Shrey Tiwari

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Education

PES University *Aug 2016 - Jul 2020*

BTech (honors) in Computer Science & Engineering (Systems & Core Computing), **Gold Medalist** *CGPA: **9.93***

Shri Chaitanya Pre-University College *Jun 2014 - Mar 2016*

12th Grade (Karnataka State Board), **Batch Topper** *Grade: **97%***

Sudarshan Vidhya Mandir Public School *Aug 2013 - Mar 2014*

10th Grade (ICSE Board), **Ranked 6th** *Grade: **93.33**%*

Research

`FixIt`: A Test-Driven Resource Leak Detection Tool for Production Cloud Services *Microsoft Research 2022*

Shrey Tiwari, Akash Lal, Suman Nath *To be submitted*

- We present a novel and lightweight instrumentation-based Resource Leak Detection tool for production cloud services. `FixIt` performs dynamic analysis by leveraging the program's test suite to accurately locate leaks in the source code of a service.

`RLCC#`: Resource Leak Checker for C# Code using CodeQL *Microsoft Research 2022*

Pritam Gharat, Narges Shadab, **Shrey Tiwari**, Akash Lal, Shuvendu Lahiri *To be submitted*

- We present a static analysis based Resource Leak Checker for C# programs. The tool and the algorithm for analysis are implemented using CodeQL. We compare `RLCC#`'s performance against `RLC`, the popular Java resource leak checker.

Work Experience

Microsoft Research *Jun 2021 - Present*

Research Fellow | Advisors: Dr. Akash Lal & Dr. Suman Nath *Bangalore, India*

- I am working in the **Cloud Reliability** Research and Innovation Area (RIA) at Microsoft Research India. The goal of the team is to "Shift Left" the Microsoft Azure cloud and prevent software bugs from reaching the production environment.
- My research aims at making Azure more reliable by developing a tool for resource leak detection. The tool was developed as a plugin for **Torch** (an internal dynamic analysis platform) and integrates with Microsoft's CloudBuild CI pipeline. It leverages a service's test suite to perform dynamic analysis for leak detection and is designed to be able to run and analyze over 100,000 unit tests daily.
- I created a benchmark suite modeled after real Azure incidents. Testing the tool against the benchmarks resulted in a **recall of 100% and precision of 79%**. Initial results prove the soundness of our hypothesis and show that our dynamic analysis based approach is a promising way of advancing the state-of-the-art.
- I am also involved in evaluating a static analysis based Resource Leak Checker for C# programs (built using CodeQL) and comparing its performance against the Checker Framework's resource leak checker for Java.

Citrix Systems *Jul 2020 - Jun 2021*

Software Engineer | Supervisor: Mukul Agarwal *Bangalore, India*

- I was a **core developer for the Citrix Cloud Connector** component. This product is a crucial component of the cloud-based "VPN Gateway as a Service" offering and is responsible for serving over **3 million long-running VPN tunnels per week**.
- I was responsible for end-to-end management of the software and my duties involved taking ownership of feature development, bug fixing, production environment monitoring, and on-call live site management.
- I helped increase the cloud connector's **test coverage to over 90%** and it ultimately became the most reliable component of the entire cloud-based VPN solution product lineup.
- It was essential for me to understand the entire end-to-end VPN solution to perform my job. I built an in-depth understanding of the deployment plans, networking between microservices, design decisions, authentication and communication protocols, log formats, and monitoring and auto-recovery systems. I honed my technical as well as soft skills in the process.

Citrix Systems *Jan 2020 - Jun 2020*

Software Development Intern | Supervisor: Mukul Agarwal *Bangalore, India*

- I implemented a robust **test automation platform** for the Citrix VPN Gateway client. The platform enabled easier and more frequent testing of code changes by eliminating all the manual testing efforts. The total testing time was reduced from **2 days to 5 hours**.
- I was involved in handling customer issues and resolving reported bugs. I gained a lot of experience in Windows debugging including areas such as dump file analysis and performance monitoring.

Morgan Stanley

May 2019 - Jul 2019

Technology Analyst Intern | Supervisor: Vignesh Natarajan

Bangalore, India

- I worked with the Tax Processing team and used docker to containerize the "Data Influx Adapter", a crucial component of the tax lot processing pipeline. I evaluated the newly developed software using an input dataset of **6 million tax lots**. Results showed that the **cost savings** were immense while maintaining the product performance.
- The containerized version was quickly adopted and deployed into the production environment. It greatly improved **code portability** and boosted **developer productivity**.

Indian Institute of Science

May 2018 - Aug 2018

Research Intern | Advisor: Prof. Arkaprava Basu

Bangalore, India

- I interned at the Computer Systems Lab in IISc under the **Narendra Summer Internship** program. I was **one** among **19** students selected from a pool of over **2500** students all across India. My research focused on the dynamic detection of **heterogeneous data races** in General Purpose GPU (GPGPU) programs that employed the CUDA programming model.

Selected Projects

Futuristic Homes: A Practical Take on Secure, Economical and Voice-enabled Smart Home Automation Systems

Aug 2019 - Jun 2020

Center for Information Security, Forensics and Cyber Resilience (ISFCR), PES University

- **Architected** and **implemented** a smart home automation solution that is secure by design, platform-agnostic (with respect to voice assistants), and fully scalable. The project involved bringing together various technologies in the fragmented IoT landscape to make an elegant, robust and intuitive solution for the automation and control of IoT networks found in homes and offices.
- The differentiating factors for the solution are its **security by design** and **cost-effectiveness**. To keep the costs minimal, we ensured that regular home infrastructure as well as smart home appliances interface well with the solution. We performed a Use and Misuse case study along with threat modeling on the initial architecture to eliminate security vulnerabilities and to establish **defense in depth**.
- **Skills:** C • Python • Node.js • Docker • Home Assistant • Arduino & Raspberry Pi • Actions on Google & Alexa Skills • IFTTT

Selfless Acts: Platform for Photograph Sharing

Jan 2019 - Apr 2019

Cloud Computing & Big Data (CCBD), PES University

- **Designed** and **implemented** a social media platform for image sharing (similar to Instagram) but for sharing pictures depicting individuals performing selfless acts for the environment, people, or animals. Working on this project gave us an in-depth understanding of **cloud computing technologies**.
- The project involved front-end development, implementation of REST APIs, designing microservices, deployment of a containerized application in the cloud using docker, load balancing the service, and more.
- **Skills:** Python • Docker • Node.js • MongoDB • Amazon Web Services (AWS)

Indian Cricket League Simulation and Score Prediction

Aug 2018 - Nov 2018

Cloud Computing & Big Data (CCBD), PES University

- We simulated Indian Premier League (IPL) cricket matches and compared the results obtained with the true outcome of the matches. We made use of **Big Data technologies** and **Distributed Systems (Hadoop)**.
- We scraped data from the internet and performed pre-processing to convert it into a usable format. We performed multiple tasks such as "player clustering" and "match event prediction" using this data. We used the results from these tasks to ultimately simulate matches.
- **Skills:** Python • Scala • Hadoop • Spark • Google Cloud Platform (GCP)

Sounds Like Data: Analysis and Prediction of Song Popularity

Aug 2018 - Nov 2018

PES University

- "*What factors determine a song's popularity?*" We used the **10,000 song subset** of the Million Song Dataset and analyzed their audio features, metadata, and the associated musiXmatch lyrics dataset to gain insight on this question. Subsequently, we **visualized** our findings and built several **machine learning models** to predict the song's popularity. Link to full project: Sounds like data.
- **Skills:** Python • Pandas • Scikit-Learn • LaTeX

Big Integer Math Library

Mar 2018 - Apr 2018

PES University

- I implemented a math library to perform large integer operations (limit: **23,249,425 digits** long). I designed an efficient processing algorithm to maximize the CPU (Arithmetic and Logic Unit) utilization and sped up the program given the hardware specifications.
- **Skills:** C • Data Structures

Farmer's Help: Autonomous Robot for Harvesting Produce

Aug 2016 - Nov 2016

PES University

- I built a physical prototype of a large-scale **autonomous robot** that helps farmers with harvesting their produce. The robot identifies the ripe fruits and proceeds to pluck them without human intervention.
- **Skills:** C • Python • OpenCV • Arduino • Sensors & Servos

Awards & Scholarships

Gold Medalist Awarded a **gold medal** for ranking **second** in the entire batch of 500+ CSE students, PES University, class of 2020

CNR Rao Scholarship Six-time recipient of the CNR Rao Merit Scholarship awarded to the **top 5** students (every applicable semester)

MHRD Scholarship Six-time recipient of the MHRD Merit Scholarship awarded to the **top 20%** of students (every applicable semester)

Achievements

MSR Jigsaw Hackathon Winner of the Microsoft Research hackathon held for all the research fellows and interns, 2021

Epsilon CTF Competition Winner of the capture the flag competition held as part of the college technical fest, 2018

Skills

Tools Git, Docker, Jenkins, Splunk, Kusto, CodeQL, IFTTT, Postman

Languages Python, C, C++, C#, Golang, JavaScript, SQL, LaTeX

Miscellaneous CUDA, Node.js, Flask, Selenium, Bash, PowerShell, Pandas, Spark, Azure

Presentations

Microsoft Research Gave a talk about research work at the **Cloud Reliability Workshop** *Feb 2022*

IISc Bangalore Presented a poster on my research work at the end of internship exhibit *Jul 2018*

Memberships

Microsoft Research **Committee Lead**, Research Fellow Socials *Jan 2022 - Present*

Citrix Systems **Member**, Toastmasters International Club *Jan 2020 - Mar 2021*

PES University **Student Researcher**, Center for Information Security, Forensics and Cyber Resilience *Aug 2019 - Jun 2020*

PES University **Student Committee Lead**, Centre for Innovation and Entrepreneurship *Jan 2018 - Oct 2019*

Workshops

Jan 2023 Workshop on Trustworthy AI (UPenn, Microsoft Research, Wadhwani AI)

Jul 2018 IISc CSA Summer School on Computer Science Research

Extracurricular Activities

Corporate Social Responsibility (CSR) Volunteer

Citrix Systems

- I helped set up Rainwater Harvesting units at a government school in Devanahalli, located in Bangalore, to help overcome the water shortages faced during the summer. I also participated in the school decoration activity where we painted classical art forms on the school walls to increase student interest and engagement.

GDC I-NCUBATE Cohort 6 Member

Indian Institute of Technology, Madras

- I participated in a gripping, intensive program on entrepreneurship and customer validation conducted by the "Gopalakrishnan-Deshpande Centre for Innovation and Entrepreneurship", IIT Madras, in collaboration with IISc Bangalore. I learned to "Start with a problem, not with a solution".
- I understood the importance of customer interactions by conducting 100 face-to-face customer interviews. The program and all its activities helped in developing a lean entrepreneurial mindset that complements an engineer's thought process.

Entrepreneurship Boot Camp Member

PES University

- I participated in the boot camp held by the "Centre for Innovation and Entrepreneurship" club. The centre held weekly sessions to introduce entrepreneurship and decode the start-up journey of guest entrepreneurs across diverse fields.
- Filled with fun activities and examples, it was a great opportunity to learn more about entrepreneurship and interact with experienced entrepreneurs and start-ups. The boot camp offered students an in-depth understanding of entrepreneurship, business, and intrapreneurship.