Lakshmi Jayalal

Curriculum Vitae

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Education

2019-Present **Indian Institute of Technology, Madras–Electrical Department**, *Communications and Signal Processing*.
Doctor of Philosophy
CGPA-9/10

2017–2019 **Indian Institute of Technology (ISM), Dhanbad – Electronics and Communications Engineering**.
Post Graduation specializing in Communications and Signal Processing
OGPA - 9/10

2013–2017 **College of Engineering, Trivandrum – Electronics and Communications Engineering**.
OGPA - 7.98/10

Publications

- **Being Communicated**, **Processing of Radio Occulation Level-1 data**.
It consolidates two methods for estimating frequency residual of one way single frequency, radio occultation (RO) experiments. On inverting the frequency residual obtained from the received signal we can perceive the information about electron density of planetary ionosphere and neutral number density of atmosphere. In order to obtain information about planetary ionosphere the uncertainty in frequency residual should be less than 0.1 Hz, which is very much crucial and challenging. In the first approach the data was divided in time domain to counter the Doppler spread which improved the time and frequency resolution. and in the second, a sliding window was implemented to improve the frequency resolution. It was found to achieve time resolution around 0.087 second and frequency resolution about 1mHz.

2016 **ICASSP**, *SigPort*, **Exploring Power Signatures for Location Forensics of Media Recordings.**.
This technical report covered various frequency estimation and classification techniques, currently being used which was extensively studied further and implemented to provide accurate Electric Network Frequency (ENF) estimates which are then used to classify the signals into the corresponding grid of recording. A modified frequency tracking approach was derived which along with the implementation of support vector machine (SVM) and Gaussian Mixture Models (GMM) classifiers provided a total accuracy of 80%. More accurate matching of ENF to its corresponding grid will enable us to use the signal as a crucial forensic material which can help in narrowing out the area of crime.

Experience

2020-2021 **Coordinator**, *RConnect*, IIT Madras.
The responsibilities include connecting the research industry with the research scholars through various events like webinars, talks, workshops, competitions etc.

2021 **Coordinator (Website Design Team)**, *Research Scholars Day 2021*, IIT Madras.

2019 **M-Tech Thesis**, *IIT(ISM) Dhanbad*, **Digital signal processing of satellite radio signals of Radio-occultation experiment and the derivation of atmospheric/ionospheric science parameters using the processed data**.
The signal received from the satellite (signal from Venus Akatsuki Radio Science experiments) orbiting the target celestial body which are stored in internationally accepted format (RDEF) are analyzed. It contains information in base band and auxiliary information such as the carrier frequency, elevation angle, etc.. The raw transmitted signal undergoes Doppler shift mainly due to the relative motion of the satellite and the receiver. The atmosphere/ionosphere of the celestial body through which the signal passes through also contributes to this shift. So once we obtain this frequency residual (due to the atmosphere/ionosphere contribution), the atmospheric/ionospheric science parameters can be derived. Various digital signal processing techniques and science inversion were studied and implemented and an accuracy of 0.01Hz and a resolution of 1mHz was achieved.

2018-2019 **Intern**, ISRO *Space Physics Lab*, VSSC, **Signal Processing of data from Radio Science experiments**.
Various data pre-processing, processing methods, and analysis were implemented, studied and inverted to obtain the Venusian atmosphere/ionosphere profiles. A similar version of analysis was implemented for the initial analysis if the data transmitted by Dual Frequency Radio Science (DFRS) Experiment of Chandrayaan-II mission such as a quick look display, and the documentation required for the further modification for the project.

2019 **Quick Look Display**, ISRO *Space Physics Lab*, VSSC.
The **Quick Look Display (QLD)**, is an automated graphical user interface for Dual Frequency Radio Science (DFRS) experiment for Chandrayaan Mission II which was developed using interactive development Language (IDL). As and when the data is pushed into the server, the QLD will detect them, and processed the data to plot the calibrated products, which in turns serves as a quick look into the experiment as and when it is conducted. It is currently installed at both VSSC and URSC.

2016-2017 **Final Year Project**, *Collision warning system using Vehicle to Vehicle communication*.
Radio Frequency Communication is used to detect any nearby vehicle and establish connection between them. This link is then used to pass on any relevant data which contains the location, traffic condition, or any other warning. From the location of other vehicles, proximity of the vehicles and the trajectory will be predicted, and if found to be critical it will warn the driver to avoid any possible collision. In addition, from the received location, the location of the other vehicle(s) are plotted in Google Maps and displayed for assistance to the driver.

2016-2017 **Treasurer**, IEEE *College of Engineering, Trivandrum*, Student Branch.
During the tenure, various state level, national level and region level events were conducted successfully.

2017 **Best Student Volunteer**, IEEE *College of Engineering Trivandrum*, Student Branch.
Was awarded the best student volunteer for the year 2017 for the membership drive conducted which resulted in enormous turnout for students that year. The student branch received the best student branch award the same year.

2016 **GHCI Student Scholar**, Grace Hopper Celebrations India , AnitaB.org.
Was selected as one of the 14 GHCI scholars selected from all around the country. And was provided with a once in a lifetime opportunity to attend the GHCI Conference. (2016)

2015-2016 **Membership Development Head**, IEEE, College of Engineering Trivandrum, Student Branch.

2016 **First Position**, *Competition: Circuit Casino*, TechnaDruva'16.
Different waveforms were asked to be generated by designing an electric circuit.

2015 **'Helios'**, Android Application, Bluetooth controller .
Single-handedly developed an android application, that can be used by android devices to control any Bluetooth controlled devices.

2015 **'Helios'-A smart table lamp**.
Developed a smart table lamp which has dual charging options (Electrical and Solar) and is Bluetooth controlled with a compact and an ergonomic design which can be used by hikers, and emergency team.

2013-2017 **RoboCET**, *Robotics club of College of Engineering Trivandrum*.
Designed and developed various projects under the aegis of RoboCET like Propeller Clock, Magic Wand, Dancing LEDs, White Line Follower

2013-2017 **Active Volunteer in IEEE**, *College of Engineering, Trivandrum*, Student Branch.
Attended and organized various events at college, state and national level under the aegis of IEEE.

2013-Present **Active member of IEEE**.

2016-2017 **Active member of Enviornment Club**, *College of Engineering, Trivandrum*.

Technical Skills

Advanced IDL, MATLAB

Intermediate PYTHON

Basic Machine learning, Estimation, Compressed Sensing, 8051 Assembly Language, C++

Languages

Malayalam **Native Speaker**

English **Proficient**

Hindi **Near Native**

Interests

- Poster and Logo Designing
- Fiction Writing
- Keyboard Playing
- Painting
- Photoshop CC
- Wattpad (author)
- Grade 2
- Acrylic