

KARTHIKEYAN GANESAN

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EDUCATION

Georgia Institute of Technology

MS in Electrical and Computer Engineering

August 2018 - May 2020

Madras Institute of Technology, Anna University

BE in Electronics and Instrumentation Engineering

August 2014 - March 2018

TECHNICAL STRENGTHS

Programming Languages

C/C++, MATLAB, Python

Libraries & tools

scikit-learn, numpy, matplotlib, pandas, PyTorch, keras

OpenMP, MPI, CUDA, OpenGL

RELEVANT COURSEWORK

Advanced Digital Signal Processing, Statistical Machine Learning, Digital Image Processing, Deep Learning, Data Analytics, Advanced Programming Techniques

EXPERIENCE

GT Brain Lab

Graduate Research Assistant

January 2019 - December 2019

- Developed classification algorithms for deciphering user attention using machine learning methods
- Compared the performance of various classification schemes like Linear Discriminant Analysis(LDA), Support Vector Machine (SVM) and k-Nearest Neighbour (kNN) algorithms
- Concluded kernel SVM as the most appropriate classifier owing to its higher classification accuracy (83%) over other methods used (LDA : 78% , kNN : 45%)

Sleepiz India Pvt Ltd

Signal Processing Intern

May 2019 - August 2019

- Developed a fundamental framework for Automatic Snore Sound Detection (ASSD) System for sleep apnea detection by adapting techniques from the domains of signal processing and machine learning.
- Compared the performance of LDA against GMM clustering, HMMs and deep learning based methods
- Performance of LDA based methods and GMM based methods were found to be identical indicating the Gaussian nature of audio features
- Enhanced modularity of the system by splitting the detection pipeline between real time hardware and cloud based processing

GT Epic Lab

Graduate Researcher

August 2018 - Decemeber 2018

- Developed an intelligent 16 channel surface electromyography based hip exoskeleton for stroke patients using pattern recognition and machine learning methods
- This novel exoskeleton predicts user movement intentions using an LDA algorithm at a tested accuracy of 90% instead of traditional moment based exoskeleton controllers (63%) while simultaneously decreasing the response time of the exoskeleton
- Performed forward feature selection and tuned optimum hyperparameters of the algorithm to reduce load on exoskeleton hardware

- Researched under the supervision of Prof S. Ramakrishnan on developing novel non-contact diagnostic modalities with a specific focus on biomedical instrumentation, physiological signal processing and AI techniques
 - Analysis of muscle fatigue conditions using electromyography signals and composite multiscale entropy. Composite multiscale entropy extracted at 10 scales is used as a feature descriptor for sEMG signals in dynamic contraction conditions. Decision trees and random forest classifiers were used for classifying fatigue states with accuracies of 79% and 86% respectively. Presented at ICMMB 2017, Melbourne, Australia
 - Fatigue Detection in Flexor Carpi Muscle using Single Mode Optical Fibre Specklegram Sensor. Developed a novel technique of estimating fatiguing conditions in muscles under isometric conditions through the use of custom fabricated OFS sensor. Applied statistical and wavelet analysis on obtained laser speckle patterns for differentiating fatigue and non-fatigue states in biceps brachii muscles.

PROJECTS

Traffic Sign Recognition using Spatial Transformer Networks August 2019 - December 2019

- Developed a Spatial Transformer CNN model for robust traffic sign detection
- The developed network achieved a recognition rate of 97% on GTSRB dataset and was tested to be invariant to various real life distortions
- The network was optimized to run inferences on limited resource devices

Content Based Audio Classification using Machine Learning Approaches August 2019 - December 2019

- Proposed and implemented a content based audio classification algorithm that extracts MFCC, LPC and Wavelet features and feeds the same to a downstream DNN in contrast to traditional spectrogram based approaches
- Achieved a classification rate of 75 % surpassing the state of the networks
- The developed architecture could potentially be used in edge devices for automatic content based audio classification

Face Spoof Detection System using CNNs January 2019 - April 2019

- Hypothesized a two stage face spoof detection pipeline using convolutional neural networks. The pipeline consists of a live face detector cascaded with a eye blink counter
- Haar like features and HOG based features were used for extracting face and eye ROIs in the input video stream and pre-trained CNNs were used for predicting and managing secure access for the facial biometric system
- The network was validated for real time performance in different lighting conditions for robustness of the model.

Muscle Co-Contraction Analysis using Deep Learning August 2019 - December 2019

- Used deep learning as a tool to analyze muscle activity under isometric conditions
- Performed time-frequency analysis on acquired sEMG signals to understand motor unit recruitment in fatigue and non-fatigue states and performed time and spectral domain feature extraction on these signals for a deep learning model to classify fatigue and non-fatigue states
- Individual neural networks built for the biceps and triceps muscles with 5 and 4 hidden layers respectively achieved a testing accuracy of 85.7%