Saurav Roy

Research Scholar, Indian Institute of Science, Bangalore
"Education is, not a preparation for life; education is life itself"

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Research Interests

- RF MetamaterialS
- Microwave Imaging
- Particle Swarm Optimization
- Antenna Design
- Software-Defined Radio

Education

2020–present **Indian Institute of Science, Bangalore**, M.Tech(Research) and PhD in Electrical Communication Engineering **CGPA: 9.0/10**.
Medium of Instruction: **English**

2015 **Indian Institute of Engineering Science and Technology, Shibpur**, B.E. in Electronics and Telecommunication Engineering **CGPA: 8.15/10 (First Class with Honours)**.
Medium of Instruction: **English**

Academic Achievement

- Recipient of the Prestigious Prime Minister's Research Fellowship (PMRF), March 2023.
- Indian patent no. 435646: "A Digitally Reconfigurable Meta-Surface for Communication in Scatter-Rich Multipath Channel" (26.06.2023).
- Roy, Saurav, Aritra Roy, and K. J. Vinoy. "Implementation of Noncoherent Media-Based Modulation With a Reconfigurable Metasurface." 2022 IEEE Microwaves, Antennas, and Propagation Conference (MAPCON). IEEE, 2022.

Research Experience

Doctoral Thesis (Ongoing) **Reconfigurable Metasurface Inspired Digital Communication and Microwave Imaging**.
Advisor: **Prof. K J Vinoy**
Brief Description of the Problem :
- Metasurface refers to a planar surface made of sub-wavelength unit cells and the addition of diodes converts it to an electronically Reconfigurable Metasurface(RM).
- Media-Based Modulation(MBM) embeds the information in the variation of the propagation medium and hence modulates the RF carrier by incorporating a RM close to the transmitter antenna.
- The number of reconfigurable states decides the number of transmitted symbols vis-'a-vis the alphabet size through mutually independent channel utilization in a rich scattering environment.
- We demonstrate a non-coherent MBM scheme where the symbols comprise only the amplitude of channel fading coefficients sans RF phase with potential applications.
- RM-based imaging system is a type of electronic scanning system and it facilitates static imaging hardware by generating spatially diverse radiation patterns.
- When they are augmented with the recent computational techniques such as compressive sensing, the burden of image-quality improvement shifts from hardware design to software tools.
- We look into the possibility of resolution improvement and the applicability of compressive sensing when the rank of the measurement matrix is constrained by the number of pixel characterizations.

UG Thesis	**Digital Multiple Topology IIR Filter Design Using FPGA**.
	Advisor: **Prof. Ayan Banerjee**
	Brief Description of the Problem :

- Four types of digital filters were designed: Butterworth, Chebyshev Type-I and Type-II and Elliptic
- MATLAB simulation was performed to obtain frequency domain response of the designed filters
- Schematic design of various architectures was performed in Spartan Xilinx
- Behavioral simulation and verification of all the filters was performed in VHDL

Academic Projects

Autumn 2020   **Implementation of Uniaxial PML for Truncation of FDTD Space**.

Instructors: **Prof. K J Vinoy, Prof. Dipanjan Gope**
Course Name: **Computational Electromagnetics**
Brief Description of the Project:

- To truncate the FDTD problem space with minimal reflections from the boundaries,a lossy uniaxial medium based PML boundary was used
- Simulation was performed in MATLAB for 2D free-space.
- The parameters of the UPML media which were affecting reflection from the boundary are: no. of UPML layers, maximum conductivity in UPML media and the order of polynomial

Autumn 2020   **Improving FFT Frequency Measurement Resolution by Parabolic and Gaussian Spectrum Interpolation**.

Instructors: **Prof. Prasanta kumar Ghosh, Prof. Soma Biswas**
Course Name: **Digital Signal Processing**
Brief Description of the Project:

- Parabolic interpolation and Gaussian interpolation methods were used to improve frequency resolution of discrete Fourier spectrum
- MATLAB simulation confirmed a large frequency resolution increase with small computing cost
- For Gaussian interpolation more than two orders of interpolation gain was observed

Spring 2021   **A Single-Layered Spoof-Plasmon-Mode Leaky Wave Antenna with Consistent Gain**.

Instructor: **Prof. Debdeep Sarkar**
Course Name: **Antenna Theory and Practice**
Brief Description of the Project:

- A leaky wave antenna was designed using a CPW line and a Surface Plasmon Polariton structure and the simulations are performed in CST Microwave Studio
- The simulations showed consistent high gain above 9 dB and 70 % efficiency throughout the bandwidth of 10.4–24.5 GHz and gain above 11 dB between 16-24 GHz.
- The simulations also confirmed a good broadside radiation pattern and a scan angle of 90 degrees

Spring 2021   **Composite Right-Left Handed Coupled Line Bandpass Filter**.

Instructor: **Prof. K J Vinoy**
Course Name: **Radio Frequency Integrated Circuits and Systems**
Brief Description of the Project:

- A bandpass CRLH coupled line filter was implemented by replacing both arms of the conventional RH coupled line microstrip filter with CRLH unit cell
- An interdigital capacitor as series capacitor and a short circuited stub as shunt inductor are used in modeling the unit cell of the CRLH filter
- Simulation was carried out in ADS and CST Microwave Studio

Relevant Course Work

Graduate   Antenna Theory and Practice, Radio Frequency Integrated Circuits and Systems, Computational Electromagnetics, Digital Signal Processing, Design of Cyber-Physical Systems, Mathematics for Electrical Engineers, Electromagnetic Metamaterials, Stochastic Models and Applications,

Undergraduate   Electromagnetic Theory and Radio-Wave Propagation, Transmission Lines and Waveguides, Antenna Engineering, Microwave and RADAR Engineering

Work Experience

Designation	**Junior Executive Officer**
Role	Air Traffic Controller (ATC)
Duration	10.2015 - 04.2019
Company	**Airports Authority of India**
Office	NSCBI Airport, Kolkata

Scholastic Achievements

- Recipient of the **AICTE, Government of India** Scholarship for Graduate Studies
- Recipient of the **Indian Oil Merit Scholarship** for Undergraduate Studies and 12th standard
- Recipient of the **Merit-cum-Means Scholarship** from the State Govt. of West Bengal for Undergraduate Studies and 12th standard
- Secured an All India Rank of **745** in **GATE 2020**
- Secured a rank of **399** in **WBJEE 2011** out of approximately *1,30,000 students*
- Received **Gold Medal** in school for good performance in 10th standard

Skills and Activities

Programming	Python, MATLAB, C
Software	CST Microwave Studio, MATLAB, Keysight ADS, GNU-Radio, LaTeX
Activity	Founding member of the IEEE MTT/AP-S Student Branch Chapter, IISc Bengaluru
Activity	Member of ECE dept. wellness committee

Certificates

- Certificate of Basic life support training(2023)
- Certificate of Appreciation(2021): **Science for Rural India Group, IISc**
- Industrial Training Completion Certificate from **Siemens Ltd.**(2014): Elevator Designing Using Programmable Logic Controller

Language

- Bengali, English, Hindi

Interests

- Football, Table Tennis, Badminton, Running, Watching Movies, Cooking

References

- **Dr.K J Vinoy**, Professor & Chair, Department of Electrical Communication Engineering, Indian Institute of Science,Bangalore, email: kjvinoy@iisc.ac.in
- **Dr.Debdeep Sarkar**, Assistant Professor, Department of Electrical Communication Engineering, Indian Institute of Science,Bangalore, email: debdeep@iisc.ac.in