NATARAJAN BALAJI SHANKAR

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EDUCATION

University of California, Los Angeles (UCLA) — Los Angeles, CA
M.S. Electrical and Computer Engineering — (expected) June 2023
Specialization in Signals and Systems — GPA**: 4.0/4.0**

National Institute of Technology Tiruchirappalli (NIT Trichy) — Tiruchirappalli, India
B.Tech Electronics and Communication Engineering — June 2020
Minor in Computer Science — **GPA: 8.57/10**
First Class with Distinction

RESEARCH EXPERIENCE

Speech Processing and Auditory Perception Laboratory (SPAPL), UCLA — Jan 2022 – present
Advisor: Dr. Abeer Alwan

- Developed a CTC-alignment single-step non-autoregressive transformer based Automatic Speech Recognition (ASR) system to increase transcription speed from speech segments during inference
- Devised data augmentation policy for children's speech to improve pretrained ASR systems and reduced relative word error rate (WER) by 12.5%
- Designed a pipeline for automatic scoring of child reading assessments based on domain adapted generation of transcripts and named entity recognition.

Signal and Image Processing Laboratory, NIT Trichy — May 2019 – July 2019
Advisor: Dr. Varun Gopi

- Integrated usage of anisotropy preserving Shearlet transform with contrast limited adaptive histogram equalization and adaptive gamma correction to obtain greater edge and contour preservation in fundus images.
- Devised a novel method to perform macula detection in fundus images with severe degradation using known optic disc data and morphological transformations to enhance darker regions and to help in further exudate grading.

Pattern Recognition and Computational Intelligence Laboratory, NIT Trichy — May 2018 – July 2018
Advisor: Dr. E.S. Gopi

- Overcame presence of instrumental acoustic sounds by extracting MFCCs from segments to perform Automatic Separation of Vocal and Non-Vocal Segments Present in South Indian Songs
- Designed and implemented several classifier models for feature separation, including a SVM with a modified kernel and generated a 26% relative classification accuracy improvement over a standard Gaussian kernel.

TEACHING EXPERIENCE

Digital Speech Processing — ***Graduate Teaching Assistant (UCLA)***

- Course focused on the theory of digital processing of speech signals, mathematical models of human speech production and perception mechanisms and techniques for speech analysis and synthesis.
- Conducted discussion sections, created and graded assignments, and designed course projects based on speech recognition in noisy environments

Python with Applications I — ***Graduate Teaching Assistant (UCLA)***

- Course introducing principles of Python programming, with a focus on data visualization and text processing
- Conducted discussion sections, and designed and graded programming assignments and projects focused on data scraping and visualization

Introduction to Programming ***Graduate Teaching Assistant (UCLA)***

- Course introducing basic principles of programming using C++
- Conducted discussion sections, and designed and graded programming assignments

PROFESSIONAL EXPERIENCE

KLA Corporation June 2022 – Sep 2022
Algorithms Intern Milpitas, CA

- Developed license generation system using Python and Flask to authenticate access requests for eligible clients for an internal tool
- Migrated backend for wafer inspection tool from Windows to Linux to facilitate multi-GPU execution
- Devised data transmission framework to enable client-side wafer inspection tool GUI to communicate with Linux based remote backend

thiMk Nov 2018 – Jan 2019
Machine Learning Intern Bangalore, India

- Analyzed data about derivatives and options using different Machine Learning techniques to observe trends present in the Indian derivative market with Python, using TensorFlow libraries.
- Collaborated with a team of traders and developed a tool to dynamically provide a signal of buy or sell based on historical data and observed real time trends and fluctuations using a LSTM neural network.

PUBLICATIONS

A hybrid feature preservation technique based on luminosity and edge based contrast enhancement in color fundus images.
Palanisamy Gopinath, **Natarajan B. Shankar**, Palanisamy Ponnusamy, and Varun P. Gopi
in Biocybernetics and Biomedical Engineering 40, no. 2 (2020): 752-763 [paper]

PROJECTS

Noise Robust Automatic Speech Recognition

- Reduced Word Error Rate by 36% relative to the baseline by augmenting the clean data with Pink Noise and custom noise reduction pipeline using a combination of Gammatone Coefficients, Quartile Normalization and Rasta Filtering

Comparison of Different Facial ROI for Remote Photoplethysmography

- Analyzed the performance of existing Remote Photoplethysmography (rPPG) techniques on different regions of the face and attained an RMSE of 8 bpm by predicting the heart rate from the temple at an ISO of 460 using POS (Plane Orthogonal to skin) algorithm

Data Compression using Online Linear Classifier

- Developed an online classifier using a hybrid clustering approach to reduce data transmission using cvxpy and achieved an accuracy of 98.1% on MNIST dataset, while drastically compressing data required by using only 0.23% of all available samples

Fovea Detection and Disease Classification using Multistep CNNs

- Formulated a novel method to delineate different regions of fundus image using Multistep CNNs in TensorFlow and attained an accuracy of 93.2% and F-1 score of 0.95 on exudate grading and detection for diagnosis of diabetic maculopathy

Type-2 Adaptive Filter for Salt and Pepper Noise Removal

- Designed and implemented a novel pooling method using Type-2 fuzzy sets for removal of Salt and Pepper Noise in Images using Python that achieved a PSNR of 31dB without any blurring caused by Gaussian low pass filters

SKILLS

Languages: C, C++, Python
Packages: PyTorch, Kaldi, TensorFlow, OpenCV, Flask, HuggingFace Transformers
Other Tools: Latex, MATLAB, PostgreSQL, Docker