Ayush **Bansal**

Low Latency Software Developer

Indian Institute of Technology Kanpur · Computer Science and Engineering

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Fields of Interest

Systems & Security
Cloud Computing
Computer Networks
Computer Architecture
Distributed Systems
Programming Languages

Education

Indian Institute of Technology Kanpur

Kanpur, India

Bachelor of Technology, Major in Computer Science and Engineering — *2016 - 2020*

- Cumulative Performance Index / CGPA: 9.0/10.0.

Work Experience

Core Engineering, Tower Research Capital

Gurgaon, India

Low Latency Software Developer — *July 2020 - Feb 2021*

- Write efficient and maintainable automated software in C++ allowing us to ensure our correct position in the market.
- Develop cutting-edge software in C++ and Python which allow trading teams to run strategies smoothly.

Eightfold.ai

Noida, India

Software Developer Intern — *Apr 2020 - June 2020*

- Developed and enhanced the experience of the chatbot as part of the personalised career site product.
- Re-designed the complete product model to facilitate and setup Behaviour Driven Development style of testing using Selenium Framework.
- Configured and deployed the complete Alert Management System for the production & development environment.

Core Engineering, Tower Research Capital

Gurgaon, India

Software Developer Intern — *May 2019 - July 2019*

- Containerized and automated Trade Reconciliation setup to run as microservices on bare metal Kubernetes.
- Developed low latency software in C++ to facilitate integration and regression testing of Trade Reconciliation setup by inducing "deterministic mutations" on the network stream to simulate diverse un-reconciliation or trading-platform failure scenarios.
- Creation of integration testing setup allowed prevention of diverse trading-platform failure scenarios saving a lot of money and time.
- Received a Pre-Placement Offer even though there was no vacant position, out of ~35 interns.

Google Summer of Code

OpenPrinting, The Linux Foundation — *May 2018 - August 2018*

- Worked on the Common Print Dialog Project, developing backend to print to a file and "GTK3" adaptor backend connecting various Common Print Dialog backends installed at the time serving all available printers to the Common backend.
- The Dialog allowed access to the available printing queues such as "CUPS", "Google Cloud Print" and more via "Dbus" on the network/system.
- The Common Print Dialog allowed access to the printing queues of diverse applications without the need to install separate softwares for each.

New York Office, IIT Kanpur

Kanpur, India

Infrastructure Management & Full Stack Developer, Supervisor Prof. Manindra Agrawal — *May 2017 - Mar 2020*

- Worked on a scalable microservice based web application with an extensive technology stack.
- Designed and developed critical backend features while ensuring type-safety.
- Developed and deployed the data sharing functionality (using Kafka, Redis, Scala and Go).
- Deployed microservices utilizing Docker, Coreos Container Linux, ConcourseCI, JenkinsCI, and have maintained the cluster on Kubernetes.
- Configured and deployed complete Persistent Volume Storage System, ConcourseCI and pipelines for diverse microservices.
- Developed and deployed LeaderBoard, an Automated Ranking and Scoring System using Ruby on Rails.

Projects

InHs: An interpreter in Haskell

IIT Kanpur

Under Prof. Satyadev Nandakumar — *Sept 2019 - Nov 2019*

- Developed an interpreter from scratch in *Haskell* interpreting a simple kernel language such as *Oz*.
- InHs supported all the basic features of a declarative sequential and concurrent language such as application of non-suspendable and suspendable statements, unification of variables and values, maintenance of a single assignment store and a semantic multi-stack.
- InHs also extends the functionality of basic kernel languages to include features such as Lazy and concurrent executions via trigger store and Non-determism using Wait Statement, IsDetermined Statement and Message passing model via mutable store.

Certification: Issuing tamper-proof certificates

IIT Kanpur

Under Prof. Sandeep Shukla — *Apr 2019*

- A Blockchain based service issuing certificates which once issued cannot be altered by anyone, accomplished by making the hash of the certificate as part of the public *Ethereum* blockchain rendering it easily accessible and verifiable by anyone in the world.
- The service works on a multi-level hierarchical system in which the instructor/manager can issue certificates for the students/employees and once issued, no one can alter them and anyone in the world can verify the certificates, thus having a wide array of applications.

PyGo: A compiler for Golang in Python

IIT Kanpur

Under Prof. Amey Karkare — *Feb 2019 - Apr 2019*

- Developed a *compiler from scratch in Python* with *source language as Golang* and *target as x86_32*.
- PyGo supported all the basic features of Golang along with the advanced features such as optimizations, efficient register allocation, short circuiting, type checking and inference.

Exploiting Binaries using Return Oriented Programming

IIT Kanpur

Undergraduate Project, Prof. Debadatta Mishra — *Jan 2019 - Apr 2019*

- Worked with x86_64 binaries to invoke any particular syscall by performing static analysis and using concepts of Return Oriented Programming.
- Developed a tool for building a ROP chain from ROP gadgets to exploit the 64-bit binaries by invoking a particular syscall.

InVaSion: Input Validation with Symbolic Execution

IIT Kanpur

Research Project, Prof. Subhajit Roy — *May 2018 - Nov 2018*

- Worked on forking-based symbolic execution engines to tackle the problem of Path Explosion with goal of increasing code and branch coverage for programs requiring formatted inputs such image readers or video players.
- Formulated a framework to represent the formatted input as a FSA, an input specification language (ISL) to be used by a software.
- Developed a tool in Ruby to parse and compile the ISL, and appending this ISL to the input program, generating a set of logical constraints on execution by symbolic execution engine, with the goal of guiding symbolic execution tool to produce better inputs.
- Improved branch coverage by greater than 150% on the programs in Siemens Test Suite, MiBench and Tiff library which require formatted input.

Linux From Scratch: Compiled Linux System from Source and Built a Package Manager

IIT Kanpur

Association of Computing Activities — *Feb 2017 - Apr 2017*

- Created a *Customized Linux based operating system* by compiling all packages from scratch using the host machine's kernel.
- Built a *Package Manager* in python which fetched the dependencies of packages and created a dependency list based on packages installed.

Positions of Responsibility

Teaching Assitant Department of Computer Science and Engineering, IIT Kanpur — *July 2019 - July 2020*

- Tutored multiple groups of 40 students in basics of C programming, for the course "Introduction to Programming".
- Designed and graded assignments, quizzes and exams for the course of ~1000 students.

System Administrator IIT Kanpur — *Mar 2018 - July 2020*

- Administered a cloud in IIT Kanpur, deploying and managing services for the campus community.
- Participating in (and Organising) Capture the Flag contests.

Coordinator Programming Club, IIT Kanpur — *Mar 2018 - Feb 2019*

- Organized, and set problems for various capture the flag and programming contests on campus.
- Conducted lecture series and workshops on programming topics.
- Organized the Summer Camp & the Winter Camp, and mentored over 50 students in various topics who completed projects in distinct fields.
- Mentored 12 students in building IoT applications using Amazon Echo/Alexa and Google Home as a Semester Project.

Honors & Awards

2020	**Academic Excellence Award**, Exceptional Academic Performance, for 3 consecutive years.	*CSE, IITK*
2019	**Exceptional Course Tutor**, Academic Year 2019-2020, rated exceptionally good by the students.	*IITK*
2016	**All India Rank 187**, Joint Entrance Exam Advanced, 200,000 candidates	*India*
2016	**All India Rank 571**, Joint Entrance Exam Mains, 1.5 million candidates	*India*
2016	**All India Rank 52**, KVPY Scholarship, Indian Institute of Science and Government of India	*Bangalore, India*

Relevant Coursework

(A∗) Abstract Algebra	Discrete Mathematics	Theory of Computation
(A∗) Programming Tools and Techniques	Data Structures and Algorithms	Computer Organization
(A∗) Principles of Programming Languages	Algorithms II	Operating Systems
Computer Networks	Systems Security	Compiler Design
Probability and Statistics	Advanced Statistical Methods	Introduction to Machine Learning
Blockchain Technology & Application	Modern Cryptology	Designing Verifiably Secure Systems

A∗: Grade for Exceptional Performance

Skills

Languages C/C++, Python, Golang, Haskell, Scala, Ruby, Javascript/TypeScript, Oz, Java, Perl

Web Ruby on Rails, Akka with Scala, Node.js, React, Flask, Django, JavaScript, TypeScript

Utilities Linux shell utilities, Git, Docker, Ansible, AWS, Kubernetes, GDB, Postgres, MongoDB, LaTeX, Jenkins, Vim