Tong-Nong Lin

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Education

University of Texas at Austin – PhD student in Computer Engineering, GPA: 3.9/4.0
National Taiwan University – MS in Electrical Engineering
National Taiwan University – BS in Electrical Engineering and Mathematics

Experience

Research Assistant, UT Austin – Austin, TX Aug 2024 – Present

- Achieved 1.4x performance improvement over Gunrock (established CUDA-based graph processing benchmark) by implementing optimized parallel algorithms in PyKokkos with selective output buffering, memory coalescing, and workload balancing techniques that eliminate redundant memory operations in GPU computing
- Applied advanced parallel programming techniques including shared memory optimization, thread block configuration, and memory access pattern analysis to design high-performance GPU algorithms for graph traversal (BFS, SSSP) and centrality computation
- Designed abstraction layer and API framework integrating Lattice Linear Predicate Detection (LLP) with PyKokkos, enabling rapid development of portable parallel code across NVIDIA GPUs and multi-core CPUs while maintaining performance optimization

Research Assistant, Academia Sinica – Taipei, Taiwan Mar 2023 – Mar 2024

- Researched streaming algorithms for graph problems with sublinear space complexity, processing large-scale graphs using limited memory
- Designed novel deterministic streaming algorithm to find independent sets meeting Turán's Bound
- Developed deterministic algorithms for integer decomposition problems using probabilistic method for existence proofs, publishing results at IWOCA 2024 with provable time and space complexities

Software Engineer, Mediatek – Hsinchu, Taiwan Sep 2019 – Mar 2023

- Developed and integrated **AES256-GCM cryptographic algorithms** into 5G modem software, ensuring secure data transmission compliant with 3GPP specifications
- Implemented **authentication protocols and encryption systems** in boot mode without RAM usage for secure startup
- Enhanced SIM-lock authentication protocols between mobile devices and carrier servers, implementing challenge-response mechanisms and certificate validation
- Developed certificate framework supporting ASN.1 DER format parsing and validation, integrating with public key infrastructure for secure communications
- Collaborated with cross-functional teams (hardware, QA, product management) in Agile development environment, delivering features on schedule for production chipsets

Research Assistant, National Taiwan University – Taipei, Taiwan Mar 2017 – Mar 2019

- Conducted research in algorithmic game theory and mechanism design, focusing on risk aversion under uncertainty
- Proposed generalized mathematical formulas modeling player risk aversion in multi-agent systems
- Proved tight and near-tight upper and lower bounds on price of anarchy and Nash-equilibrium analysis

Publications

Tong-Nong Lin, et al., **Efficient Algorithms for Decomposing Integers as Sums of Few Tetrahedral Numbers**, Proceedings of the 35th International Workshop on Combinatorial Algorithms (IWOCA)

- Developed algorithms for **integer decomposition** improving theoretical bounds using **probabilistic and deterministic methods**
- Analyzed time and space complexity with formal proofs and implemented efficient **C++** prototypes

Projects

Program Analysis and Compiler Development

- Modified **GCC compiler** to support new language expressions
- Used **ANTLR4** for lexing, parsing, and semantic analysis of **Trino SQL**
- Leveraged **Java Pathfinder (JPF)** to build custom **memoization and code coverage tools** via listener mechanisms
- Extended **OpenJDK** to support new syntax forms for expression grouping: [[Expression, Expression, Expression, ...]]

Skills

Programming: C/C++(Proficient), Java, Python, Go, Rust, Lean, HOL Light
Frameworks: PyKokkos, CUDA, OpenMP, ANTLR4, JPF, LLVM, Docker, Git, Linux, CMake, Linux/Unix
Expertise: Algorithm Design, Compiler, Funtional Programming, Program Analysis, Parallel Programming, multithreaded programming, Performance Optimization, GPU Programming, Distributed System, Static Analysis, Graph Algorithms, Software Testing, High-Performance Computing (HPC)
Databases: Neo4j, Graph Databases, SQL

Honors & Awards

Graduate School Fellowship, University of Texas at Austin 2024
Research Publication, IWOCA International Conference 2024