

# Anirudh Nakra

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## EDUCATION

### Delhi Technological University

#### Bachelor of Technology

Major: Electronics and Communication Engineering

Capstone Research: Circularly polarized antennas for 5G systems

Department rank 1: 7<sup>th</sup> semester, Department rank 1: 6<sup>th</sup> semester, Department rank 3: 5<sup>th</sup> semester, Department rank 3: 4<sup>th</sup> semester

New Delhi

Jul 2021 (Expected)

CGPA: 8.9 (Till 7th Semester)

Last 60 Credit Hours CGPA: 9.77

### Delhi Public School, RK Puram

#### Class 12, CBSE

Principal's Gold Medalist

Top 2.5 percentile of CBSE Board 2017 (all India)

Top 1.5 percentile of JEE Mains 2017

New Delhi

Jul 2017

Percentage: 96.4%

## PUBLICATIONS

1. **Anirudh Nakra**, Abhijeet Vats, Asok De "Design of High Bandwidth Circularly Polarized Antipodal Vivaldi Array for 5G Applications"  
Accepted at **IEEE International Conference of Emerging Technologies (INCET) 2021**

## RESEARCH AND WORK EXPERIENCE

### Research Intern, Neuromechanics group, Centre for Biomedical Engineering (Remote due to COVID-19)

#### Indian Institute of Technology, Delhi

Sept 2020—Present

Delhi, India

- Working on devising a computational model and an IOT/Wearable based framework for COVID-19 prediction
- Reviewing the effectiveness of oxygen saturation, ECG ST-segment elevation, respiratory rate in pandemic prediction models
- Analyzing and implementing various SIR, MLP-ICA, ANFIS, SVM, ANN like CDNet based ML models
- Review paper in preparation to be submitted to IEEE Reviews in Biomedical Engineering

### Lead Undergraduate Researcher, Department of Electronics & Communication Engineering

#### Delhi Technological University

Aug 2020—Present

Delhi, India

- Working on "Design of High Bandwidth Circularly Polarized Antipodal Vivaldi Array for 5G Applications"
- CST and HFSS implementations of antennas such as printed lotus Quasi Yagi and Antipodal Vivaldi antenna
- CST implementation of high isolation 6 stage Wilkinson Power Splitter
- Design of broadside coupling based 90-degree phase shifter
- Designed the integrated system with an Axial Ratio that was 0.098 dB at the design frequency
- Ongoing refinement of design to fabricate the system

### Lead Undergraduate Researcher, Department of Electronics & Communication Engineering

#### Delhi Technological University

Aug 2019—Present

Delhi, India

- Working on "Terrain Imaging for Locomotive Drivers – Infra-Red, Enhanced Optical and Rangefinder Assisted."
- MATLAB implementation of rail line detection using Radon and Hough transform.
- MATLAB implementation of night time object detection using modified DECOLOR and adaptive thresholding
- Created a noise removal hybrid MRF-dark channel prior system via OpenCV and MATLAB
- Formulating fusion-based template matching and coupling system for better object detection results. Manuscript in preparation.
- Implemented moving image optical flow system and improving the results using "normal flow" methodology

### Summer Research Intern, Department of Electronics & Communication Engineering

#### Delhi Technological University

Jun-Jul 2020

Delhi, India

- Worked on old manuscript classification system of scripts such as Tamil, Telugu, Devanagari
- Analyzed different document matching systems: SWM, MODS, HWNet
- Created a literature review of different segmentation methodologies in complex scripts: Docstrum, Voronoi, XY Cut, Smearing
- Surveyed HWNet based framework for robust word spotting and recognition in handwritten word images
- Studied and compared text document classification models on multilingual and monolingual text documents: LINGO, SVM, LanideNN

### RADAR Intern

#### Bharat Electronics (BEL), Sahibabad

Jun-Aug 2019

Ghaziabad, U.P., India

- Trained on the basics, operations and applications of RADAR systems deployed by Indian Armed Forces
- Worked on the company's venture 'Rohini Radar' comprehending the related industrial practice
- MATLAB simulation of various antennas and RADAR technologies such as CFAR, Patch Antennas, Pulse compression
- Awarded "Excellent" grade in BEL internship

## PROJECTS

### Construction of a novel CO-OFDMA WDM integrated RoF system

Aug2020- Oct 2020

- Synthesized a circuitry system for WDM- Coherent OFDMA system on Optisystem software
- Improving noise margins and increasing SNR by modifying the receiver system based on an intradyne based architecture
- Suggested coherent intradyne based receiver and filter modifications to decrease BER and created a new RF-optical transmitter and receiver
- Successful in creating a working model and working on a preliminary draft for a research paper

### Digital Signatures: Applications and Implementations

2020- Oct 2020

- Literature review and identification of important SoC and software-based schemes for communication encryption such as hashing
- Simulating basic ciphers such as Caesar, different substitution cipher and ciphers like Vigenere, Base64, Playfair, RSA on C++ and Python
- Implementation of cryptographic algorithms like Secure hash, ECDSA, RSA
- Application based study done comparing the effectiveness of the ciphers and algorithms in different situations

### Comparison study on different microwave frequency antennas and their applications

Aug-Oct 2020

- Implemented different microstrip patch antennas and presented patch geometry modifications such as a circular or pentagonal shape
- Created Vivaldi and Quasi-Yagi antenna designs from scratch along with their parameter and dimensional calculations
- HFSS implementation of 5 antennas: microstrip patch, modified microstrip patch, UWB microstrip patch, Vivaldi and Quasi Yagi
- Comparison of the workings of different antennas based on parameters like radiation efficiency, return losses, Q/Qib, directivity, etc

### Verilog implementation of Multiple Input Signature Register (MISR) and Type 1/Type 2 Linear Feedback Shift Register (LFSR)

Jan — Jun2020

- Created a literature review of LFSRs and analyzed their performance parameters such as power consumption, propagation delay
- Implemented on Verilog HDL and C++ Type 1 LFSR, Type 2 LFSR, MISR, Geffe generators, Cellular Automata
- Created a novel communication scrambler using a modification of an existing LFSR polynomial
- Suggested improvements over existing systems such as GLFSR, Weighted PRNG, Low power LFSR design through VLSI logic

### Radio Frequency Identification (RFID) Based Indoor Navigation System for Visually Impaired

Apr-June2020

- Created a navigational aid system for the visually impaired via RFID
- Created a hardware architecture to interface and use the system using MINI-MAX 51, EMIC module, SR-07 Kit, Parallax RFID reader
- Devised a framework and modified the A\* algorithm to suit our needs by implemented a navigating software based on F, G and H costs.
- Implemented the whole system using Proteus 8.6 and MPLAB X IDE v8.63 in C language.

### Design of a microprocessor-based traffic signal controller for a junction of four roads

Sept-Nov 2019

- Created a 8085 based traffic signal controller
- Setup was chosen as to emulate the actual traffic conditions with a roundabout
- The algorithm was implemented on MASM assembler and a presentation was given to the Laboratory Teacher in charge
- Awarded the highest grade based on the ppt, verbal presentation and actual code implementation

## RELEVANT COURSEWORK & GRADES

Communication Systems (O)	Wireless Sensor Networks (O)	Microprocessors and Interfacing (O)
Digital Communications (A+)	Linear Integrated Circuits (O)	Analog Electronics- II (O)
Digital Signal Processing (O)	Embedded Systems (O)	Electromagnetics (A+)
Computer Vision (O)	Digital Electronics- II (O)	Computer Architecture (A+)
Machine Learning (O)	VLSI Design (O)	Testing & Diagnosis of Digital System Design (O)

### Independent Studies:

MIT OCW 2018: Matrix Methods in Data Analysis, Signal Processing, and Machine Learning  
IITD Robothlon 2019: Project workshops on IoT, AI&ML, Robotics  
Coding Blocks 2018: Certificate course on python fundamentals  
Coursera: Computational Neuroscience (Ongoing)  
Coursera: Deep Learning Specialization (Ongoing)

## TECHNICAL COMPETENCIES

- Language skills: Python (pandas, numpy, scipy), MATLAB, openCV, Embedded C, LaTeX, VHDL, Verilog HDL, C++, C, HTML, MASM
- Technical Softwares: HFSS, OrCAD Capture CIS, OrCAD PSpice A/D, Proteus, Xilinx ISE, Cadence Virtuoso, OptiSystem, Simulink, LTSpice, Xilinx Vivado, Anaconda, Clion, Turbo C++
- General Software: Microsoft Word, Microsoft Excel, Adobe Photoshop (Elementary), Blender (Elementary)
- Languages: Hindi, English, Korean (Elementary)