Maryann Benny Fernandes

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Stanford Class of '23

Note: Highlighted blue words are links

EDUCATION

Stanford University **Sept 21 – June 23**
Master of Science in Electrical Engineering
Courses: Spacecraft Design & Laboratory, Space Mechanics, Modern Optics, Electromagnetic Waves, Introduction to Matrix Methods, Reading and Writing in Poetry (Poetry book attached after page 4 of my resume), Tennis, Independent Research in Antennas, Board Level Design, Image System Engineering

Xavier Institute of Engineering, University of Mumbai, India **June 15 – May 18**
Bachelor of Engineering in Electronics and Telecommunication

St. Xavier's Technical Institute, Autonomous, Mumbai, India **June 12 – May 15**
Diploma in Electronics and Telecommunication

Training: Took classes at Stanford to prepare for my Private Pilot and Amateur operator License (will be giving the exam in 2023), Public Policy Negotiation: Multiparty Problem-solving and conflict resolution (Stanford Law School), Public Policy for young leaders (Centre for Civil Society), Public Policy Bootcamp with a specialty in Technology, Society, and government (Vision India Foundation)

WORK EXPERIENCE

Intern | ***Flight Communication Systems Section, NASA Jet Propulsion Laboratory*** *(Aug'22 – Dec'22)*

- R&D of a multifrequency metal-only metasurface antenna using CST. (Project details in research experience.)

Course Assistant | ***Dept. of Electrical Engineering, Stanford University***

- The Fourier Transform and its Applications (EE261): Prof. Brad Osgood (Sept'22 – Dec'22)
  Assist the instructor during class, conduct office hours twice a week, & answer doubts & queries on homework & general.
- The Fourier Transform and its Applications (EE261): Prof. Shi Dong (June'22 – Aug'22)
  Assist the instructor with live streaming of the class, conduct weekly review sessions, and office hours twice a week on the Fourier series, Fourier transformation of continuous and discrete signals, and their applications.
- Introduction to Electromagnetics and its Applications (EE42): Prof. Olav Solgaard (Mar'22 – June'22)
  Assist the instructor in conducting lab experiments, and in-class teachings on electrostatics, magnetostatics, Maxwell's equations, 1D wave equation, electromagnetic waves, transmission lines, and 1D resonators.
- Signal Processing and Linear Systems II (EE102B): Prof. John Pauly (Mar'22 – June'22)
  Assist the professor in teaching the concepts and tools for continuous - and discrete-time signal and system analysis with communications, signal processing, and control applications.
- High-Frequency Circuit Design Laboratory (EE 251): Prof. Thomas Lee (Jan'22 – Mar'22)
  Conducted 4 lab experiments for five students on Microstrip structures, narrow & broadband amplifiers, oscillator-mixer modules, IF chains, and demodulators for the design of an FM Receiver.

Course Grader | ***Dept. of Electrical Engineering, Stanford University***

- Computational Imaging (EE 367): Prof. Gordon Wetzstein & Prof. David Lindell (Jan' 22 – Mar'22)
  Graded python programming & image processing assignments & exams for computational imaging methods & applications.
- Introduction to Linear Dynamical Systems (EE 263): Prof. Sanjay Lall (Sept'21 – Dec'21)
  Graded applied linear algebra & linear dynamical system homework and exams with circuits, communications, signal processing, & control systems applications.
- Introduction to Photonics (EE 134): Prof. Dan Congreve (Sept'21 – Dec'21)
  Graded assignments that focused on the principles, generation, manipulation, and detection of light in optical systems.

Research Assistant| ***Dept. of Applied Physics, Stanford University*** (Sept' 21 – Dec'21)

- Studied Stimulated Brillouin Scattering with Prof. Michel Digonnet & Intelligent Fiber optic systems (IFOS) for Vibrational Temperature Sensors on rockets. Simultaneously, I worked on designing a delay line system.

Graduate Apprentice| ***Society for Applied Microwave Electronics Engineering & Research, Govt of India*** (Jan'20 – June'21)

- Worked on the Radiometry System for Early Breast Cancer Detection Project. I designed a 2.4 GHz microstrip antenna on HFSS under two test conditions, a breast phantom with & without a cancerous tumor ranging from 1 mm - 10 cm. Then, I designed the system's video amplifier on NI Multisim & tested its functionality on a breadboard (74 dB video amplifier and 500 – 10 kHz filter). Once accomplished, I designed every block on the radiometry system using OrCAD.
- I prepared the design proposal for a VHF radar, 4*32 Yagi-Uda antenna array using HFSS, 2:1 power splitter, and a power distribution network using ADS & calculated the entire system's radar calculations.

R-42 AI Fellow| ***R42 AI Institute, Start-up Concr*** (Jun'21–Aug'21)

- Studied potential connections in cancer biology in the human body to dark matter in the gravitational lensing of outer space.

RESEARCH EXPERIENCE

Multifrequency metal-only metasurface antenna | NASA JPL | *CST, HFSS* (Aug'22 – Present)

- I work as an intern on a JPL graduate fellowship with my PI, Dr. Nacer Chahat, and my post-doctoral mentor Dr. Gaurangi Chahat. My work involves the R&D of a multifrequency metasurface antenna on CST. My task is to make the metal-only antenna suitable for future telecommunication needs with fast-automatic switching, stable connectivity, & the ability to operate for extended periods in extreme cold/hot/high radiation environments, including cryogenic & highly ionized temperatures.
- The design is an analytical & full-wave analysis of a waveguide & has metasurface elements on the top layer. The Fairfield result for both 28 GHz & 32 GHz should resonate in the same direction below -3 dB beamwidth with suitable S11 parameters.

Reflectarray antenna | Stanford | *HFSS* (Mar'22 – June'22)

- I performed Independent Research in the aeronautics and astronautics engineering department under PI, Dr. Manan Arya in the Morphing Space Structures Lab. I designed a Reflectarray Antenna on HFSS & investigated four different types of patches for the reflector such as identical patches with variable-length phase delay lines, variable-size patches, variable angular rotations in a single plane, and same array patches in multiple planes
- After manually manufacturing the patches using copper tape on FR4, & witnessing its results on a VNA, I concluded that an array of identical 45° rotated patches with delay stub lines in two planes, alternated by 90° in every 2D Cartesian quadrant, produced better phase, return loss, VSWR, & Smith Chart results.

Inflatable Antenna | Stanford | *MATLAB, HFSS* (Feb'22 –June'22)

- As a graduate student with two undergrads, we developed a 2.4 GHz Inflatable Antenna in the Aeronautics and Astronautics Engineering Department in a two-quarter Spacecraft Design Laboratory class.
- The project comprised mathematical calculations of the patch antenna & its reflector design on MATLAB, and their HFSS simulations. Manual manufacturing of the patch antenna by using FR4 material and copper tape, and Kapton tapping six reflective mylar petals for the reflector and six non-reflective mylar petals for its inflating support. After the three components were merged, the antenna was inflated, tested on a VNA, and optimized to secure 2.4 GHz.

Tunable Radiation Cooling | Stanford | *Lumerical, MATLAB* (Sept'21 – Jan'22)

- In the electromagnetic waves class, under Prof. Jonathan Fan, my recommender and academic advisor, I worked on the project 'Radiation Cooling'. Along with a teammate, I investigated different ways to tackle climate change by using the cold of outer space to cool down objects on the earth through the transparent atmospheric window (8 – 13um) that overlaps with the blackbody radiation spectrum.
- Via a tunable system design, we obtained a spectrum with minimum absorptivity in the solar wavelengths, high emissivity in the atmosphere transparency window, & suppressed emissivity between 9.3 and 10μm for daytime and night-time.

WiMax-based Meta-Material Antenna | Xavier Institute of Engineering | *HFSS, IE3D* (Jun'17 – Jun'18)

- During the final year of my undergrad, supervised by Dr. Prathibha Sudhakaran, I worked on the project 'WiMax-based Meta-Material Antenna', to overcome the low gain, poor efficiency & narrow bandwidth limitations in a unit-cell microstrip antenna.
- As a team of five, the 2x1.6 mm FR4 design comprised a 2.4 GHz microstrip sandwiched above a 3*3 metamaterial layer. In this project, my work involved the HFSS design. We published a paper on this project in the IJSER Journal.

Manually fabricated patch antenna | Xavier Institute of Engineering | *Multisim, Eagle* (Dec'16 – May'17)

- My junior-year project, supervised by Mrs. Shailaja Udetwar, was a dual-band manually fabricated patch antenna at 2.4 GHz and 1.8 GHz. As a team of four, the antenna was simulated & optimized on IE3D and fabricated using manual PCB manufacturing skills.
- I performed the fabrication at home by cutting the double-sided copper layer FR4 material as per its required mathematical calculations and itching off the unrequired copper on the top layer using FeCl3. Then, I drilled a hole and soldered an SMA connector. After connecting the coaxial cable to a VNA, we tested the results.

Reverse Cerebro | Xavier Institute of Engineering | *Multisim, Eagle* (Jun'17 – Dec'17)

- During my junior year, in a team of three, I worked on building Reverse Cerebro. This project could help in the treatment of paralytic patients by monitoring their brain activity through the Galvanic Vestibular System that zaps a nerve in the ear to change directional movement in the human body. In the project, my work involved designing the circuit, assembling its components, and testing it on volunteers. Our final analysis was based on the results we were able to secure from 30 volunteers.

Smart Bag | St. Xavier's Technical Institute | *Multisim, Eagle* (Jun'14 – Apr'15)

- In a team of four, during the senior year of my diploma, I worked on building a multifunctional bag for students and travelers. The intelligent pack contained five features such as a solar laptop and mobile charger, a confidentiality material check, emergency panic button, lost-person tracking, and stolen bag detection via Bluetooth. My contributions were to the hardware section of the entire project, like its circuit designing and assembling.

HACKATHONS

Stanford Health++ Hackathon, 2021 – *Third Prize*

- In a team of three with two Stanford Business School graduate students, we pitched an idea Vale9: Epileptic Seizure Prediction using Wearable EEG. The wearable EEG headband was designed to help an epileptic seizure patient to be one step ahead of a seizure by alerting them, their family members, and healthcare providers up to 1 hour in advance through an in-built chip in the band.

MIT Hacking Racism in Healthcare, 2020 – *Winner*

- Our team, comprising a professor, a medical doctor from the Indian armed forces, a software engineer, an electrical engineer, and an RF engineer, designed the idea of rainbow Identities and collaborated with Black Tech Matters.

- Under the theme of Intersectionality, we pitched the idea of helping youth from the LGBTQ, BIPOC & other minority youth communities get access to good healthcare.
- The idea pitch is here (5:55), and the results of the competition are here (15:47)

European Space Agency Virtual Hackathon, 2020 – *Runner up*

- As a team of 3, we identified a solution to the COVID-19 pandemic targeting SDG 3 - Health & Well-Being. We pitched the sustainability & viability of our business model. A video of the idea pitch is here, and A report by ESA on the project is here

MIT Hacking Medicine Grand Hack, 2020 – *Participant*

- Under the theme of Customized Cancer Care Treatment, my team comprising healthcare professionals, engineers, and data scientists pitched an idea for skin cancer treatment.
- Our problem statement was to tackle the harmful UV exposure in humans with a solution that would help create awareness on how to minimize a person's risk of skin cancer.

NASA International Space Apps COVID-19 Challenge, 2020, *participant*

- My two younger sisters and I, pitched the idea "Earth Do Humans See you" by analysing the impact of COVID-19 on the United Nations (UN) Sustainable Development Goals (SDGs)
- We looked at the current and ongoing change in the monitoring indicators of the UN SDGs using Earth observation/remote sensing and global Earth system model-derived analysis products.

TECHNICAL SKILLS

- **Programming**: Python, MATLAB, CircuitPy, Julia
- **Circuit Building, PCB designing, Robotics:** Multisim, OrCAD, Eagle, KiCad, Soldering, Openscad (3D Printer)
- **RF simulators**: CST, HFSS, IE3D, ADS, Lumerical

MAJOR ACADEMIC RECOGNITION

Councilor, Stanford's, School of Engineering Deans Graduate Student Advisory Council, 2022-23

- I serve as a representative from the electrical engineering department and the council's master's sub-committee leader.
- I got involved because I wanted to use my technical, cultural, leadership, and communication skills to be a voice and bridge for positive change between the graduate students (who have and do not have stories similar to mine) and the dean's leadership.

1000 Dreams Fund Scholarship, 2021

- I received this scholarship to fund my MS education beyond tuition.

Excellence Award for Distinction in undergrad, 2018

- For my undergrad academic and extra curriculum performance, I received an award from Citizencredit Cooperative Bank.

Valedictorian of the class of 2018

- I was selected by Xavier Institute of Engineering's leadership team among the 500 graduating students of the class of 2018.
- I received the award for my all-around accomplishments in Academics & Extracurriculars, including sports, social work, technical, & cultural activities. Additionally, I was also the recipient of the Joan & Dr. Frank Trochi Scholarship.

IEEE, Karen Bartleson President's medal, 2017

- Awarded after a former IEEE XIE chairperson, Gaurav Harshe described my work and contribution to Karen Bartleson when she visited Colorado State University, USA for an IEEE event.
- Impressed by my work, she handed over her IEEE president medal of 2017 to be given to me. The best award of my life.

Best all-around student, 2014, 2015

- I received the award twice and was selected by St. Xavier's technical institute leadership team among the 500 students of the college solely because of my all-around performance in Academics & Extracurricular activities.

HONORS

"A Bold Life" No Essay Scholarship, 2022

- I received this award after showcasing an adventurous and exciting life.

Stanford's Baccalaureate class of 2020, 2021 & 2022, *Presidential Flag Bearer*

- I was the flag bearer for the president of Stanford University Marc Tessier-Lavigne and his team at the Baccalaureate ceremony.

Italian Space Agency Culture Challenge, 2020 - *Winner*

- During the 1st online congress organized by the Space Generation Advisory Council at the Italian Space Agency Culture challenge I displayed a 30 seconds video of my Indian and Goan (native from the state of Goa, India) heritage culture.

International Astronomy and Astrophysics Competition, 2020, *Bronze Honour*

- I had a qualification round of 5-mathematical-based answers, & a pre-final written test of two primaries, two complexes, & two research problems. In the final round, for 40 multiple-choice questions, I had to get as many correct questions in 40 minutes. The exam tested my knowledge of astronomy & astrophysics, and I was placed in the top 20% of all participants.

International Youth Math Competition, 2020, *Pre-finalist*

- I had a quals round of 5-mathematical-based answers, and a pre-final written test of 2 basic, 2 difficult, & 2 research problems.

NASA Astrophoto Challenge, 2019 & 20, *Standout mention*

- Recognized by Harvard and Smithsonian for my image-processing skills on the M51 and M82 galaxies. The images I received from the Hubble Telescope were 99.99% black, and I had to process them by using NASA's image system engineering software. Successfully, I made the galaxies visible by filtering out the noise and inverting them.

Indian Space Research Organization (ISRO), Indian Institute of Remote Sensing (IIRS), 2020, *Outreach Participant*

- I was recommended by my employer, the Society for Applied Microwave Electronics Engineering and Research, SAMEER to study Remote Sensing, and Master Planning of Urban areas via satellites.

Indian Institute of Technology, Varanasi, 2020, *Third Prize*

- Along with my two younger sisters, we presented a case study on the use of 'Technology in Education. We showcased how smart learning in classrooms through the use of innovative technology could empower our coming generation.

BBC World News Service, The Engineer-Reengineering the Future, 2020, *Featured*

- During the COVID-19 pandemic, BBC News selected me as one of their participants at 'The World Debate'.

World Space Week SARTELLITE competition, 2020, *Second Runner-up*

- Along with my youngest sister, we designed a rocket system.

MEMBERSHIP

- Space Generation Advisory Council, member, 2020 - present
- Indian Catholic Youth Movement, 2019 – present
- TED's global community member, 2018 – present
- IEEE student member 2016-17, 2017-18

JOURNAL PUBLICATIONS (Google Scholar: https://bit.ly/mbf_papers)

WiMAX Based Meta Material Antenna on IE3D using Lithography, International Journal of Scientific & Engineering Research Volume 9, Issue 3, March 2018

Manually Fabricated Patch Antenna, International Journal of Scientific & Engineering Research Volume 9, Issue 4, April 2018

TECHNICAL PRESENTATIONS

- **State Level Project Competition, 2016, *Participant***
  Project title: Andro-RFID Smart Bag (The project description is in my research experience.)
- **National Level Project Competition, 2015, *Winner***
  Project title: Smart Bag (The project description is in my research experience.)
- **National Level Paper Presentation Competition, 2015, *Runner-up***
  Paper title: Confidentiality Material Check, a device that uses passive RFID tags on materials with a module in-built in a bag.

UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS (UNOOSA) CONFERENCES, participant

- United Nations/Austria Symposium: Space Applications for Sustainable Development Goal 13: Climate Action, *2020*
- World Space Forum on "Space for our Future" virtual edition organized by UNOOSA and UAE Space Agency, *2020*
- Space Gen United, Space Generation Advisory Council, first online Congress, 2020

EXTRACURRICULAR ACTIVITIES

- Industry Liaison Officer, Stanford's Women in Electrical Engineering (WEE), 2022-23
- TEDx Stanford, Finance Director, 2022-223
- Stanford University, School of Engineering and Electrical Engineering, MS Panellist for Incoming students, 2022
- Event Staff for Weddings, Stanford Memorial Church, 2022
- Chief Hackathon Director, Stanford Quantum Computing Association, 2021-22
- Co-Director for QC Hack, a collaboration between Stanford, University of California Berkley & Yale University, 2022
- NASA Psyche Mission - the process and lifetime of a space mission, Educator, 2020
- NASA Educator Professional Development participant with Texas State University, 2020
- TEDx XIE Licensee & Organizer, 2018
- Editor-in-chief, Xavier Institute of Engineering, 2017-18
- IEEE XIE Chairperson, 2016-17

SOCIAL SERVICE, volunteer

- Through the Catholic Community @stanford, I volunteer at St. Anthony's Padua home to serve food to the poor every Saturday as well as on special days in the year. I am also a farming volunteer at the Common Roots Farm, an Altar Server, and an occasional Lector at every Sunday service in the Memorial Church at Stanford. (2021-23).
- I am a volunteer with Roble Living Laboratory for Sustainability. We receive donations & dorm items that are made available for free to the Stanford Community throughout the year. (2022-23)
- I was a Grad Crew during Stanford's Commencement week for the class of 2020, 2021, and 2022.
- I am a Stanford Graduate Mentor with the Women in Electrical Engineering, First-generation low-income, & Women's Community Centre. (2021-23)
- I volunteered as an alto singer COVID-19 alto singer for crowdfunding events with NHS Virtual Choir and Eric Whitacre-Virtual Choir 6 (2020-21)
- I taught the Sustainable Development Goals through music and drama to primary, secondary, and high school students, and college going teenagers, at Teach for India, and Samvedana Trust (2020)
- I was a Research & Social Media Volunteer with Fridays for Future India (2020)

- World Heritage Volunteer (2018)
- I built two Wired Water Level Indicators for Xavier Institute of Engineering, Mumbai, India water tanks along with the youngest sister to help eliminate the overflow of water every morning (2018)
- Catholic Faith Educator at St. Anthony's Church, Mumbai, India (2013 – 21)

HOBBIES

- **Play the ukulele and piano**
- **Poem Writing** *(I am working on getting a Poetry book published in 2023)*
- ***Artificial Flower Making***
- **Basketball** *(I represented my school at the county-level and college level-championships)*
- **Running** *(I represented my school at the 100m, 200m, 4*100m relay, and long jump Maharashtra State Championship)*