Sricharan Vijayarangan

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Research Interests

Application of Machine Learning and statistical methods to biosignal analysis, Human Computer Interaction inspired behavioural modelling and medical image analysis.

Education

- **SASTRA Deemed to be University** — Thanjavur, India
  Bachelor of Engineering in Electronics and Communication Engineering; CGPA: (8.05/10.0) — *Aug. 2015 – July. 2019*
- **The Emirates National School** — Sharjah, UAE
  High School — *Graduated May 2015*

Experience

- **Healthcare Technology Innovation Centre, IIT Madras** — Chennai, India
  Lead Project Engineer — *June 2020 - Present*
  - **Lifestyle Assessment**: Coordinated the development of a lifestyle assessment platform that quantifies stress, recovery, physical expenditure and sleep quality index in collaboration with Netrin
  - **Perceptual MRI reconstruction**: Developed GAN based models for MRI Reconstruction to optimize for perceptual MRI image quality. Optimized the perception-distortion tradeoff curve to obtain best possible perceptual images.
- **Healthcare Technology Innovation Centre, IIT Madras** — Chennai, India
  Project Engineer — *June 2019 - May 2020*
  - **Sleep Quality Assessment**: Assisted with the development of sleep quality assessment pipeline through HRV and activity analysis from ECG. This required the classification of sleep into its constituent stages and subsequently extracting quality.
  - **Stress Assessment**: Assisted with the development of stress assessment pipeline through HRV analysis. Analyzed various edge cases and helped formulate and validate dynamic thresholds for stress assessment.
  - **OMNI**: Developed open source Deep Learning models for robust monitoring of neonate breathing and cardiac health along with a well documented wearable Raspberry Pi implementation guide.
  - **Compact MRI reconstruction**: Developed compact DL models for MRI Reconstruction with the use of Knowledge Distillation. Also expanded the work to MRI Super resolution.
  - **SpO2 and pulse oximetry**: Developed a minimally calibrated data driven approach to obtain SpO2 from reflectance PPG waveforms. Additionally, proved that the state of the art ML models are deficient in modelling out of distribution samples.
  - **CPSC 2019 Challenge**: Participated in obtaining challenging QRS Detection and Heart Rate Estimation from Single-Lead ECG Recordings. The main focus was to develop algorithms that could provide gold standard R peak estimation in presence of motion artifacts.
- **Healthcare Technology Innovation Centre, IIT Madras** — Chennai, India
  Project Intern — *December 2018 - May 2019*
  - **Force estimation from Sole sensor**: Assisted the development of an algorithm to estimate force from Sole sensor in presence of motion. Used feature processing and basic ML algorithms to develop a pipeline for the same.
  - **Interpretable arrhythmia detection**: Developed a 8 class arrhythmia detection system in collaboration with doctors from CMC Vellore. Used Gradcam and LSTM visualization techniques to visualize the DL models that aided saliency and improved trust.
- **International Institute Of Information Technology Hyderabad (IIIT-H)** — Hyderabad, India
  Summer student — *July 2019*
  - **Summer school on Machine Learning**: Sessions introduced advancements of computer vision using deep learning. Selective topics: Generative Adversarial Networks, Variational Autoencoders, Domain Adaptation, Meta Learning and Bias and Fairness in AI, Graph Neural Networks

- **Bhabha Atomic Research Centre** Mumbai, India
  Project Trainee *May 2018 - July 2018*
  - **Automation of Security using Convolutional Neural Networks**: Ran various CNN architectures on X-ray images using Keras and visualized the activations using ZF Net

Publications

- **Biosignal analysis**:

  1. **S. Vijayarangan** *et al.* Interpreting Deep Neural Networks for Single-Lead ECG Arrhythmia Classification, in International Conference of *Engineering in Medicine and Biology Society* (EMBC 2020).
  2. **S. Vijayarangan** *et al.* Robust Modelling of Reflectance Pulse Oximetry for SpO2 Estimation, in *Engineering in Medicine and Biology Society* (EMBC 2020).
  3. **S. Vijayarangan** *et al.* RPnet: A Deep Learning approach for robust R Peak detection in noisy ECG, in International Conference of *Engineering in Medicine and Biology Society* (EMBC 2020).

- **Medical Image analysis**:

  1. B. Murugesan, **S. Vijayarangan** *et al.* KD-MRI: A knowledge distillation framework for image reconstruction and image restoration in MRI workflow, in *Medical Imaging with Deep Learning* (MIDL 2020).

Coursework

Digital Signal Processing, Engineering Mathematics, Matrix analysis and applications, Speech processing and Digital Image Processing

Professional activities

- **Blog - CompactML**: Journals my ML/AI podcast journey. (Launched August 2020)
- **Guest talk**: Bridging the gap between research and industry in ML and AI in University College of Engineering, Dindukal.
- **Workshop**: IOT based NodeMCU interfacing as part of TECS- July 2017.

Test Scores

- **GRE**: 329/340 (Quants: 170, Verbal: 159)
- **TOEFL**: 115/120

Programming Skills

- **Languages**: Python, C++, Matlab, SQL
- **Modules**: Pytorch, Scikit-learn, Scipy, Skimage, OpenCV
- **Misc**: Vim, Bash, Git

Organizations

- **The Electronics Club at SASTRA (TECS)**: Was involved in participating in multiple national tech fests and organizing numerous workshops.
- **Bhumi (Environmental NGO)**: Was involved in seed ball making events and awareness campaigns.