C. Chan[†]**, "Adaptive label smoothing for classifier-based mutual information neural estimation," in *2021 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jul. 2021. DOI: 10.1109/isit45174.2021.9518097
- [29] P. K. Vippathalla, **C. Chan[†]**, N. Kashyap, and Q. Zhou, "Secret key agreement and secure omniscience of tree-PIN source with linear wiretapper," in *2021 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jul. 2021. DOI: 10.1109/isit45174.2021.9518075
- [30] Q. Zhou, **C. Chan[†]**, and R. W. Yeung, "On the discussion rate region for the PIN model," in *2020 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2020. DOI: 10.1109/isit44484.2020.9174268
- [31] **C. Chan[†]**, N. Kashyap, P. K. Vippathalla, and Q. Zhou, "Secure information exchange for omniscience," in *2020 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2020. DOI: 10.1109/isit44484.2020.9174231
- [32] **C. Chan[†]**, A. Al-Bashabsheh, D. S. H. Tam, and C. Zhao, "Finding better web communities in digraphs via max-flow min-cut," in *2019 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jul. 2019. DOI: 10.1109/isit.2019.8849221
- [33] **C. Chan[†]**, N. Kashyap, P. K. Vippathalla, and Q. Zhou, "One-shot perfect secret key agreement for finite linear sources," in *2019 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jul. 2019. DOI: 10.1109/isit.2019.8849668
- [34] **C. Chan[†]**, A. Al-Bashabsheh, and Q. Zhou, "Agglomerative info-clustering," in *2018 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2018. DOI: 10.1109/isit.2018.8437930
- [35] **C. Chan[†]**, M. Mukherjee, N. Kashyap, and Q. Zhou, "Multiterminal secret key agreement at asymptotically zero discussion rate," in *2018 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2018. DOI: 10.1109/isit.2018.8437913
- [36] Q. Zhou and **C. Chan[†]**, "Secrecy capacity under limited discussion rate for minimally connected hypergraphical sources," in *2018 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2018. DOI: 10.1109/isit.2018.8437565
- [37] **C. Chan[†]**, M. Mukherjee, N. Kashyap, and Q. Zhou, "Secret key agreement under discussion rate constraints," in *2017 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jun. 2017. DOI: 10.1109/isit.2017.8006783

- [38] **C. Chan**[†], A. Al-Bashabsheh, and Q. Zhou, "Info-clustering: An efficient algorithm by network information flow," in *2017 Information Theory and Applications Workshop (ITA)*, IEEE, Feb. 2017. DOI: 10.1109/ita.2017.8023445
- [39] N. Ding, **C. Chan**, Q. Zhou, R. A. Kennedy, and P. Sadeghi, "A faster algorithm for asymptotic communication for omniscience," in *2016 IEEE Globecom Workshops (GC Wkshps)*, IEEE, Dec. 2016. DOI: 10.1109/globcomw.2016.7848809
- [40] **C. Chan**[†], A. Al-Bashabsheh, Q. Zhou, and T. Liu, "Duality between feature selection and data clustering," in *2016 54th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, IEEE, Sep. 2016. DOI: 10.1109/allerton.2016.7852222
- [41] **C. Chan**[†], M. Mukherjee, N. Kashyap, and Q. Zhou, "When is omniscience a rate-optimal strategy for achieving secret key capacity?" In *2016 IEEE Information Theory Workshop (ITW)*, IEEE, Sep. 2016. DOI: 10.1109/itw.2016.7606855
- [42] M. Mukherjee, **C. Chan**[†], N. Kashyap, and Q. Zhou, "Bounds on the communication rate needed to achieve SK capacity in the hypergraphical source model," in *2016 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jul. 2016. DOI: 10.1109/isit.2016.7541750
- [43] N. Ding, **C. Chan**, Q. Zhou, R. A. Kennedy, and P. Sadeghi, "Fairness in communication for omniscience," in *2016 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jul. 2016. DOI: 10.1109/isit.2016.7541712
- [44] N. Ding, **C. Chan**, T. Liu, R. A. Kennedy, and P. Sadeghi, "A game-theoretic perspective on communication for omniscience," in *2016 Australian Communications Theory Workshop (AusCTW)*, IEEE, Jan. 2016. DOI: 10.1109/ausctw.2016.7433656
- [45] **C. Chan**[†], A. Al-Bashabsheh, and Q. Zhou, "Incremental and decremental secret key agreement," in *2016 IEEE International Symposium on Information Theory (ISIT)*, IEEE, Jul. 2016. DOI: 10.1109/isit.2016.7541752
- [46] **C. Chan**[†] and T. Liu, "Clustering by multivariate mutual information under chow-liu tree approximation," in *2015 53rd Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, IEEE, Sep. 2015. DOI: 10.1109/allerton.2015.7447116
- [47] **C. Chan**[†], A. Al-Bashabsheh, J. B. Ebrahimi, T. Kaced, S. Kadhe, T. Liu, A. Sprintson, M. Yan, and Q. Zhou, "Successive omniscience," in *2015 International Symposium on Network Coding (NetCod)*, IEEE, Jun. 2015. DOI: 10.1109/netcod.2015.7176782

- [48] P. H. Che, S. Kadhe, M. Bakshi, **C. Chan**, S. Jaggi, and A. Sprintson, "Reliable, deniable and hidable communication: A quick survey," in *2014 IEEE Information Theory Workshop (ITW 2014)*, IEEE, Nov. 2014. DOI: 10.1109/itw.2014.6970826
- [49] P. H. Che, M. Bakshi, **C. Chan**, and S. Jaggi, "Reliable deniable communication with channel uncertainty," in *2014 IEEE Information Theory Workshop (ITW 2014)*, IEEE, Nov. 2014, pp. 30–34. DOI: 10.1109/ITW.2014.6970786
- [50] P. H. Che, M. Bakshi, **C. Chan**, and S. Jaggi, "Reliable, deniable and hidable communication," in *2014 Information Theory and Applications Workshop (ITA)*, IEEE, Feb. 2014. DOI: 10.1109/ita.2014.6804271
- [51] **C. Chan**[†], K. W. Shum, and Q. T. Sun, "Combinatorial flow over cyclic linear networks," in *2013 IEEE Information Theory Workshop (ITW)*, IEEE, Sep. 2013. DOI: 10.1109/itw.2013.6691270
- [52] F. Liu, X. Wang, **C. Chan**[†], and Y. J. Zhang, "An achievable degree of freedom for multi-hop wireless networks under layered TDD constraint," in *2013 8th International Conference on Communications and Networking in China (CHINACOM)*, IEEE, Aug. 2013. DOI: 10.1109/chinacom.2013.6694595
- [53] **C. Chan**[†], "Cyclic linking network," in *2013 IEEE International Symposium on Information Theory*, IEEE, Jul. 2013. DOI: 10.1109/isit.2013.6620334
- [54] C. Meng, H. Seferoglu, A. Markopoulou, K. W. Shum, and **C. Chan**, "Multicast packing for coding across multiple unicasts," in *2013 International Symposium on Network Coding (NetCod)*, IEEE, Jun. 2013. DOI: 10.1109/netcod.2013.6570820
- [55] **C. Chan**[†], "Agreement of a restricted secret key," in *2012 IEEE International Symposium on Information Theory Proceedings*, IEEE, Jul. 2012. DOI: 10.1109/isit.2012.6283585
- [56] F. Wang and **C. Chan**, "Variational-distance-based modulation classifier," in *2012 IEEE International Conference on Communications (ICC)*, IEEE, Jun. 2012. DOI: 10.1109/icc.2012.6364879
- [57] **C. Chan**[†], "From secret key agreement to matroidal undirected network," in *2012 Information Theory and Applications Workshop*, IEEE, Feb. 2012. DOI: 10.1109/ita.2012.6181788
- [58] **C. Chan**[†], "Matroidal undirected network," in *2012 IEEE International Symposium on Information Theory Proceedings*, IEEE, Jul. 2012. DOI: 10.1109/isit.2012.6283513
- [59] **C. Chan**[†], "Universal secure network coding by non-linear secret key agreement," in *2012 International Symposium on Network Coding (NetCod)*, IEEE, Jun. 2012. DOI: 10.1109/netcod.2012.6261891

[60] **C. Chan[†]**, “Multiterminal secure source coding for a common secret source,” in *2011 49th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, IEEE, Sep. 2011. DOI: 10.1109/allerton.2011.6120167

[61] **C. Chan[†]**, “Delay of linear perfect secret key agreement,” in *2011 49th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, IEEE, Sep. 2011. DOI: 10.1109/allerton.2011.6120294

[62] **C. Chan[†]**, “The hidden flow of information,” in *2011 IEEE International Symposium on Information Theory Proceedings*, IEEE, Jul. 2011. DOI: 10.1109/isit.2011.6034285

[63] **C. Chan[†]**, “Linear perfect secret key agreement,” in *2011 IEEE Information Theory Workshop*, IEEE, Oct. 2011. DOI: 10.1109/itw.2011.6089530

[64] **C. Chan[†]** and L. Zheng, “Mutual dependence for secret key agreement,” in *2010 44th Annual Conference on Information Sciences and Systems (CISS)*, IEEE, Mar. 2010. DOI: 10.1109/ciss.2010.5464805

Submitted papers

[65] **C. Chan[†]**, “Secret key agreement for hypergraphical sources with limited total discussion,” paper submitted to *IEEE Transactions on Information Theory*. DOI: 10.48550/arXiv.1910.01894

Educational Innovation and Leadership

SocraticAI	Led development of a family of AI teaching assistants that provide hints rather than solutions to support computational thinking.
CE-Quiz	Designed and deployed Collaborative E-Quiz (CE-Quiz), an AI-assisted in-class assessment framework for programming education.
TBL infrastructure	Developed AI-powered Team-Based Learning infrastructure supporting large programming classes with more than 600 students.
Agentic coding workflows	Led development of agentic coding teaching workflows using Hermes agents, LiteLLM, JupyterHub, and DIVE.
CS1302A curriculum	Designed and prepared the new CS1302A curriculum emphasizing GenAI, AI agents, and agentic coding.

Selected Educational Impact

- Supported large-enrollment programming courses serving over 600 students.
- Published and presented teaching innovations at international conferences including IEEE TALE 2025, INTED 2026 and EDULEARN 2026.
- Secured or participated in multiple competitive educational funding initiatives including TDG, TDLEG-IICA and FITE.
- Delivered invited talks and professional-development activities for schools, teachers, government stakeholders and higher-education practitioners.

Editorship

Journal paper reviewer

- IEEE Transactions on Information Theory
- Journal of the Franklin Institute
- SIAM Journal on Discrete Mathematics
- Entropy
- IEEE Access
- IEEE Internet of Things Journal

Conference paper reviewer

- IEEE International Symposium on Information Theory (ISIT)
- IEEE Information Theory Workshop (ITW)
- IEEE Information Theory Workshop (ITW)
- Neural Information Processing Systems (NeurIPS)

Invited Talks, Workshops and Community Engagement

- 2026 **DIVE into Agentic Coding: Can You Teach AI to Teach You?**, *presented at CityUHK Learning Classroom, City University of Hong Kong*
- 2026 **Emerging Learning Environments and Technologies for Scaling TBL**, *panel speaker, Future Learning Unlocked Workshop, City University of Hong Kong*
- 2026 **SocraticAI and Generative AI Education**, *guest lecture*
- 2026 **Demonstration of E-Quiz and CE-Quiz**, *visit by Education Bureau (EDB) Delegation, City University of Hong Kong*
- 2026 **AI in Science Education**, *Teachers' Development Day, 65 secondary school teachers*
- 2025 **Guest of Honour and Graduation Speaker**, *Po Leung Kuk Lo Kit Sing (1983) College*
- Oct 4-5, 2022 **DIVE into Math with JSXGraph in JupyterLite**, *presented at the Third International JSXGraph Conference 2022, online*
- May 25, 2022 **Beyond Maximal Densest Subgraphs: A General Framework for Information Density**, *presented at Huawei – IEEE ITSoc HK Joint Workshop on Semantic Information Theory 2022, Hong Kong, China*
- Aug 23 – 28, 2021 **Mutual Information in Machine Learning**, *presented at 2021 Croucher Summer Course in Information Theory (CSCIT), Hong Kong, China*
- Feb 27, 2020 **An Advantage of Estimating Mutual Information through Entropies**, *presented at 2020 The International Zurich Seminar on Information and Communication (IZS), Zurich, Switzerland.*
- Aug 19, 2019 **An Advantage of Estimating Mutual Information through Entropies**, *presented at 2019 TBSI Workshop on Probability and Information Theory (WPI), Hong Kong, China*
- Jul 31, 2019 **MI-NEE: Mutual Information Neural Entropic Estimation**, *presented at National University of Singapore (NUS), Singapore, Host: Dr. Jonathan Scarlett*
- Jul 29, 2019 **MI-NEE: Mutual Information Neural Entropic Estimation**, *presented at Nanyang Technological Institute (NTU), Singapore, Host: Prof. Wee Peng Tay*
- Jul 15, 2019 **Neural Entropic Estimation: A faster path to mutual information estimation**, *presented at 2019 TBSI Workshop on Learning Theory (WOLT), Shenzhen, China*
- Nov 30, 2018 **Detecting Strong Communities From Cooperative Games**, *presented at 2018 Symposium on Big Data Challenges for Predictive Modeling of Complex Systems, Hong Kong, China*
- Aug 17, 2017 **Info-Clustering: From Mathematical Theory to Practical Algorithms**, *presented at 2017 IEEE Taiwan/Hong Kong Joint Workshop on Information Theory and Communications (ITCOM), Penghu, Taiwan.*
- Oct 17, 2016 **Info-Clustering: A Mathematical Theory for Data Clustering**, *presented at Tsinghua-Berkeley Shenzhen Institute, Shenzhen, China, Host: Prof. Shao-Lun Huang*

- Aug 18, 2016 **Duality between feature selection and info-clustering**, *presented at Claude Shannon Centenary Workshop*, ShanghaiTech University, Shanghai, China, Host: Prof. Ziyu Shao
- Aug 5, 2016 **Info-Clustering: A Mathematical Theory for Data Clustering**, *presented at Institute of Information System*, Tsinghua University, China, Host: Prof. Yuen Shen
- Aug 4, 2016 **Info-Clustering: A Mathematical Theory for Data Clustering**, *presented at the School of Computer & Communication Engineering*, University of Science & Technology Beijing, Xian, China, Host: Prof. Qifu T. Sun
- June 8, 2016 **Info-Clustering: A Mathematical Theory for Data Clustering**, *presented at Xidian University*, Xian, China, Host: Prof. Chao Chen
- May 19, 2016 **Info-Clustering: A Mathematical Theory for Data Clustering**, *presented at Shannon Centenary Workshop*, 2016 Hong Kong, China, Host: Prof. Raymond W. Yeung
- Apr 13, 2016 **Info-Clustering: A New Information-Theoretic Paradigm for Data Clustering**, *presented at the School of Science and Engineering*, The Chinese University of Hong Kong (Shenzhen), Host: Prof. Simon Poon
- Sep 27-28, 2015 **Clustering of Random Variables by Multivariate Mutual Information**, *presented at the Coordinated Sciences Laboratory*, University of Illinois, Urbana-Champaign (UIUC), Urbana, IL 61801, USA, Host: Prof. Pramod Viswanath
- Sep 23-26, 2015 **Clustering of Random Variables by Multivariate Mutual Information**, *presented at Research Laboratory of Electronics*, EECS, MIT, Cambridge, MA, USA, Host: Prof. Lizhong Zheng
- Dec 8-15, 2013 **Information-theoretic Security**, *presented at the Institute for Interdisciplinary Information Sciences*, Tsinghua University, Beijing, China, Host: Prof. Shenghao Yang
- Nov 12-14, 2012 **The Link between Secret Key Agreement and Network Coding**, *presented at DIMACS Workshop on Information-Theoretic Network Security*, DIMACS Center, CoRE Building, Rutgers University, Piscataway, New Jersey, USA, Host: Prof. Yingbin Liang and Prof. Prakash Narayan
- Nov 3, 2010 **Mutual Dependence of Random Variables**, *presented at the Institute of Network Coding*, The Chinese University of Hong Kong, Hong Kong., Host: Prof. Raymond Yeung
- April 21, 2010 **Network Coding for Secret Key Agreement**, *presented at the Department of Electronic and Computer Engineering*, Hong Kong University of Science and Technology, Hong Kong., Host: Prof. Vincent Lau
- Jan 14, 2010 **Generating Secret in a Network**, *presented at the IE-ITCSC Joint Seminar*, The Chinese University of Hong Kong, Hong Kong., Host: Prof. Angela Zhang

Teaching and Learning

Course delivery

- 2025/26 Sem. A—B **CS1302 Introduction to Computer Programming**, *course leader*, CityU undergraduate level, approximately 600 students
- Implemented Team-Based Learning (TBL) at scale, combining active learning, peer instruction, and collaborative problem-solving to address reduced engagement caused by students' overreliance on AI-generated solutions.
 - Deployed SocraticAI, Collaborative E-Quiz (CE-Quiz), and AI-assisted debugging activities that require students to explain their reasoning, collaborate with peers, and actively solve problems rather than consume generated answers.
 - The full-scale TBL deployment in Semester B substantially improved objective learning outcomes: the course failure rate decreased from 9.5% to 4.0%, and the average midterm score increased from 54% to 70%.
 - Established a student-partnership model in which students from the Semester A pilot were recruited as PALS leaders and peer mentors for Semester B, creating a sustainable cycle of student contribution to the learning ecosystem.
 - Undergraduate students were hired to improve the learning platforms, develop new educational tools, and contribute to developing courseware and training the SocraticAI model.
 - Prepared the 2026/27 CS1302A curriculum emphasizing GenAI, AI agents, and agentic coding.
- 2024/25 Sem. A **CS1302 Introduction to Computer Programming**, *course leader*, CityU undergraduate level, 166–222 students in assigned lecture/labs out of 337–410 students in class
- 2023/24 Sem. A
- 2022/23 Sem. A
- 2021/22 Sem. A
- 2020/21 Sem. A
- Redesigned the course as a college-required course to teach Python programming to first-year students from various departments.
 - Developed interactive lecture/lab materials to be used on the DIVE platform [24], enabling students to learn programming remotely with ease and without complicated setup.
 - Created programmable online exams on the E-Quiz platform [23] to ensure fair assessment, allowing students to focus on demonstrating their understanding without worrying about careless mistakes or exam administration issues.
 - Developed an e-learning tool called OPTLite, which allows students to visualize, share, and debug Python code safely and reliably in a web browser. OPTLite operates in a serverless mode, enabling it to function without an internet connection.
 - Created an e-learning tool called DiveWidgets, which integrates OPTLite and other JavaScript applications such as JSXGraph into Jupyter notebooks. DiveWidgets enhances the learning experience by providing interactive elements and visualization capabilities within the notebook environment.
 - Developed interactive materials for AI-Assisted programming via locally deployed LLMs as well as remote OpenAI services.
- 2023/24 Sem. B **CS5483 Data Warehousing and Data Mining**, *course leader*, CityU post-graduate level, 46–61 students
- 2022/23 Sem. B
- 2021/22 Sem. B
- 2020/21 Sem. B
- 2019/20 Sem. A
- 2018/19 Sem. B
- 2017/18 Sem. B
- Developed the course to help students gain a thorough understanding of the core design of various data-mining algorithms and provided them with hands-on experience using various tools such as Python, R, and Weka.
 - Created a datamining package that captures the core design of different data-mining algorithms and used it to develop programmable exams on E-Quiz [23], with extensive modular randomizations to ensure fair assessment.
 - Developed interactive tutorial materials on DIVE [24] with GPU support to teach students how to conduct computationally-intensive data mining projects using different tools.
 - Incorporated Azure OpenAI into the DIVE platform for AI-assisted teaching and learning.

2020 Summer	SPAECSDS A Data Science Short Course , <i>lecturer</i> , CityU postgraduate level, 121 students ○ Developed interactive materials for the first 3 (out of 6) 3-hour lectures on data science, providing students with practical experience in data mining techniques. ○ Implemented a JupyterHub server to facilitate virtual teaching and learning, ensuring students have access to necessary computing resources.
2019/20 Sem. B	CS3481 Fundamentals of Data Science , <i>course leader</i> , CityU undergraduate level, 143 students ○ Transitioned teaching materials from static format to Jupyter notebooks that can be run on Google Colab, addressing the need for virtual teaching and learning when students cannot come to computer labs to work on their data mining projects. Collaborated with the department to explore online lecture options. ○ Experimented with online midterm and exam creation on Canvas, utilizing remote proctoring solutions such as Respondus Lockdown Browser and Zoom webcams. Collaborated with the department to provide guidelines for online exams and worked with CityU CSC and OCIO to resolve network connection issues.
2018/19 Sem. A	CS1102 Introduction to Computer Studies , <i>lecturer</i> , CityU undergraduate level, 182 in assigned lecture/labs out of 551 students in class ○ Created the final cyber-security lab assignment, providing students with an overview of basic Python language syntax for operations, functions, composite data types, conditionals, and iterations. ○ Utilized platforms such as trinket, JSFiddle, and Plunker for collaborative and interactive code demonstrations in class, which can also be embedded directly on the course website. ○ Experimented with uReply to engage a large class of over 100 students, facilitating faster Q&A in the classroom.
2015/16 Term 2	ENGG1410A Linear Algebra and Vector Calculus for Engineers , <i>lecturer</i> , CUHK undergraduate level ○ Created audio slides using reveal.js, enhancing the learning experience with audio narration and visual aids. ○ Created an e-Learning course on KEEP with the audio slides, providing students with a convenient and accessible way to review course materials. ○ Developed new teaching methods that incorporated competition, collaboration, and gamification, enhancing student engagement and motivation.
Student supervision	
Completed	6 PhD thesis, 23 FYPs
Ongoing	6 PhD theses, 6 FYPs
PhD students at CityU	Ongoing: DING Feilong, HOU Runlin, TANG Ruoqin, CHEN Siya, WANG Zimeng, LIANG Qihang Completed: HANG Ching Nam, WANG Xu, WONG Man Fai, ZHAO Chao, LI Jingting
PhD student at CUHK	ZHOU Qiaoqiao (graduated, co-supervised by Prof. Raymond W. Yeung.)
FYP students at CityU	Ongoing: NG DZI Fan, SO Chi Wang, LAI Ming Kei, WONG Yue Sing, LI Shuyuan, TSE Mat Ho Completed: SHISH Chun Hin, LEE Lik Sing, LEUNG Kin Fai, LEE Ka Ho, LAU Pak Kong, LUI Yuk Yan, LI Suet Wa, WONG Chun Hei James, CHAN Tsz Hin, NG Ho Man, TANG Wing Yi William, WONG Tik Wai Anson, CHEUNG Ching Fung, YEOH Zhi Qi, PAREKH Mustafa, HUI Fai Yeung, CHAN Chi Sum, TAM Chun Hoi, TANG Ho Hin, CHEUNG Ka Lun, KAN Ka Ho, LAM Chung Hin, LUI Yi Wai

Open-Source Educational Tools

DIVE	DIVE4DEC: portable containers that make virtual learning Diversified, Interactive, Versatile, and Engaging; the JupyterHub-based platform for interactive, executable teaching materials, including GPU-enabled collaborative group servers for Team-Based Learning.
DIVEWidgets	interactive widgets integrating OPTLite and other JavaScript applications (e.g., JSXGraph) into Jupyter notebooks for the DIVE platform.
E-Quiz	e-quiz: a self-contained and programmable online exam platform with extensive modular randomization for fair assessment.
CE-Quiz	Collaborative E-Quiz: an AI-assisted in-class programming assessment in which students may seek help from classmates, peer mentors, and GenAI in the form of hints rather than answers.
SocraticAI	a family of language models trained to provide guiding hints and Socratic questioning rather than solutions, supporting computational thinking and debugging skills.
OPT_Mentor	a visual debugger for Python integrated with Socratic AI, running entirely in the browser with local inference (WebLLM) and no server required.
OPTLite	optlite: a serverless online Python tutor built on Pyodide that lets students visualize, share, and debug Python code safely in the browser.
OPT_CPP	OPT_CPP: a serverless visual debugger for C++.
jupyter-ai-hermes	Jupyter AI assistant and magics for chatting with, and running, the Hermes Agent directly inside notebooks.
local_hermesagent	run the Hermes Agent locally and drive it from Python applications over the Agent Client Protocol (hermes-acp-sdk).
Moodle plugins	moodle-qtype_coderunner: a question type that runs student-submitted programs in a sandbox; moodle-qbehaviour_dfcbmexplicitvaildate: a deferred-feedback question behaviour with explicit validation.
datamining	datamining: a package capturing the core design of data-mining algorithms, used to generate randomized exam questions on E-Quiz for CS5483.

Knowledge Exchange

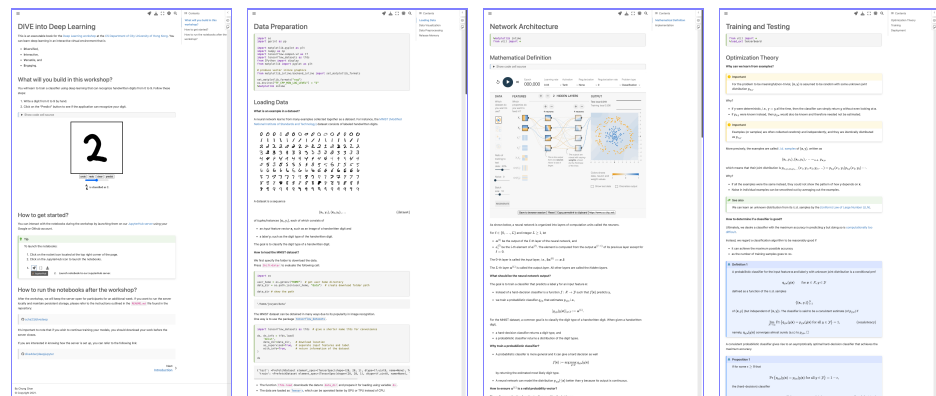
Public Talks

- July 4, 2024 **DIVE into deep learning**, presented at *STEM Carnival*, The Bright Future Engineering Talent Hub, College of Engineering, CityU
- July 28, 2023 **DIVE into deep learning**, presented at *CityU-Learning Classroom for Secondary School Students*, Office of the Provost and Deputy President, CityU
- July 7, 2023 **DIVE into deep learning**, presented at *STEM Carnival*, The Bright Future Engineering Talent Hub, College of Engineering, CityU
- Apr 12, 2023 **Panel Discussion with Prof. Erdal Arıkan, the Father of 5G Polar Code**, *How to Boost Technology Development by Information Theory*, Chaspark
- Aug 11, 2022 **Portable Containers to DIVE into CS and Math**, presented at *CityU-Learning Classroom for Educators*, Office of the Provost and Deputy President, CityU
- Nov 12, 2021 **Sharing of Good Teaching Practices by CENG Outstanding Teaching Awardees 2020–21**, CityU
- Apr 22, 2021 **DIVE for DEC**, presented at *CityU International Affairs Association (CIAA) Talk*, online
- Aug 14, 2020 **Deep Learning**, presented at *CityU-Learning Classroom for Secondary School Students*, 2020, Aug 14, online.

Publications for General Audience

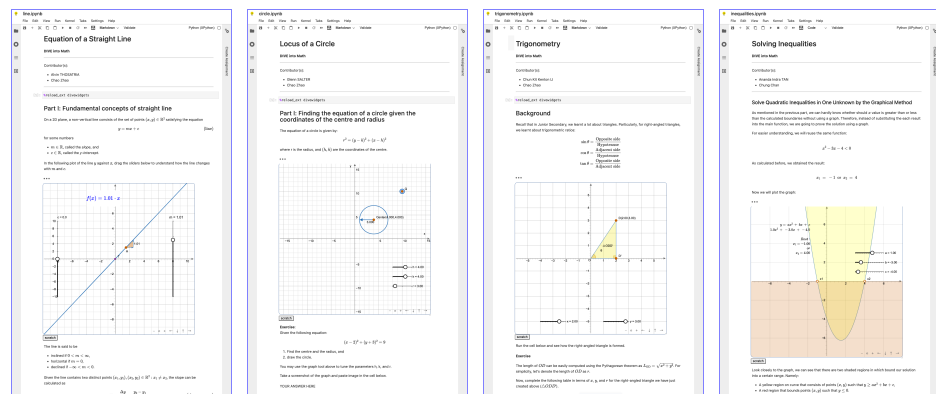
Executable book launchable to Kubernetes with GPU, DIVE into deep learning

URI: <https://www.cs.cityu.edu.hk/~ccha23/deepbook/>



JupyterLite notebooks executable in serverless mode, DIVE into Math

URI: <https://dive4dec.github.io/lab/?path=divemath%2Fdivemath.ipynb>



■ Summary of Achievements

Teaching

In 2021, Prof. Chan was awarded the CENG Outstanding Teaching Award for his exceptional teaching performance. He has been an active member of the Computer Science Department at City University of Hong Kong, where he regularly teaches both the graduate course CS5483 Data Warehousing and Data Mining and the undergraduate course CS1302 Introduction to Computer Programming. Since 2020, he has been using interactive teaching materials to enhance the learning experience of his students.

In particular, Prof. Chan led the re-development of CS1302 for its first offering since 2020 semester A in Python, a highly demanded programming language. The course supports all departments in CENG as well as other departments from CSCI and CB, with 300-400 first-year undergraduate students every semester. To improve virtual teaching and learning, he received two teaching grants from UGC to develop interactive eLearning environments for lectures/tutorials (DIVE) [24] and for quizzes/exams (E-Quiz) [23].

Prof. Chan received largely positive feedback from his students for the interactive teaching materials and platforms DIVE and E-Quiz. Nearly 20 undergraduate students in CS1302 went on to support DIVE in different ways. To benefit students beyond CityU, Prof. Chan presented the teaching materials and eLearning tools to teachers and software developers in the CityU Classroom for Educators and at the 3rd International Conference on JSXGraph. The materials are publicly accessible in a browser with no login required, enabling teachers to easily bring what they learned to their classes. Over the past two years, Prof. Chan collaborated with 6 CityU undergraduate students and 3 postgraduate students to co-author two papers that were accepted by the esteemed teaching and learning conference, TALE 2022 and TALE 2023.

To properly assess students' performance, especially during the onset of COVID-19 when exams are held online, Prof. Chan worked with CSC, OCIO, and the CS Department to develop different strategies to conduct online exams. He deployed an interactive platform called E-Quiz to conduct programmable online exams, which involves creating question templates like a computer program that consists of variables for randomization. He developed a data mining package to generate answers to the randomized questions. The questions are carefully written with interactive illustrations and test cases so students can check their answers and re-attempt to correct careless mistakes. The platform will automatically time, save, and submit students' attempts, allowing students to focus on answering the exam questions. Despite many technical challenges, Prof. Chan successfully ensured the reliability and scalability of the E-Quiz platform for 300-400 students to take on-campus/off-campus exams easily using a safe exam browser. He also created a question bank on E-Quiz with over 100 questions for students to practice. The platform is highly customizable and integrated into Canvas, providing students with additional practice opportunities.

Research

Prof. Chan's research focuses on network information theory with applications to machine learning and security.

Information-theoretic security One of his main contributions is an extension of Shannon's mutual information to the multivariate case [15], which he connected to concrete operational meanings in source coding, network coding, and security using techniques from submodular function optimizations. In the past three years, Prof. Chan completed a related ECS project [7][65], which provided complete and near-complete solutions to various challenging and fundamental problems in the secret key agreement problem, with connections to other problems in computer science such as distributed simulations. He also formulated the problem of secure information exchange and bounded the minimum leaked in secure omniscience.

Information networks in machine learning Prof. Chan has also applied network information theory to study the problem of machine learning. His main contribution involves a general info-clustering paradigm [12] that extends the single-linkage algorithm beyond graphs. Prof. Chan proposed new clustering objectives in the past three years and characterized their solutions. In particular, he proposed a combinatorial theory of information to study GNN. His initial research results include a new notion of information density and strengths beyond graphs.

Neural estimation of information measures In addition, Prof. Chan has proposed ways to avoid overfitting when estimating mutual information using deep learning techniques. While existing work points out the issue of undershooting, Prof. Chan and his student identified the issue of overshooting in the noise contrastive estimation of mutual information [4]. They are currently working on a new solution that uses generative adversarial networks to provide realistic label smoothing that avoids overshooting.

Prof. Chan's research has generated fundamental results published at renowned conferences in information theory, such as IEEE ISIT and ITW, and the prestigious journal IEEE Transactions on Information Theory. He has presented the results at universities abroad, such as NTU and NUS, and at international workshops, such as the Croucher Summer Course in Information Theory and the Workshop on Semantic Information Theory. Prof. Chan has been serving as the president of the IEEE Information Theory Society Hong Kong Chapter from 2019 to 2022, demonstrating his leadership in the field.

Future Plan

Prof. Chan plans to incorporate generative AI into both teaching and research. He plans to leverage generative AI to quantify and estimate mutual information, which can provide insights into how the technology can generate intelligent responses to complex questions. By applying results from Information theory, he aims to establish fundamental limits on generative AI and develop better designs that can get close to those limits.

Furthermore, Prof. Chan believes that the capability and limitations of generative AI must be clearly understood in mathematical terms to prevent misuse. To apply generative AI to teaching, he is eager to develop a series of well-designed teaching materials and a supporting platform to facilitate the responsible use of this powerful technology.