ANJALI AGARWAL

Researcher
Tata Research Development and Design Centre

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RESEARCH INTERESTS

Brain-Computer Interface, Computational Neuroscience, Signal Processing, Deep Learning

WORK AND RESEARCH EXPERIENCE

Researcher September 2020 - Present
Tata Research Development and Design Centre
- Currently part of Behavioral, Business and Social Sciences research group.

Research Assistant October 2019 - June 2020
Nanyang Technological University, Singapore
- Developed a Multimodal Deception Detection system that can detect if a person is innocent or guilty based on eye-tracking data. The project was in collaboration with ***Temasek Labs***, under the guidance of ***Prof. Eng Siong***.
- Extracted various attributes from the raw data and performed statistical analysis to evaluate their significance.
- Modeled a linear classifier for prediction which achieved an accuracy of **99.2%**

Summer Intern May 2019 - July 2019
ApexPlus Technologies, Hyderabad, India
- Worked on various modes of wired communication, Ethernet and UART.
- Incorporated **GMII Communication** for packet decoding project. Improvised the communication system for more speed and throughput.
- Implemented a C based hardware programming using a tool flow kit called Chips 2.0.

Summer Intern May 2018 - June 2018
Ignitarium Technology Solutions, Kochi, India
- Part of a team developing a **Machine Learning based Defect Detection** application using Convolutional Neural Networks.
- Ported the application to an FPGA for better speed and accuracy. [*Video*] [*Report*]

EDUCATION

Bachelor of Technology, Electrical Engineering August 2016-August 2020
Indian Institute of Technology Palakkad, India
- Cumulative Grade Point Average (CGPA): 8.84/10.00
- Received the award for developing Innovative Assistive Communication Device.
- Successfully completed two industrial and one research internship.

PROJECTS

Automated Sleep Scoring System June 2021 - Present
Genzel Lab, Donders Institute of Brain, Cognition and Behaviour, Netherlands
- Designing an automated sleep scoring system using LFP data recorded from a silicon probe in prefrontal cortex and hippocampus.
- Extracted various features relevant for efficient classification, which can be fed into an energy-based model for obtaining all possible sleep stages.

EOG Based Virtual Keyboard February 2019 - April 2019

Indian Institute of Technology Palakkad, India

- Developed an EOG(Electrooculogram) based virtual keyboard which can assist people with motor neuron disease to communicate effectively using eye movements.
- Extracted the EOG signals using ECG electrodes placed around the eyes and filtered using analog filters.
- Built a classifier in MATLAB to differentiate the eye movements and remove the blink artifacts.
- Designed a novel and modified keyboard to increase the typing speed by **24%**. [*Video*] [*Code*]

Heart Rate Monitoring System using PPG sensor March 2019 - April 2019

Indian Institute of Technology Palakkad, India

- Designed a non-invasive Heart Rate Monitoring System using the Infrared PPG (Plethysmograph) sensor.
- The signals were filtered using analog filters and processed using Arduino and MATLAB. [*Video*]

SCHOLASTIC ACHIEVEMENTS

- Successfully completed the summer school on Computational Neuroscience and Deep Learning, offered by ***Neuromatch Academy***, as an interactive student.
- Secured the third place in ***BR41N.IO Hackathon*** organized by ***gtec medical engineering GmbH*** and ***IEEE Brain*** for the Data Analysis Category for the project "**Towards P300 calibration-less single-trial classification**". The project was aimed at improving the accuracy of P300 Speller device.
- Featured in ***The Times of India***, for developing an **Assistive Communication Device** for paralyzed and speech-impaired patients. Also assisted a sixty-three-year-old fully paralyzed and speech-impaired patient in communicating her thoughts and needs to her family.
- Made it to the Quarterfinals of ***DST & Texas Instruments India Innovation Challenge Design Contest 2017*** anchored by NSRCEL, Indian Institute of Management, Bangalore (IIMB) and supported by MyGov. Designed an **EOG based Smart Wheelchair** which can be used by paralyzed people in moving around comfortably.

TECHNICAL SKILLS

- **Programming Languages:** Python, Java, C, C++, VHDL, Verilog, Assembly Language(MIPS).
- **Software:** MATLAB, Eclipse, Android Studio, LabView, AutoCad, LTSpice, KiCad, Eagle, Xilinx ISE Design Suite.
- **Hardware:** Field Programmable Gate Array(FPGA), Arduino, Raspberry Pi, 3D Printing.
- **Tools:** Pytorch, Tensorflow, Git, MNE Python.

RELEVANT COURSES

Digital Image Processing	Digital Systems and Design	Neural Signal Processing
Biomedical Engineering	Analog Circuits	Machine Learning
Wireless Communication	Control Systems	Deep Learning
Digital Signal Processing	Analog and Digital Communication	Natural Language Processing

VOLUNTEERING EXPERIENCE

- Demonstrated various projects to high school students during Science Day, to motivate them towards science.
- Volunteered as a subject in data collection for various Brain-Computer Interface research projects.
- Involved in horticulture activities in college campus, as an NSS volunteer.