

Calvin A. Perumalla, PhD Email: calvinapollos@gmail.com | Phone: 813-508-0752 | LinkedIn: linkedin.com/in/calvin-perumalla | Santa Clara, CA (open to onsite)

Professional Summary Signal processing and machine learning engineer with 8+ years building end-to-end pipelines that transform raw physiological sensor and video data into actionable insights. PhD in Electrical Engineering with deep expertise in DSP (filtering, spectral/wavelet analysis, feature extraction), time-series modeling (LSTM/CNN), and biomedical systems. Proven collaborator with hardware/software teams and clinicians; shipped production ML at Vectra and led multi-sensor R&D at Stanford Medicine.

Skills - Signal Processing: FIR/IIR, FFT/STFT, spectral analysis, wavelets, adaptive filtering (MMSE), feature engineering, denoising, calibration, synchronization - **ML & CV:** CNN/LSTM for activity recognition, keypoint/gesture-based features, anomaly detection, classical ML (SVM, RF, PCA), model validation/metrics - **Languages/Tools:** Python (NumPy, SciPy, Pandas, scikit-learn, PyTorch, TensorFlow, Matplotlib, Jupyter), SQL, PySpark, C++, MATLAB, AWS, Databricks - **Data & Systems:** Multimodal sensor fusion (video/EEG/pressure), data acquisition, labeling pipelines, experiment design, A/B and cross-validation, HPC/productionization - **Domains:** Biomedical signal processing (ECG/EEG/ultrasound-force), surgical video analytics, wireless systems; familiarity with RF/time-frequency concepts

Relevant Experience Postdoctoral Researcher, Dept. of Surgery — Stanford School of Medicine, CA | Feb 2021–Present - Built AI pipelines (CNN+LSTM) for surgical activity recognition from endoscopic video; designed labeling, preprocessing, and temporal modeling to detect knot-tying, suture throws, and cutting; achieved SOTA accuracy for gesture detection. - Led design and deployment of piezo-resistive wearable sensor arrays and DAQ for scoliosis brace force mapping; delivered accurate, long-duration pressure tracking across 10+ patient pilots; developed calibration, filtering, and feature extraction. - Developed EEG-based performance assessment: end-to-end acquisition in OR/sim labs (190+ cases), preprocessing (artifact removal, spectral/wavelet features), and LSTM modeling to distinguish high vs. low performance. - Prototyped conformable, acoustically transparent pressure sensor array for ultrasound force mapping; characterized pressure distributions and linked forces to outcomes. - Drove rigorous validation: ground-truthing workflows, ROC/PR analysis, cross-validation, and robustness testing; collaborated with hardware/firmware/software to integrate algorithms into broader systems. - Co-PI, Stanford Catalyst: co-developed product strategy for sensor-based surgeon assessment; secured \$350K seed funding.

Data Scientist — Vectra AI, San Jose, CA | Oct 2017–Mar 2020 - Designed and productionized ML anomaly detection for network security (e.g., DNS exfiltration via volume/entropy features; DCE-RPC threats via collaborative filtering). - Built scalable data pipelines (SQL, PySpark, SparkML) over 1B+ rows; authored high-performance, production-grade Python in distributed/HPC environments. - Reduced analyst workload by ~80% by delivering reliable, high-precision detectors and clear, explainable metrics.

PhD Research Assistant, iWin Lab — University of South Florida, Tampa, FL | Jan 2013–Aug 2017 - ECG predictive analytics: engineered time-domain and rhythm-variability features and trained neural networks/SVMs to forecast paroxysmal atrial fibrillation (24-hr recordings), achieving >99% prediction accuracy in studies. - Diagnostic classification of cardiac conditions from long-term ECG with neural networks (98% accuracy). - Co-developed wireless integrated vectorcardiogram (iVCG): MMSE-based rotation/compensation to 12-lead ECG with <6% error; self-tracking algorithms to <5% error. - Deep learning for mobility prediction in 5G: LSTM prediction of base station handovers with 95% accuracy.

Education - PhD, Electrical Engineering — University of South Florida, 2017 Dissertation: Machine learning and adaptive signal processing techniques for electrocardiographic applications

- MS, Electrical Engineering — University of South Florida, 2014 - BTech, Electronics & Communication — Malla Reddy Engineering College (JNTU), India, 2011

Selected Patents & Publications - US Patent 11,426,113: System and method for the prediction of atrial fibrillation (2022) - US Patent 9,451,890: Integrated Vectorcardiogram System and Method of Use (2016) - AI-based video segmentation: procedural steps or basic maneuvers? Journal of Surgical Research, 2023 - Predicting Episodes of Atrial Fibrillation using RR-Intervals and Ectopic Beats, IEEE BHI, 2016

Additional - Funding: Key Personnel on NIH R01s; Co-PI, Stanford Catalyst (\$350K seed) - Mentorship/Collaboration: Led interns and cross-disciplinary teams; frequent design/peer reviews and grant writing - Affiliations/Awards: National Academy of Inventors (USF Chapter); 2021 Holman finalist (podium)