

Dipesh Kafle

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Curious Software Engineer with a strong interest in Programming Languages, Formal Verification and Systems Programming.

Education

National Institute of Technology Tiruchirappalli

2019-2023

B.Tech in Computer Science and Engineering

CGPA: 8.84/10

- Studied algorithms and data structures, discrete mathematics, computer architecture, operating systems, computer networks, databases, theory of computation, and compilers.

Work Experience

Uber

07/2023 – Present

Software Engineer

Bengaluru, India

- Primarily a backend engineer in the Trip Operations Platform team responsible for HITL (Human In The Loop) workflow orchestration and building a platform for knowledge workers.
- Working mostly with **Java**, **gRPC**, in-house dependency injection framework (based on **Spring Boot**), **Cadence** (A durable workflow orchestration engine), **Kafka** and **distributed databases** in my day to day work.
- Contributing to the frontend side of things as well using **Typescript**, **React** and **GraphQL**.

IIT Madras

07/2022 – 02/2024

Research Intern

Remote

- Worked with Dr. KC Sivaramakrishnan and Dr. Kartik Nagar alongside a PhD student on a project that aimed to verify an OCaml style garbage collector with F*/Low*.
- Helped with the integration of the extracted verified code with the [OCaml bytecode interpreter](#), ran real-world OCaml programs and ran benchmarks to analyze performance.
- Wrote a [next-fit allocator in Rust](#) which would then be hooked with the generated verified stop-the-world mark and sweep code. Analyzed performance using this before the bytecode interpreter integration.

Tarides

05/2023 – 07/23

Software Engineering Intern

Remote

- Worked on developing [Par_incr](#), a library for incremental computation with support for freshly introduced parallelism constructs in OCaml.

CDAC Bangalore

02/2023 – 05/23

Research Intern

Remote

- Developed a GCC plugin that transformed a familiar code snippet to highly optimized subroutines and another one that tuned loop unrolling heuristics based on linear regression model.
- Developed tool to visualize GCC's AST and filter out unnecessary information, to help with our program transformation experiments.
- Suggested potential ARM specific optimizations for future exploration.

Uber

06/2022 – 07/2022

Software Engineering Intern

Bengaluru, India

- Worked on improving reliability and observability of a service, involved setting up alerts and dashboards, integrating and collecting metrics, and error analysis.

Technical Projects

Par_incr

- A library for incremental computation with support for parallelism in **OCaml**. Other similar libraries lack parallelism constructs. The work is based on the paper [Efficient Parallel Self-Adjusting Computation](#). [[Slides](#)]
- Wrote the library from scratch and thoroughly tested it.
- Identified performance bottlenecks through profiling and applied various optimization techniques in OCaml.
- Wrote benchmarks, compared the performance with other similar libraries, and achieved similar if not better performance on average.

Code Character

- A strategy-based programming game where you control troops in a turn-based game with the code you write in one of the multiple programming languages (C++, Python, Java) available in the game.
- Worked on the implementation of the [simulator \(C++\)](#)
- Worked on the [game driver \(Rust\)](#). Implemented the process orchestration, communication among the game processes, concurrent execution of games. Leveraged different system programming concepts, such as inter-process communication, unix processes, epoll, pipes, SPMC channels, etc in the implementation.

Enma

- A programming language written in C++ and OCaml.
- The language has a uni-directional type checker and can be compiled to bytecode or readable C++ code. The bytecode interpreter is written in OCaml.

BF JITs

- Implemented Just In Time compilers for Brainfuck language using Dynasm and Inkwell crate (provides LLVM bindings) in Rust.

Pragyan CTF

- Prepared challenges for Binary Exploitation/Reversing category, involving a small custom memory allocator, reversing SIMD instructions, and other common vulnerabilities.

Talks and Writings

Understanding Memory Management

- [Slides](#), [Video](#)

Personal Blog

- [What is a Fixed Point Combinator?](#)
- [Non Local Jumps with setjmp and longjmp](#)

Skills

Programming: C, C++, Rust, OCaml, Java, Typescript, Python

Areas: Programming Languages, Systems Programming, Back-End Development, Databases

Languages

- **Nepali:** Native proficiency
- **Hindi:** Native proficiency
- **English:** Fluent (Professionally)