INBASEKARAN PERUMAL

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EDUCATION

National Institute Of Technology, Surathkal **2020-2024**
Bachelor of Technology in Electronics and Communication Engineering **CGPA 9.19/10 (Rank: 4/138)**

RESEARCH INTERESTS

- Edge AI
- Model Compression & Optimization
- Hardware-Aware ML
- ML for Efficient Computing
- Hardware-Software Co-Design
- Systems for ML

PUBLICATIONS

"Some Intriguing Observations on the Learnt Matrices in Deep Unfolded Networks"
Submitted to ICASSP 2025. Authors: Kartheek Kumar Reddy Nareddy, Inbasekaran Perumal, Chandra Sekhar Seelamantula

WORK EXPERIENCES

RingCentral (ML Engineer @RingSense AI) **July 2024 — Present**
Mentors: Mr. Sushant Hiray | Mr. Sanchit Garg

- Enhanced Text Punctuation ASR API by integrating speaker diarization algorithms, improving transcription accuracy
- Developed and optimized ASR pipeline, adapting language models for low-resource domains and incorporating domain-specific phrases and voice activity detection (VAD)
- Dockerized DL models, developed client libraries, and deployed on Kubernetes to streamline workflows
- Optimized Elasticsearch mappings and queries, reducing latency overall latency from 16s to 5s for 20M records

Google Summer of Code (Open Source Developer @Intel OpenVINO Toolkit) **May 2024 — Aug 2024**
Mentors: Mr. Dmitriy Pastushenkov | Ms. Ria Cheruvu

- Developed a real-time gaze tracking application for Windows, Linux, and macOS using C++, Qt6, OpenCV, and OpenVINO
- Implemented facial landmark and gaze detection, utilizing pre-trained models for edge inference via webcam
- Designed calibration methods with ray-casting and convex hull algorithms to map eye gaze to screen coordinates
- Designed user-friendly features: system tray app, installation wizard, custom notifications, and performance statistics
- Enhanced performance by implementing INT-8 quantization and FPS limits, achieving 3.4% CPU usage on Intel Core Ultra
- Reduced power consumption from 26W (GPU) to 14W (NPU) by integrating NPU and DP4A AI acceleration

Indian Institute of Science, Bangalore **April 2024 — July 2024**
(Research Intern @Spectrum Lab, Dept. of Electrical Engineering)
Mentors: Mr. Kartheek Reddy | Prof. Chandra Sekhar Seelamantula

- Extended undergraduate thesis on image inverse problems in super-resolution microscopy and lensless imaging.
- Formulated priors using L1 and Minimax Concave Penalty with Tight Frame (TF) loss on variants of ISTA
- Implemented and optimized deep learning models: LISTA, TF-LISTA, and ALISTA architectures
- Developed a de-biasing algorithm using the Moore-Penrose pseudoinverse to refine amplitude estimates
- Improved reconstruction accuracy by 20.67% at 30 dB SNR with 10% sparsity
- Applied methods to SMLM; manuscript under preparation for *SIAM Journal*

Goldman Sachs (Summer Analyst Intern @ Cards Marcus Data engineering) **May 2023 — July 2023**

- Automated business progress report generation using Airflow workflows with granular event signals for detailed analysis.
- Implemented an efficient PySpark data model on AWS Databricks, mapping business processes across 15 workflows.
- Developed comprehensive reports, including SLI and SLA misses, for detailed performance tracking.
- Delivered these reports to key stakeholders via email, saving team leads 30 minutes daily and improving efficiency.

Determinant Studios (SDE Intern/Research Intern) **Nov 2022 — May 2023**

- Developed Vidhi App, a voice-activated inventory management tool available on the app store
- Automated ledger and stock tracking by voice for shopkeepers and non-readers
- Integrated OpenAI's Whisper V2 ASR with a NER engine (17 classes), achieving 95.32% precision and 96.1% recall
- Filed a provisional patent for the custom NER engine

TECHNICAL SKILLS

Core Competencies:	Computer Vision, Image Processing, Deep Learning/ML, Computer Architecture, Digital Design
AI & Data Science & Big Data:	PyTorch, TensorFlow, OpenCV, OpenVINO, NumPy, SciPy, spaCy, n8n, PySpark, AirFlow, Snowflake
Hardware & Architecture:	Verilog, FPGA, Quartus Prime, Vivado, QtSpim, Ripes, Gem5
Languages & Query:	Python, C++, C, TypeScript, SQL, Elastic DSL
DevOps & Tools:	AWS, Linux, Kubernetes, Docker, CMake, LaTeX

ACADEMIC PROJECTS

PDM to Ethernet Frame Generator

- Designed an FPGA-based Ethernet PHY controller with RMII interface for 100 Mbps data transmission
- Processed PDM audio signals from MEMS microphones, applying decimation and resolution enhancement
- Performed 256-point FFT and developed an application for real-time Fourier spectra visualization and audio playback
- Integrated hardware components such as FIFO and debounce switches, addressing clock domain crossing challenges

MIPS 5-Stage Pipeline Processor

- Designed and simulated a 5-stage pipelined MIPS processor on Cyclone V SoC FPGA
- Implemented pipeline registers, forwarding, stalls, hazard detection, and static branch prediction
- Extended MIPS instruction set with MUL, optimizing pipeline control and reducing branch misprediction penalties
- Validated with Modelsim and FPGA testing, using QtSpim programs for factorial and Fibonacci calculations

Noise2Noise

- Developed a neural network model to restore noisy images, trained on Gaussian noise, with zero mean and a nonzero variance, without using clean image priors
- Evaluated the performance of two models, REDNet and UNet, using mean PSNR and SSIM as metrics for inputs with a standard deviation of noise (σ) of 0.01, 0.02, and 0.03
- Observed that the ability of a network to denoise an image reduces as the noise value increases, with a higher rate of drop in SSIM in the case of UNet (drop from 0.645 to 0.374) compared to REDNet (drop from 0.577 to 0.435)

LEADERSHIP AND EXTRACURRICULAR EXPERIENCE

Computational Intelligence Society Chair, IEEE-NITK Student Branch **April 2023 — April 2024**

- Inaugural Chairman of CIS NITK; initiated Kaggle Cup, a nationwide ML hackathon with 3 tasks
- Led AI-Vision-Cup, a computer vision competition with 250+ participants
- Organized Intell Quest, an NLP hackathon with 100+ participants, and hosted ML talks with industry experts

Executive Member of IEEE Computer Society **October 2021 — April 2024**

- Organized 5 events, including Girl Geek Hack 2023 (400+ registrants) addressing gender disparities in technology
- Received Outstanding Student Chapter of the Year 2023 (Runner-up) in Bangalore
- Volunteered at ICDDSS 2023 and ICRIE 2022, mentoring juniors in career advancement and technical projects

Executive Member of Intelligence Group, Web Club **November 2021 — April 2024**

- Led ML League at NITK, delivering 6 sessions from foundational ML to advanced CV, NLP, and RL concepts
- Led the ML track in Silicon Maze 2022 and 2023 with 4 difficulty levels for first year undergraduates

Member of Centre for Open-source Software and Hardware, NITK **January 2022 — April 2024**

- Co-organized API Day Coastal Karnataka, which attracted 300+ participants and promoted open-source collaboration
- Shared insights on open-source and GSoC during the Athenium Talk Series, attended by over 100 participants ()

ACHIEVEMENTS

- Achieved a percentile of 99.31 in the Joint Entrance Examination(JEE) from a pool of more than 1.1 million candidates.
- Bagged the certificate of appreciation for securing the highest marks in Social Studies (100%) in 2018.

REFERENCES

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