

SHAURYA GOMBER

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Education

University of Illinois at Urbana-Champaign

Illinois, USA

Masters of Science (Focus: Formal Methods & PL), Computer Science; GPA: 4.0/4.0

Aug 2022 - May 2024

Key Courses: Formal Software Development Methods (A+), Program Verification (A+), Trustworthy AI Systems (A+)

Indian Institute of Technology, Guwahati

Assam, India

B. Tech., Computer Science and Engineering; GPA: 9.66/10

July 2016 - June 2020

Industry Experience

Applied Scientist Intern

June 2023 – Aug 2023

Zelkova team, Automated Reasoning Group, AWS, Amazon Inc.

Santa Clara, CA, USA

- Zelkova reasons about AWS access control policies by encoding them and verification conditions as SMT queries.
- Some semantics can be hard to encode in SMT, like conditions that rely on type-casting.
- For e.g.: allow access if a string S in the request context is numerically less than 42.
- Developed efficient encodings using SMTO (SMT with Oracles) to encode such **type-casting semantics**.
- This **solved $\sim 30k$ such production queries** (unsolved before) with avg. query solving time **1 min**.
- Also **contributed to CVC5's SMTO solver** by identifying/fixing bugs and improving the oracles I/O interface.

Software Engineer II

June 2020 – June 2022

Software Engineering Intern

May 2019 – July 2019

D.E. Shaw & Co.

Hyderabad, India

- Worked on firm's proprietary **distributed trading system**. Implemented features to streamline traders' workflows, made business logic changes, and optimized it to handle large amounts (TBs) of trading data.
- Participated in code reviews and design discussions for some major system components and mentored new joiners.
- *Intern:* Implemented a high-performance, **type-safe functional programming API** to read and write trading data on the on-premise database. Used it to get **60X run-time improvement** in production-critical scripts.
- Tech Stack: Java & C++ (backend), React (frontend). Misc: OCaml, Scala, Git, Python, Bash, Grafana.

Research Experience

Logic-guided learning methods | Prof. Gagandeep Singh, UIUC

Mar 2023 - Present

- Working on training Deep Neural Networks to adhere to logical (symbolic) constraints.
- Exploring ways to incorporate non-differentiable values (symbolic constraints, SMT solver outputs) as training loss
- Such networks can be used to speed up tasks needing adherence to logical constraints (like Program Analysis).

Inductive Syntax-Guided Synthesis | Prof. Madhusudan Parthasarathy, UIUC

Oct 2022 - Mar 2023

- Worked on solving syntax-guided synthesis (SyGuS) problems inductively using constraint solving (Z3 Solver).
- Explored ways to prune the search space by analyzing examples not satisfying the guessed candidate program.

Selected Projects

Efficient SAT Solver | Python | [Code](#)

- Implemented the *CDCL (Conflict Driven Clause Learning)* SAT algorithm, with state-of-the-art optimizations like 2-watched literals, Decision Heuristics (VSIDS, DLIS) and Restart Heuristics (Geometric, Luby).
- Devised new heuristics based on intelligent data structures (Priority Queues) and innovative restart strategies.

Monotonic Neural Networks | Python, Keras, Tensorflow, Numpy | [Code](#)

- Implemented a gradients-based loss method that enforces monotonicity while training neural networks.

Traffic Light Model Checker | NuSMV Model Checker | [Code](#)

- Used the *NuSMV Model Checker* to simulate the traffic lights model at a road junction.
- Verified its correctness by checking temporal-logic safety constraints like two lights can not be on simultaneously.

Compiler Construction | C++, Flex, Bison, SPIM simulator | [Code](#)

- Developed a *compiler for a C-like language* from scratch by implementing all stages of compilation.
- The stages include: lexical analysis, parsing, intermediate code generation, and target MIPS code generation.

Achievements

- **Institute Merit Scholarship IITG 2019:** \$2800 for scoring the highest grades in the academic year 2018-19.
- **Microsoft Code.Fun.Do 2019:** Among *top 10* national finalists (300+ teams, Topic: Blockchain Voting System)
- **ACM ICPC 2018:** Represented IIT Guwahati in India regionals held at Amritapuri, Kerala.