Abrahim Ladha

https://ladha.me/
abrahimladha@gatech.edu

EDUCATION

Masters of Science, Computer Science — Fall 2019 - Fall 2021
Georgia Institute of Technology, Atlanta, GA,
Research areas: Cryptography, Secure Multi-party Computation
Other interests: Complexity Theory, Logic, Computability, Quantum Computing

Bachelor of Science, Mathematics — Fall 2016 - Spring 2019
Georgia Institute of Technology, Atlanta, GA,
Degree Concentration: Discrete Mathematics

Dual Major, Mathematics and Computer Science — Fall 2014 - Spring 2016
Armstrong State University, Savannah, GA,
Transferred to Georgia Tech after two years

RESEARCH EXPERIENCE

GABLE: Garbled Autonomous Bots Leveraging Ethereum — Spring 2019 - Fall 2020
Worked with Dr. Vlad Kolesnikov for SANDIA National Labs for over a year developing, debugging, and testing software. I also provided advisement to SANDIA labs on multi-party computation, and garbled circuits.
The GABLE Report

Quantum Compilers — Spring 2021
Worked briefly with Dr. Qureshi on a sub-problem of qubit mapping for NISQ devices.

Big Data and Quantum Mechanics: — Fall 2018
Trained under Dr. Medford to calculate absorption energies of physical models with Quantum Expresso, on the PACE supercomputing cluster.
vip.gatech.edu/teams/big-data-and-quantum-mechanics

Private Set Intersection: — Summer 2016
Worked with Dr. Rasheed to implement a secure hamming distance protocol as a comparator for a Private Set Intersection (PSI) Algorithm.
Summary of Research

Topological Graph Theory: — Spring 2016
Worked with Dr. Lambert to find new upper and lower bounds For the crossing number of the Paley graph on 13 vertices.

The N-Queens Problem Mod 2 — Summer 2014 - Spring 2015
Worked with Dr. Brown to find classes of permutations and algebraic properties of a variation of the traditional n-queens problem.
Exploring mod 2 n-queens games

PAPERS

- C. Cordi, M. Frank, K. Gabert, C. Helinski, R. Kao, V. Kolesnikov, **A. Ladha**, and N. Pattengale "Auditable, Available and Resilient Private Computation on the Blockchain via MPC" CSCML 2022
- M. Frank, C. Cordi, K. Gabert, C. Helinski, R. Kao, V. Kolesnikov, **A. Ladha**, N. Pattengale "The GABLE Report: Garbled Autonomous Bots Leveraging Ethereum" Sandia Report SAND2020-5413, 2020
- T.M. Brown, A. Ladha "Exploring mod 2 N-Queens Games" Recreational Mathematics Magazine, 6(11), 15-25. https://doi.org/10.2478/rmm-2019-0002, 2019

TEACHING EXPERIENCE

CS3510 Design and Analysis of Algorithms ***Lecturer***
CS4510 Automata and Complexity ***Lecturer*** Spring 2023
Two distinct courses of upper division theoretical computer science. Duties will include lecturing four classes a week, and designing homework and exams. Nearly five hundred expected students and who knows how many TAs to manage. Truly a dream job to impact and help this many students!

CS 4510 Automata and Complexity ***Lecturer*** Summer 2021
My first semester as sole instructor. Lectures when above and beyond what would be covered in a normal semester. Syllabus, full lecture videos and notes available free here:
`https://cryptolab.gtisc.gatech.edu/ladha/CS4510SU21.html`

CS 4510 Automata and Complexity ***Section X*** Spring 2021
I asked to design an advanced/honors section of CS 4510, specially tailored for Mathematics undergrads, and theory oriented computer science undergrads. Lectures overlap with the normal section but assignments are much greater in both breadth and depth. Topics include Gödel incompleteness, Kolmogorov complexity, primitive recursive functions, Myhill-Nerode and Rice's theorems, and more. Now a cult favorite among the theory oriented undergrads and math majors. Some assignments and notes available here:
`https://ladha.me/files/sectionX/`

CS 8803/4803 Blockchain and Cryptocurrencies Fall 2019, 2020, Spring 2021
Starting as an undergrad, I worked with Dr. Kolesnikov to design a graduate level course which had never been taught before. I put a large emphasis on proofs and theory. Responsibilities also included lecturing, holding office hours, creating and grading problem sets, and student advisement.

CS 4510 Automata and Complexity Fall 2019, 2020, 2021
Worked under Dr. Zvi Galil and Dr. Santosh Vempala. Responsibilities include holding office hours, creating and grading problem sets, and student advisement.

Programming Competition Coordinator Spring 2016
I organized meetings to help our programming team practice for events, such as the ACM ICPC and regional programming competitions.

Camp Counselor Weekends and Summers 2013-2016
I taught Girl Scouts programming, to help them earn their many computing related badges. I also taught game development to high school students

AWARDS & HONORS

- Marshall D. Williamson Fellowship[1] — Spring 2022
- "Thank a Teacher" Award, Computer Science 4510 × 2 — Fall 2021
- "Thank a Teacher" Award, Computer Science 4510 × 2 — Summer 2021
- "Thank a Teacher" Award, Computer Science 4510[2] — Fall 2020
- ChemEcar 1st Place Nationals — Fall 2018
- ChemEcar 1st Place Southern Regionals — Spring 2018
- Lancy C. Jen Shearhouse Scholarship — Spring 2016
- GA Power Research Scholar — Summer 2016
- Eagle Undergraduate Mathematics Conference 3rd Place — Spring 2016
- ACM ICPC, Regionals, 4th place — Spring 2016
- Video Game Design State of Georgia, 9th, 6th, 3rd place in — 2012, 2013, 2014

NOTABLE COURSEWORK

Georgia Tech

- ECE 8803 Introduction to Quantum Computing
- CS 8803 Secure Multiparty Computation
- CS 7210 Distributed Systems
- CS 6727 Information Security Practicum
- CS 6725 Information Security Policies
- CS 6550 Advanced Algorithms
- CS 6340 Software Analysis
- CS 6265 InfoSec Lab Binary Exploitation
- CS 6238 Secure Computing Systems
- CS 6262 Network Security
- CS 6260 Applied Cryptography
- CS 6035 Introduction to Information Security
- CS 4510 Automata and Complexity Theory
- CS 3510 Design and Analysis of Algorithms
- MATH 6121 Abstract Algebra I
- MATH 4032 Combinatorial Analysis
- MATH 4432 Algebraic Topology
- MATH 4803 Knot Theory
- MATH 4431 Introduction to Topology
- MATH 4150 Number Theory
- MATH 4107 Abstract Algebra I
- MATH 4317 Real Analysis I
- MATH 4320 Complex Analysis
- MATH 4441 Differential Geometry
- MATH 4280 Information Theory
- MATH 3406 Second Course in Linear Algebra

[1] For my work developing CS4510 Section X.

[2] I won this award five separate times.

- MATH 3235 Probability Theory
- MATH 3012 Applied Combinatorics
- ISYE 3833 Linear Programming
- PHYS 4782 Quantum Information and Quantum Computing

Armstrong

- CS 5825 Artificial Intelligence
- CS 5700 Computer Security
- CS 3510 Theory of Computation
- CS 3330 Comparative Languages
- MATH 5160 Number Theory
- MATH 4900 Topological Graph Theory
- MATH 4340 Graph Theory
- MATH 4011 Real Analysis I
- MATH 4022 Real Analysis II
- MATH 3360 Modern Geometry
- MATH 3110 Abstract Algebra
- PHYS 3200 Math Methods for Physicists

EXTRA-CURRICULAR ACTIVITIES

I am a fluent programmer, with preferences for Python, C, and Rust. I also enjoy reading really old textbooks. I read a lot. I keep some of my writings on my blog at ladha.me/blog