Cheng XU Ph.D.

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Senior software developer with proven experience in designing and implementing various high-performance, secure database and blockchain systems. Strong expertise in database, blockchain, cryptography, and information security with top-notch coding skills and open source project maintenance experience.

Professional Experience

Fortinet Burnaby, BC, Canada
Senior Software Developer *Dec 2021 – Present*

Simon Fraser University Burnaby, BC, Canada
Visiting Post-doctoral Research Fellow *Mar 2020 – May 2022*

- Advisor: Prof. Jian Pei
- Designed novel techniques to build future generation high-performance blockchain systems.
- Developed a blockchain prototype in Rust (https://github.com/hkbudb/slimchain) to demonstrate the effectiveness of the novel design.

Hong Kong Baptist University Hong Kong
Ph.D. Candidate *Nov 2014 – Feb 2019*
Senior Research Assistant / Post-doctoral Research Fellow *Dec 2018 – Apr 2021*

- Advisor: Prof. Jianliang Xu
- Designed novel algorithms and indexes for cloud-based query services to support efficient verifiable query processing in a wide range of enterprise systems.
- Developed novel techniques to enable integrity assured search in blockchain databases.
- Resulted to several research papers published in top-tier journals and conferences.

Syracuse University Syracuse, NY, USA
Visiting Scholar *Sep 2017 – Dec 2017*

- Advisor: Dr. Yuzhe Tang
- Designed and implemented a memory-access pattern secure software system on Intel SGX.
- Developed a dynamic program partitioning framework to support implementing a variety of external oblivious algorithms and achieving cache-miss obliviousness.

Homebrew | https://brew.sh Hong Kong
Core Maintainer *Feb 2015 – Feb 2017*

- Acted as one of the core maintainers for the open source project Homebrew, which is the most popular package manager on macOS.
- Implemented several major features and improvements including better tap system, core/formulae split, sandbox system, portable Ruby, and many bug fixes.

Education

Hong Kong Baptist University Hong Kong
Ph.D. in Computer Science *Nov 2014 – May 2019*
Dissertation: Authenticated Query Processing in the Cloud
Advisor: Prof. Jianliang Xu

Huazhong University of Science and Technology Wuhan, China
Bachelor of Engineering in Electronics & Information Engineering *Sep 2009 – Jun 2014*

Skills

Programming C/C++, Rust, Java, Python, Ruby, Matlab, LaTeX, Bash, Javascript
Tools Docker, Kubernetes, Terraform, Vim, Tmux, Git, macOS, Linux
Languages English, Mandarin

Research Interests

- Authenticated query processing for outsourcing cloud computing.
- Searchable blockchain with integrity assurance.
- Privacy preserving query processing and access control.

Selected Publications

Complete List: Google Scholar [DKG_JaAAAAAJ] · DBLP [Xu_0004:Cheng]

1. H. Wang, **C. Xu**, C. Zhang, J. Xu, Z. Peng, and J. Pei, "vChain+: Optimizing verifiable blockchain boolean range queries," in *Proceedings of the 38th IEEE International Conference on Data Engineering (**ICDE '22**)*, Kuala Lumpur, Malaysia, May 2022, pp. 1928–1941, Full Paper.
2. **C. Xu**†, C. Zhang†, J. Xu, and J. Pei, "SlimChain: Scaling blockchain transactions through off-chain storage and parallel processing," *Proceedings of the VLDB Endowment (**PVLDB**)*, vol. 14, no. 11, pp. 2314–2326, Jul. 2021, Full Paper.
3. Z. Peng, **C. Xu**, H. Wang, J. Huang, J. Xu, and X. Chu, "P^{2}B-Trace: Privacy-preserving blockchain-based contact tracing to combat pandemics," in *Proceedings of the 2021 ACM SIGMOD International Conference on Management of Data (**SIGMOD '21**)*, Xi'an, Shaanxi, China, Jun. 2021, pp. 2389–2393, Short Paper.
4. C. Zhang†, **C. Xu**†, H. Wang, J. Xu, and B. Choi, "Authenticated keyword search in scalable hybrid-storage blockchains," in *Proceedings of the 37th IEEE International Conference on Data Engineering (**ICDE '21**)*, Chania, Crete, Greece, Apr. 2021, pp. 996–1007, Full Paper.
5. K. Li, Y. Tang, J. Chen, Z. Yuan, **C. Xu**, and J. Xu, "Cost-effective data feeds to blockchains via workload-adaptive data replication," in *Proceedings of the 21st International Middleware Conference (**Middleware '20**)*, Delft, Netherlands, Dec. 2020, pp. 371–385, Full Paper.
6. H. Wang, **C. Xu**, C. Zhang, and J. Xu, "vChain: A blockchain system ensuring query integrity," in *Proceedings of the 2020 ACM SIGMOD International Conference on Management of Data (**SIGMOD '20**)*, Portland, OR, USA, Jun. 2020, pp. 2693–2696, Demo Paper.
7. **C. Xu**, C. Zhang, and J. Xu, "vChain: Enabling verifiable boolean range queries over blockchain databases," in *Proceedings of the 2019 ACM SIGMOD International Conference on Management of Data (**SIGMOD '19**)*, Amsterdam, Netherlands, Jun. 2019, pp. 141–158, Full Paper.
8. C. Zhang, **C. Xu**, J. Xu, Y. Tang, and B. Choi, "GEM^2-Tree: A gas-efficient structure for authenticated range queries in blockchain," in *Proceedings of the 35th IEEE International Conference on Data Engineering (**ICDE '19**)*, Macau SAR, China, Apr. 2019, pp. 842–853, Full Paper.
9. C. Zhang, **C. Xu**, J. Xu, and B. Choi, "Distributed kNN query authentication," in *Proceedings of the 19th IEEE International Conference on Mobile Data Management (**MDM '18**)*, Aalborg, Denmark, Jun. 2018, pp. 167–176, Full Paper.
10. **C. Xu**, J. Xu, H. Hu, and M. H. Au, "When query authentication meets fine-grained access control: A zero-knowledge approach," in *Proceedings of the 2018 ACM SIGMOD International Conference on Management of Data (**SIGMOD '18**)*, Houston, TX, USA, Jun. 2018, pp. 147–162, Full Paper.
11. **C. Xu**, Q. Chen, H. Hu, J. Xu, and X. Hei, "Authenticating aggregate queries over set-valued data with confidentiality," *IEEE Transactions on Knowledge and Data Engineering (**TKDE**)*, vol. 30, no. 4, pp. 630–644, Apr. 2018, Full Paper.
12. Q. Zhu, H. Hu, **C. Xu**, J. Xu, and W.-C. Lee, "Geo-social group queries with minimum acquaintance constraints," *The VLDB Journal (**VLDBJ**)*, vol. 26, no. 5, pp. 709–727, Jul. 2017, Full Paper.

†These authors contributed equally.

Talks

1. Blockchain Privacy Preserving Techniques, *The 36th CCF National Database Conference*, Jinan, China, Oct. 2019.
2. Towards Searchable and Verifiable Blockchain, *1st Workshop on Blockchain and Data Management at 35th IEEE International Conference on Data Engineering*, Macau, Apr. 2019.
3. When Query Authentication Meets Fine-Grained Access Control: A Zero-Knowledge Approach, *2018 ACM SIGMOD International Conference on Management of Data*, Houston, USA, Jun. 2018.

Awards

- SIGMOD Travel Award, ACM *2018*
- Department RPg Performance Award, Hong Kong Baptist University *2018, 2019*
- Postgraduate Research Symposium Best Research Performance Award & Best Poster Award, Hong Kong Baptist University *2018*
- Yakun Scholarship Scheme for Mainland Postgraduate Students, Hong Kong Baptist University *2018*