



# Yuvraj Singh Malhi

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## Education

### Birla Institute of Technology & Science, Pilani (BITS Pilani)

Pilani, India

BACHELOR OF ENGINEERING (ELECTRONICS AND INSTRUMENTATION)

2018 - Present

- Courses** — Computer programming, Network programming, Data structures, Cloud computing, Microprocessor programming.
- Positions** — Teaching assistantship (01), Undergraduate research assistantships (04), Industry internships (02).

### Central Board of Secondary Education

Bangalore, India

SENIOR SECONDARY

2018

- JEE percentile: **99.38%**. SAT Subject score in Mathematics: **800/800**
- Aggregate percentage in engineering subjects: **95.2%** – Class Rank: **3**

### Central Board of Secondary Education

Bangalore, India

SECONDARY

2016

- Grade Point: **10/10** – Class Rank: 1. Received **Certificate of Merit**

## Research

### RESEARCH EXPERIENCE & FORMAL PROJECTS

#### IIT Kanpur, c3i Cybersecurity Division

Kanpur, India

RESEARCH INTERN

May 2021 - July 2021

- Among **top 5** students from India selected to be a part of the **Intrusion Detection Team** of IIT's cybersecurity division. Learnt about IDS roles, applications, working mechanisms, limitations, and future prospects.
- Surveyed and categorized IDS solutions for **non-encrypted and encrypted traffic analysis** based on application and detection mechanism.

#### Undergraduate Research Assistant, BITS Pilani

Pilani, India

PROJECT WITH PROFESSOR VIRENDRA SHEKHAWAT ON **INTRUSION DETECTION SYSTEMS FOR IoT USING ML** - 10/10

Spring 2021

- Designed and implemented **network IDS for IoT devices** to overcome design flaws of existing intrusion detection systems. This IDS can detect 22 types of attacks with help of three ML based modules using **Random Forest, ANN, Decision Tree, and XGBoost** algorithms.
- Central Module used for attack detection & classification with F1 Score **94.41%**. One among two edge modules used for only attack detection at IoT edge with F1 scores of **99.98%** and **99.87%**.

PROJECT WITH PROFESSOR HARI BABU ON **MITIGATING DoS/DDoS ATTACKS IN SDN DATA PLANES** - 10/10

Spring 2021

- Surveyed and analyzed methods used to **detect and mitigate** Denial-of-Service (**DoS**) and Distributed Denial-of-Service (**DDoS**) attacks at **Data Plane** level in Software Defined Networks (SDN) using P4 language.
- Identified **limitations of P4** for attack detection and mitigation such as: No support for loops and for complex functions, and minimal support for mathematical analysis. This project is further being used by students to develop a defense solution at data plane level.

PROJECT WITH PROFESSOR RAHUL SINGHAL ON **NOVEL OPTIMIZATION TECHNIQUE OF LOW LOSS ANTENNA** - 10/10

Fall 2020

- Designed a simple and efficient **regression optimization** technique for designing antennas with low return loss (< -15 dB).
- Used the designed technique on **MATLAB** to optimized a 2.4 GHz Patch antenna **4X faster**.

PROJECT WITH PROFESSOR NAVNEET GUPTA ON **COMPARISON OF ANN SOFT COMPUTING TECHNIQUES FOR ANTENNA DESIGN** - 10/10

Spring 2020

- Worked on soft-computing, artificial neural network, and their combined use for **low cost calculations**.
- Compared performance of **22** combinations of networks and optimization algorithms for designing a rectangular patch of a Microstrip antenna. This test was carried out for different use-case frequencies of **WiFi** (5 GHz), **Bluetooth** (2.48 GHz) & **3G** (1.8 GHz).
- Achieved highest accuracy of **99.938%** with Reduced Radial Basis Network and quickest training time of **0.001s** with Generalized Regression.

### PAPERS & PUBLICATIONS

#### Two-Level Machine Learning Driven Intrusion Detection Model for IoT Environments [Pre-print]

[Geneva | Read paper](#)

Y.S. Malhi, V.S. Shekhawat, [IN REVIEW] INTERNATIONAL JOURNAL OF INFORMATION AND COMPUTER SECURITY (IJICS)

TBD

#### A Comparative Study on Industrial Multiphase Flow Measurement Techniques

[Assam, India | Read Paper](#)

Y.S. Malhi, P. Grover, R.N. Ponnalagu, 8TH INTERNATIONAL AND 47TH NATIONAL CONFERENCE ON FLUID MECHANICS AND FLUID POWER (FMFP)

Dec 2020

#### Comparison of ANN based Soft Computing Techniques for Electromagnetic Modeling of a Microstrip Patch Antenna [Pre-print]

[Jaipur, India | Read Paper](#)

Y.S. Malhi, N. Gupta, [IN REVIEW] 6TH INTERNATIONAL CONFERENCE ON SOFT COMPUTING: THEORIES AND APPLICATIONS (SOCTA-21)

TBD

## Work Experience

### Samsung Research & Development Institute

Bangalore, India

NETWORK AND SYSTEMS INTERN

July 2021 - Present

- Working on **ML-based log analysis** for **system fault detection** and post-mortem **root cause analysis**.
- Working on **anomaly detection** by monitoring system background information in order to take preventive action before hard failure occurs.

### lotlot

Pune, India | [See Project](#)

LINUX AUTOMATION INTERN

Dec 2019 - Jan 2020

- Automated** the process of notifying user on occurrence of a specific event.
- Created an **SMTP client** with CLI in **C++** to send TLS encrypted emails using **cURL** library.

### Larsen & Turbo Chiyoda

Gujarat, India | [Read Paper](#)

SUMMER INTERN

May 2020 - July 2020

- Identified and documented state-of-the-art instrumentation techniques and devices used in **complex multiphase flow measurement**.
- Published 'A Comparative Study on Industrial Multiphase Flow Measurement Techniques' in FMFP 2020.

### Student's Society of Mess Services (SSMS)

Pilani, India

MESS SECRETARY, SSMS GOVERNING COUNCIL MEMBER

Aug 2018 - July 2019

- Part of a 13 member governing council responsible managing day-to-day mess activities, quality assurance, infrastructure development, re-newing tenders, and resource allocation of over **200 employees** and having annual budget of more than **Rs 2 Crore**.

## Additional Projects

### Ultra Fast Trace-route

[See Project](#)

- A concurrent server runs traceroute on multiple domains and give results within **3 sec**, which is up to **10X faster** than standard traceroute.
- A TCP client runs on a separate window to find the **longest common routing path** among given set of domains.

### Linux shell with added functionality

[See Project](#)

- A clean and verbose **command shell** built in **C** that can support output redirection and almost all **CLI commands** like ls, cat, grep etc.
- Additionally, this shell includes two new commands: **double pipe** `||` and **triple pipe** `|||`.

### Concurrent TFTP Servers

[See Projects](#)

- Created a TFTP single process server to handle multiple clients concurrently using **listen** call on multiple client FDs. Speed: **~25 Mbps**.
- Created a TFTP **multi process server** to handle multiple clients by creating a new child server for each client. Speed: **~50 Mbps**.
- These servers are incorporated with unresponsive client **timeouts** and can run in **verbose** mode.

### Ultra-fast URL Port Scanner

[See Project](#)

- Scans URL open ports upto **10X faster** than traditional scanners by using upto 100 of child scanners **concurrently**.
- The scanner also **lists all IPv4 and IPv6 addresses** allotted to each URL.

### Simple Hadoop Implementation

- Replicated a simpler version of **Google File Storage** by creating client, data server and meta-data server. Client uploads files in chunks and **distributed data servers** store 3 separate copies of each chunk to ensure **availability** in case any data server crashes.
- All IPC (Inter process communication) for download, upload, permission, and **security** of files is facilitated by the **meta-data server**.

## Teaching

### Teaching Assistant, BITS Pilani

Pilani, India

TA OF PROFESSOR HARI BABU FOR THE COURSE 'IS F462 NETWORK PROGRAMMING'

July 2021 - Present

- Selected as teaching assistant for a **graduate level course** to conduct **networking programming labs** and doubt clearing sessions.
- Responsible for correcting **lab assignments** and providing inputs for lesson plans.

### Manzil (NGO)

Delhi, India

TEACHER

Aug 2020 - Present

- Part-time volunteer teacher of **English** and **C++** classes conducted for under privileged children.

## Interests & Extracurricular Activities

<b>DOMAINS</b>	Present – ML/DL, Security of: Software, Networks, Systems. <b>Past</b> – Digital VLSI, Competitive coding
<b>LANGUAGES</b>	<b>Proficient</b> – C, C++, Python, MATLAB. <b>Basics</b> – Java, HTML, Assembly language, Spice
<b>MOOC COURSES</b>	Ethical hacking courses (02), Network security courses (01), Machine learning (02), Research paper writing (01)
<b>EXTRACURRICULARS</b>	Reading, Teaching, Hockey ( <b>University team</b> ), Running, Punjab Cultural Association
<b>HONORS &amp; AWARDS</b>	Best <b>all-rounder</b> award (2018), School <b>Pupil Leader</b> (2018), <b>1st</b> in National Astronomy Olympiad (2017)
<b>SCHOLARSHIPS</b>	Class 12 outstanding performance (2018), FIITJEE Scholarship (2017), AFSH Class 10 outstanding performance (2016)