Andrews George Varghese

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Education

Indian Institute of Technology (IIT) Bombay — **Mumbai, India**
B.Tech. (Honors) in Electrical Engineering, GPA : 9.65/10, Dept. Rank : 4/150 — 2018 – 2022
Minor in Computer Science and Engineering

Work Experience

NR vRAN Software Engineer | Samsung Electronics HQ, South Korea — Sep '22 – Present
Developing highly optimized 5G L1 PUSCH algorithms in C++20, leveraging SIMD for superior performance

- *Accolades:* **vRAN Group Best Programmer Award**, Q1 '23, and **Samsung SW Awards**, H1 '23 & H1 '24
- Achieved **18%** performance boost in channel and noise matrix operations by leveraging linear algebra, enhancing loop structure, improving memory access patterns, and exploiting instruction-level parallelism
- Coordinated with Intel engineers to adapt the Frequency Equalization module for the new Sapphire Rapids processor and 5GISA (float16) resulting in **70% performance improvement** along with **20% power savings**
- Designed, validated **lock-free** PUSCH scheduler to reduce the impact of thread scheduling delays by **90%**
- Redesigned the software and hardware LDPC architectures, increasing parallelism and reducing locks by 50%, leading to a **2.2x speedup** in SW and a **20% performance improvement** in HW
- Implemented E2E testing framework with support for asynchronous inter-cell communication to simulate real-world scenarios; parallelized long-running tests' framework to reduce runtimes from **30 days to 20 days**
- Currently collaborating with Intel engineers in integrating **AMX (Advanced Matrix Extensions)** by redesigning our SIMD(vector)-centric code to use **tiled operations**

Networks Engineer (Intern) | Samsung Electronics HQ, South Korea — Jun '21 – Jul '21

- Explored SIMD via bitonic sort and obtained **5x speedup** over `std::sort` on vectors of 8-bit integers
- Vectorized gold sequence generator using Galois field theory & Barrett Reduction, obtaining a **10% speedup**

Research Experience

Autonomous Aircraft Control via Reinforcement Learning — Feb '22 – Sep '22
Airbus Learning to Fly Challenge — Mentor: Prof. Shivaram Kalyanakrishnan

- Addressed the Heading Control Task using the JSBsim flight dynamics model: maintain an Airbus A320's heading and altitude within strict safety margins, with larger random yaw turns executed every 150 seconds
- Designed a control algorithm using **policy search** via hill climbing, trained on a **core sub-task** of flying for 360 seconds with large yaws at both 150s and 300s, ensuring transferability to the original task
- Developed an objective function with a custom lexicographical ordering for improved search efficiency over the policy space; prioritized tighter turns over higher immediate rewards to incentivize valid yaw executions
- Results: Placed **1st** in the competition, with an average flight time of **132 minutes**

Autonomous Underwater Vehicle (AUV-IITB) — Oct '18 – Aug '22
RoboSub, AUVSI & US Office of Naval Research — Mentor: Dr. Leena Vachhani
An all-student team working on the development of the AUV Matsya that navigates & performs realistic tasks

- *Accolades:* **Young Researcher Prize**, IEEE OES 2021, Japan | **Finalists (7th) at RoboSub 2022**, Maryland
- Formulated a **Time Difference of Arrival** (TDoA) based algorithm to locate a pinger underwater using 4 hydrophones; supplemented with Taylor-series and Monte Carlo simulations to model error-propagation
- Developed a mission control in ROS to process dependency trees of asynchronous tasks; supported **real-time priority and success probability updates** using sensor fusion of vision, acoustics and localization data
- Calculated optimal positioning of 8 thrusters on Matsya to ensure 6 DoF maneuverability; implemented a 6-PID controller and navigator system that achieves setpoints using minimal time and power under constraints
- Designed the software stack for commercial Remotely Operated Vehicles (ROVs) built in collaboration with Larsen & Toubro and major Indian oil companies in CoE-OGE for defense and pipeline inspection purposes

Modeling Uncertainty in DNNs Spring '21
EE691 RnD Project Mentor: Prof. Amit Sethi

- Integrated Evidential Deep Learning method into curriculum learning framework for Out-Of-Distribution detection in the Tiny ImageNet Dataset with average **5% increase** in accuracy under label noise and OOD data
- Observed Contrastive Learning with K-means scoring had better OOD data separation than Gausssian scoring

Academic Projects

Hangman on Pt-51 uController: Simulated Hangman on an LCD; supported randomized start word selection, inputs via UART + keyboard, guess timeouts via interrupts; judged **best submission** of the course

Right Ventricle Segmentation: Implemented symmetric UNets to segment cardiac cine MRIs and find right ventricle endocardium and epicardium; trained with dice and focal losses to handle class imbalances

Fingerprint Matching: Given database and probe fingerprints, identified matches using Poincaré index based core detection and band-limited phase-only correlation obtained from iDFT of their cross-phase spectrum

Recommender Systems: Implemented traditional, deep learning and ensemble music recommender systems

Mentorship and Leadership

Team Leader | AUV-IITB, IIT Bombay May '21 – Aug '22
Managed operations, finances ($100K budget), knowledge transfer in a 4-tier, **50+ member**, multi-disciplinary team; set vision and strategy while identifying risks and planning contingencies; obtained $30K in sponsorships

Teaching Assistant | IIT Bombay Nov '20 – Jul '22
CH105: Organic Chemistry | *PH108: Basics of Electricity & Magnetism* | *CS101: Computer Programming and Utilization*
Conducted regular tutorials for 100+ students; created problem sets & projects; vetted exam materials; organized help sessions for under-performers in CS101; received the **TAship Excellence Award** for work in CS101

Institute Student Mentor, Department Academic Mentor | IIT Bombay Jul '20 – Aug '22
Mentored **28 first-years** & **14 sophomores** to thrive in college life; guided **16 first-time mentors** in their mentorship journey as their Sub-Group Head; assisted an under-performing senior get back on track and **graduate** under the Academic Rehabilitation Program; received **Special Recognition Award** for exemplary mentorship

Relevant Coursework and Skills

Computer Science	Advances in Intelligent and Learning Agents, Design and Analysis of Algorithms, Operating Systems, Advanced Topics in ML, ML for Remote Sensing, Networks
Electrical Engg.	Processor Design, Computer Architecture for Performance and Security
Mathematics	Probability and Random Processes, Data Analysis and Interpretation, Complex Analysis, Linear Algebra, Differential Equations, Calculus
Programming	C/C++, Bash, Python, VHDL, Kotlin, MySQL, Django, LaTeX
Software	PyTorch, TensorFlow, DPDK, ROS, Intel VTune, Git, MATLAB, Intel PCM

Scholastic Achievements

- Awarded **3 AP grades** (Advanced Performer) for exceptional performance in Digital Systems, Foundations of VLSI CAD, Organic and Inorganic Chemistry
- Received the Quadeye Excellence Scholarship '22 for academic achievements and quantitative reasoning skills
- Secured **All India Rank 91** in **JEE Advanced 2018** out of over 1.5 million candidates
- **Gold medalist** (one of top 35 out of 56,000 candidates) in the Indian National Chemistry Olympiad (INChO)
- Received the **Best Outgoing Student** Award from Maharishi Vidya Mandir School for all-round achievement
- Recipient of **NTSE Scholarship**, **KVPY Fellowship** (Govt. of India) for being in the nation's top 1500 students

Extracurriculars

- Completed **Chartered Financial Analyst Level I** in Feb 2024 and currently a CFA Level II candidate
- Secured **3rd place internationally** in the MaRRS International Spelling Bee Contest in 2014 and 2015
- Placed **2nd nationally** in the SPELLINC competition, 2015, conducted by LINC pens at Kolkata
- Completed **5th grade in piano** from the Associated Board of the Royal Schools of Music (ABRSM), London