Lingkun Kong

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Education

Rice University — Houston, TX

Department of Computer Science — *Aug. 2018 – now*

Ph.D. Candidate, GPA: 4.0/4.0

Shanghai Jiao Tong University — Shanghai, China

Department of Computer Science & Zhiyuan College — *Jul. 2014 – Jul. 2018*

B.S. in Computer Science with Honors, GPA: 3.9/4.0

Research Interests

Data Stream Processing, Programming Languages, Big-Data Systems, Matching of Regular Patterns

Work Experience

Facebook — May. 2021 - Aug. 2021

Summer intern in Data Infrastructure Privacy team

Goal: The Policy Evaluation Service (PES) performs static analysis over SQL queries to determine whether they cause unsafe data flows. My intern project is about reducing the latency of PES by inserting a cache of SQL templates.

1. Finished the project four weeks before the expected deadline, which includes generalizing queries as templates, matching queries with templates, and generating PES checking results based on cached data.
2. Built a cache with a 77% cache hit rate, which is close to the theoretical maximum value (i.e., $< 84\%$).
3. Analyzed the performance of cache – cache hits increase the speed of PES by 30x, and cache misses add $< 3\%$ latency.

Selected Research Projects

Software-Hardware Codesign for Efficient In-Memory Regular Pattern Matching — 2021 - 2022

Research Assistant, supervised by Dr. Konstantinos Mamouras and Dr. Kaiyuan Yang

Goal: to provide a memory-efficient software-hardware codesign for the matching of regular patterns.

1. Proposed a concept called *counter-unambiguity* to identify occurrences of counting in regexes that can be handled with a small amount of memory; Built a Java checker that combines both exact and over-approximate static analyses for counter-(un)ambiguity that arise in several application domains.
2. Proposed a hardware design that augments the prior NFA-based architecture CAMA with counter and bit vector modules; Achieved substantial energy and area reductions compared to prior state-of-the-art designs.
3. Provided a compiler that translates POSIX-style regexes into code used to program the hardware.

Query Language for Complex Analysis over Data Streams — 2018 - 2020

Research Assistant, supervised by Dr. Konstantinos Mamouras

Goal: to design and implement a language that facilitates the complex analyses over data streams.

1. Proposed a language that provides high-level programming abstractions for stream processing with formal semantics.
2. Implemented the language as a Java library with a rich set of operators, which is ∼5x faster than prior advanced tools.
3. Used the proposed language to prototype algorithms for healthcare monitoring and high-frequency trading.

Acemap: *Academic Map System* — 2015 - 2017

Research Assistant, supervised by Dr. Xinbing Wang

Goal: to analyze the big data constructed as academic networks, which contains massive academic information including paper, author, research topic, and etc.

1. Developed visualizing applications for academic information networks and presentation approaches.
2. Implemented the paper recommendation algorithms, presented it on website, and published a patent.
3. Created two statistic models, EBM and MSM, for academic network analysis.

Selected Publications

L. Kong, Q. Yu, A. Chattopadhyay, A. Le Glaunec, Y. Huang, K. Mamouras, and K. Yang. *Software-Hardware Codesign for Efficient In-Memory Regular Pattern Matching*, accepted by PLDI, 2022.

L. Kong, K. Mamouras. *StreamQL: A Query Language for Processing Streaming Time Series*, OOPSLA, 2020.

J. Huang, **L. Kong**, L. Kong, Z. Liu, Z. Liu and G. Chen. *Blockchain-based Crowd-sensing System*, HotICN 2018.

L. Fu, S. Ma, **L. Kong**, S. Shi, X. Wang, *FINE: A Framework for Distributed Learning on Incomplete Observations for Heterogeneous Crowdsensing Networks*, IEEE ToN 2018.

Selected Scholarship & Honors

China National Scholarship *highest honor for undergraduates in China, top 0.2% nationwide* — *2015 & 2017*

Zhiyuan Honor Scholarship *award for academic performance* — *2014 & 2015 & 2016 & 2018*