Raghav Malik

PHD STUDENT · COMPUTER ENGINEERING

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Education

Purdue University   *West Lafayette*

PHD COMPUTER ENGINEERING   *August 2019 - present*
- Advisor: Dr. Milind Kulkarni

BS COMPUTER ENGINEERING   *August 2016 - May 2019*

Professional Experience

2019-2024

Research Assistant, Parallelism, Languages, and Compilers Lab
- Designed a protocol for evaluating computations with ciphertext-dependent branches
- Extended general vectorization techniques to apply to encrypted arithmetic circuits
- Developed an algorithm for efficiently vectorizing private decision tree inference
- Contributed to the design of a metaprogramming language for writing cryptographic applications

2022

Research Intern, Microsoft Research:
- Developed scheduling optimizations for the MSCCL GPU compiler
- Designed an event-based simulation engine for profiling MSCCL communication collectives

Publications

Malik, Raghav, Kabir Sheth, Milind Kulkarni. 2023. Coyote: A Compiler for Vectorizing Encrypted Arithmetic Circuits. Proceedings of the 28th ACM International Conference on Architectural Support for Programming Languages and Operating Systems, Volume 3: 118-133.

Malik, Raghav, Vidush Singhal, Benjamin Gottfried, Milind Kulkarni. 2021. Vectorized Secure Evaluation of Decision Forests. Proceedings of the 42nd ACM SIGPLAN International Conference on Programming Language Design and Implementation: 1049-1063.

Bao, Yuyan, Kirshanthan Sundarajah, **Raghav Malik**, Qianchuan Ye, et. al. 2021. HACCLE: Metaprogramming for Secure Multi-Party Computation. Proceedings of the 20th ACM SIGPLAN International Conference on Generative Programming: Concepts and Experiences: 130-143.

Awards, Fellowships, & Grants

2019-2023   **Elmore Fellowship**, Elmore School of Electrical and Computer Engineering

Presentations

* presenting author; + mentored undergraduate

INVITED TALKS

Fall 2024. *Compiling Homomorphic Circuits with Control Flow*. Poster: Midwestern PL Summit 2024

Fall 2023. *Managing Ownership and Lifetimes*. Guest lecture, Object Oriented Programming in C++, Purdue University

Fall 2023. *Coyote: A Compiler for Vectorizing Encrypted Arithmetic Circuits*. Invited talk: Midwestern PL Summit 2023

Spring 2023. *Coyote: A Compiler for Vectorizing Encrypted Arithmetic Circuits*. Invited talk: Galois, Inc.

Fall 2022. *Vectorized Secure Evaluation of Decision Forests*. Invited talk: Cornell University.

Sreekanth, Vickranth*+, Dulani Wijayarathne*+, **Raghav Malik**, Milind Kulkarni. 2023. Parallel Encrypted Arithmetic Vector Scheduling for Optimized FHE Computations. Departmental seminar: Purdue Programming Languages Group.

Sreekanth, Vickranth*+, Dulani Wijayarathne*+, **Raghav Malik**, Milind Kulkarni. 2023. An Optimization for Vectorizing Encrypted Arithmetic Circuits. Poster: Summer Undergraduate Reserch Symposium, Purdue University.

Bao, Yuyan, Kirshanthan Sundarajah*, **Raghav Malik**, Qianchuan Ye, et. al. 2021. HACCLE: Metaprogramming for Secure Multiparty Computation. GPCE Conference Talk.

Teaching Experience

Fall 2024	**Object Oriented Programming in C++**, Teaching Assistant *Designed and delivered some lectures, wrote exams, managed undergraduate TAs*
Summer 2024	**Data Structures and Algorithms**, Instructor *Designed an 8-week course, designed and delivered lectures, problem sets, and exams.*
Spring 2024	**Object Oriented Programming in C++**, Teaching Assistant *Held office hours, managed undergraduate TAs, designed and delivered some lectures*
Fall 2023	**Object Oriented Programming in C++**, Teaching Assistant *Held office hours, developed autograding framework, delivered guest lecture*
Spring 2023	**Discrete Mathematics**, Teaching Assistant *Held office hours, developed a proof assistant for automatically verifying Gentzen-style proofs*

Mentoring

2022-2024	**Dulani Wijayarathne**, Summer Undergraduate Research Student
2022-2024	**Vickranth Sreekanth**, Summer Undergraduate Research Student
2021-2022	**Kabir Sheth**, Undergraduate Research Assistant
2019-2021	**Vidush Singhal**, Undergraduate Research Assistant
2019-2020	**Benjamin Gottfried**, Undergraduate Research Assistant

Skills

TECHNICAL SKILLS

C++, Python, Haskell, Linux, Git, object-oriented programming, functional programming

RESEARCH SKILLS

Compiler optimizations, vectorization, cryptography, homomorphic encryption, multiparty computation, program synthesis

SOFT SKILLS

Mentoring undergraduates, designing and teaching courses, writing grants, collaborating on research

Professional Development

SERVICE

2024-2025	**Association of Computing and Machinery, PLDI**, Organizing Committee, Student Volunteer Chair
2022-2023	**Association of Computing and Machinery, PLDI**, Student Volunteer

PEER REVIEW

Artifact Evaluation Committee, PPoPP 2024