

# Shivansh Rai

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Aspiring graduate with a solid foundation in algorithms, networks and systems design, who is passionate about writing efficient code, solving challenging problems, and learning new technologies.

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## Technical Skills

- **Languages:** C, C++, Go, Python, Bash, Haskell, Java
- **Web Technologies:** TypeScript, Angular, Django
- **Tools:** Git, Vim, Linux shell utilities
- **Operating Systems:** Ubuntu, FreeBSD
- **Extensive Experience in:** Operating Systems, Compiler Design & Development, Testing, Networks
- **Interests:** Virtualization technologies, Containerization, Docker, Kubernetes

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## Distinguished Projects

### **MIPS Compiler for GoLang / Prof. Subhajit Roy**

[github.com/shivansh/goqo](https://github.com/shivansh/goqo)

- Implemented a Go language compiler using Go
- Generated lexer and parser using gocc toolkit
- Added support for multiple return values, defer statements and recursion, among other features
- Improved the generated MIPS assembly by implementing peephole optimizations and reaching definition analysis
- Implemented a mark-and-sweep garbage collector

### **B+ Tree Key Value Store / Prof. Amey Karkare**

[github.com/shivansh/kiwi](https://github.com/shivansh/kiwi)

- Implemented a B+ Tree based persistent key-value store in Haskell and Go obeying ACID properties
- Analyzed the two implementations to draw comparisons based on metrics such as performance and runtime memory requirements
- Identified the pros and cons of modeling in functional and imperative styles of programming

### **Statistical Bug Localization / Prof. Subhajit Roy**

[github.com/shivansh/bugLocate](https://github.com/shivansh/bugLocate)

- Explored the problem of statically localizing bugs in a given C program using statistical approaches
- Designed an instrumentor using Rose compiler and used it to improve branch predictions by learning all branch correlations using Pearson's chi-squared test

### **RTP Based Video Stream / Prof. Dheeraj Sanghi**

[github.com/shivansh/videoStream](https://github.com/shivansh/videoStream)

- Designed and developed a feedback driven real-time protocol (RTP) based video streaming application
- Implemented a lock-free reader-writer model for manipulating shared message queues

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## Work Experience

### **Google Summer of Code '17 / FreeBSD**

MAY 2017 – AUGUST 2017

- Developed an infrastructure to automate generation of tests for all the utilities in the FreeBSD base system
- Discovered and fixed a bug in the implementation of ln(1) utility in FreeBSD ([link](#))
- All code was reviewed and pushed to production
- [github.com/shivansh/smoketestsuite](https://github.com/shivansh/smoketestsuite)

### **Google Summer of Code '16 / FreeBSD**

MAY 2016 – AUGUST 2016

- Developed test scripts for regression testing of TCP/IP stack implementation in FreeBSD
- Used Google's packetdrill to develop test scripts
- Discovered and reported a bug in the behavior of TCP stack implemented in FreeBSD-11.0-Release ([link](#))
- All code was reviewed and pushed to production
- [github.com/shivansh/tcptestsuite](https://github.com/shivansh/tcptestsuite)

### **Full Stack Developer / NYC Office, IIT Kanpur**

SEPTEMBER 2015 – ONGOING

- Contributed to a large scale polyglot web application built with an extensive technology stack
- Designed and developed features for frontend using Angular2 and features for backend using Scala

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## Education

### **Bachelor of Science**

#### **Indian Institute of Technology (IIT) Kanpur**

**Major: Mathematics and Scientific Computing**

AUGUST 2014 – MAY 2019 (*anticipated*)

**Course Work:** Operating Systems, Compiler Design, Distributed Systems, Computer Networks, Linux Kernel Programming, Functional Programming, Data-Driven Program Analysis, Multi-agent Systems, Data Structures and Algorithms, Theory of Computation, Computer Systems Security, Computer Organization, Computational Methods, Fundamentals of Computing

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## Miscellaneous

- **Google Devfest '16**, IIT Kanpur: Winning team ([link](#))
- **Takneek '15**, IIT Kanpur: First runner up in Web-Dev, an annual web development competition ([link](#))