Dr. VRUSHALI G. RAUT

Associate Professor, Department of E & TC

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OVERVIEW:

Qualifications: Ph.D.(E&TC), ME (Electronics), BE (Electronics)
Experience: Teaching -27 years
Date of Joining STES: 15/12/2000
Skills and Proficiencies: Machine Learning, Deep Learning, Embedded System, Computer Vision, MATLAB, VLSI

SIGNIFICANT ACHIEVEMENTS:

- MODROBS of Rs.6, 00,000/- received for Modernization for Electronic Measurement Lab from AICTE, New Delhi
- Research Fund of Rs. 2,10,000/- received for Research work on "Artifact identification and elimination from brain activity pattern for Brain Computer Interface" from Savitribai Phule Pune University, Pune as a Principal investigator.
- Assisted Ms. Fatemeh Shahlaei a PhD student for her work on biomedical signal processing from Electronic Science Department of Fergusson College, Pune.
- Assisted Mr. Soorya Dev member central research lab, SKN Medical College and General hospital for his research and paper writing on a pilot study analyzing EEG signal.
- Presented Poster in regional conference "INNOVATION-2008", organized by University of Pune on 17-18 Nov. 2008
- Participated in Zonal level Research Competition " AVISHKAR-2013" , University of Pune, BCUD, on 23rd Dec. 2013.

AREA OF EXPERTISE /RESEARCH INTERESTS:

- Signal Processing, Embedded System, VLSI

NUMBER OF STUDENTS GUIDED:

- PG – 15 , UG – 35+ Groups

RESEARCH PULICATIONS:

Publication Summary:

Scopus/ SCI-11
International Journal: 11
Conference : 18

h-index : 04
i10 index : 02
https://scholar.google.com/citations?user=y--EPAsAAAAJ&hl=en

FUNDED RESEARCH PROJECT:

- Research Fund of Rs. 2,10,000/- received for Research work on "Artifact identification and elimination from brain activity pattern for Brain Computer Interface" from Savitribai Phule Pune University, Pune as a Principal investigator.

RESEARCH WORK:

Phd Research Work:

The research proposes the spontaneous BCI using Motor Imagery (MI) signals as the input to the system. Objectives of the research ensure the robust signal processing requirements of the 2-class MI based BCI with the variations like number of subjects, time window and the quantity of training and testing samples. Volume conduction, band limitation, and spatial spread of the EEG signal on neighboring electrodes are taken in consideration while pre-processing and the signal is modelled accordingly. Feature extraction methodologies used in the research, scrutinizes the time, time-frequency and spatial domain features and searches the relevant features prominent in characterising the MI task. The classification strategies works on kernel selection and fine-tuning the classifiers fitting it to the requirement of the system.

The objectives of research are

1. To study and distinguish various brain signals and corresponding brain activities.
2. To study and analyze state of art brain-computer interfaces.
3. To study and select brain activities and design appropriate stimulator.
4. Modelling and interpretation of brain activity pattern for enhancing brain-computer interface as assistive technology
5. To identify various artifacts and compare the artifact removal techniques on the basis of their properties, to implement an efficient technique for artifact removal.
6. To propose and implement an optimized technique for feature extraction of selected EEG signals.
7. To design effective classification method suitable for high variability EEG signal.
8. To suggest brain activity pattern for BCI with improved accuracy and Information transfer rate.

Contributions of Research Work:

1. A novel method based on wavelet band energy is proposed and implemented in this work for the selection of matching wavelet function. It is enhanced by adding wavelet band entropy for crosschecking the selected wavelet.
2. Volume conduction of the EEG signal is handled in this research by suggesting and implementing surface laplacian(SL), which restructures the signal, considering curvature of scalp surface and spread of the signal on neighboring electrodes. The effect is adjudged from the boost obtained in the classification accuracy.
3. Reduction in a number of electrodes and hence the collected signals are directly related to the complexity of BCI. This work contributes to optimizing the electrode requirement for the system.
4. The signal modelling proposed for this optimized structure removes the spatially correlated noise by wavelet decomposition and thresholding of the signal matrix. Principal components of

the wavelet reconstructed signals keep the movement-related variations intact, enhancing performance of the system.

5. This work contributes by proposing the two combinations of methodologies for judging the system in terms of processing time evaluated by information transfer rate(ITR) as performance parameter.

NOTABLE GUIDED PROJECTS:

PG projects:

- VLSI design of Low power 0.4 V operational common mode feed forward transconductance amplifier.
- Implementation of AES Algorithm on FPGA for Low Area and power Consumption
- Hardware Software Co-Simulation of Edge Detection for Image Processing System

UG Projects:

- Miniature Metamaterial Antenna for Microwave Imaging Application
- Fuel Theft Detection and Location Based Control
- Identifying and implementing a machine learning method suitable for processing VEP
- Implementation of APB Protocol using Verilog

RESOURCE PERSON TO INDUSTRY/ACADEMIA:

- Delivered the Expert session on "Advances in Control Systems" at Modern Education Society's Wadia College of Engineering Pune on 29th April 2024
- Worked as reviewer for 7th International Conference on computing communication control and automation organized on 18-19 Aug.2023 Technically sponsored by IEEE Pune Section and organized by Pimpri Chinchwad College of Engineering Nigdi Pune.
- Delivered an Expert session on "Code Division Multiple Access", for the students of BE E&TC at Cummins College of Engineering for Women, An Autonomous Institute affiliated to SPPU, on 13th April 2023.
- Contributed as resource person in "Virtual Labs: Hands on Online Workshop" Organized by Nodal centre 227-Sinhgad College of Engineering, under Virtual Lab-IIT Bombay, on 2nd December 2022
- Delivered Guest lecture on, "Application of Static Electric and Steady Magnetic Fields" , at Electronics and Telecommunication Department of Smt. Kashibai Navale College of Engineering, Pune 0n 26th Aug. 2022.
- Delivered Expert Lecture on Unit-III: Signal Generators of Elective-I: Electronics Measurement in the subject of TE (E&TC) 2019 course in the Faculty Orientation Workshop held under the aegis of BoS (E&TC) for TE E&TC 2019, organized by Department of E&TC, JSCOE, Pune.
- Delivered expert session on "Reconfigurable Computing" , at Department of Electronics and Telecommunication Engineering, Rajarshi Shahu College of Engineering, Pune 33 on 13th Novemeber 2017.
- Resource person for Teachers Training Program on "Network Synthesis and Filter Design" in Faculty Training Program on Third year E&TC Curriculum, from 17th -22nd June 2013, at Sinhad Academy of Engg. Kondhwa.

SUBJECTS TAUGHT:

- Reconfigurable Computing
- Design for Testability
- Computer Vision
- VLSI in Signal Processing
- Artificial Intelligence
- Machine Learning
- Deep Learning
- Mobile Communication
- Electronic Devices and Circuits
- VLSI
- Electromagnetics
- Network Synthesis and Filter Design
- Antenna and Wave Propagation
- Linear Integrated Circuits
- Network Theory
- Microcontroller
- Cellular Network
- Control System
- Analog Communication

FDP/STTP/SDP/WORKSHOPS ORGANIZED AS A COORDINATOR:

- Successfully coordinated the International students workshop on "Data Science using Python" on 19th Feb. 23rd, 2024 organized by brainOvision solution India pvt. Ltd. in association with AICTE
- Successfully organized the "National conference on Pervasive Computing" 2024 on 5th April 2024. 80 papers are presented and published in conference. Conference papers are further published by STM in their journals. Selected papers are published in Scoupus indexed Journal.
- Successfully organized two days state level workshop on "National Education Policy-2022: Establishment of Research & Development Cell in Institutions", from 07-08 Feb, 2023, at E&TC Dept. of Sinhgad College of Engineering.
- Worked as Coordinator for 5 days FDP on "PYTHON 3.4.3" in association with IIT spoken tutorial Bombay, 31st May-4th June 2021
- Worked as Coordinator for organization of webinar on "Use Of IoT For Control Systems" in association with IETE Pune Centre, 31st May 2021.
- Organized Webinar on IoT & Enabling Technologies 2nd Sep. 2020, with Copper Cloud, IO Tech Pvt Ltd.
- Organized Guest lecture on "LTE and Beyond" for BE E&TC, lecture delivered by Mr Gaurav Lokhande from Oracle, conducted on 27th May,2021.
- Organized 1 month Training and internship program on "Antenna Design Thinking 3" in association with ZinZout Teltech India, from 26 Dec. 2020 to 17 Jan 2021.
- Organized 5 day value addition program "Antenna Design Thinking" from 28th Sep.2019 to 5th Oct 2019. in association with Zinzout Teltech. Pune

- Co-coordinator for National Conference on Pervasive Computing (NCPC-2018), held on Feb. 27-28, 2018.
- Worked as Coordinator for FDP on Embedded Image Processing under TEQIP II from May 6^{th}-10^{th} 2013.

CONFERENCES ATTENDED:

- International Conference on Pervasive Computing (ICPC-2015), Sinhgad College of Engineering, Pune, India, Jan. 8-10, 2015.
- National Conference on Pervasive Computing 5-6 July 2024, at SCOE, Pune

FDP/STTP/SDP ATTENDED:

- TEQIP/AICTE/ISTE/IETE sponsored FDP -20
- Spoken tutorial IIT Bombay sponsored- 2
- Microsoft India & SAP India sponsored-01
- Continuing Education Programme, IIT Bombay – 01
- Other-7

RESPONSIBILITIES HANDLED AT STES/SCOE/DEPT:

Society Level

- Organizing committee member for International Telecommunication Union (ITU)International Conference (ITU) held at Narhe Campus
- Committee Member: Sinhgad Karandak, JAPAN Education Fair (2015)

Institute Level (SCOE)

- Institute level coordinator of "PARAKH" activity by AICTE
- Organizing Committee member for Graduation Ceremony.
- Coordinator at Facilitation center for Direct second year admission.
- Organizing committee member for INNOVATION, Graduation Ceremony.
- NAAC committee member at Institute level

Department Level (E&TC)

- Lab In charge for Electronic Measurement Laboratory, Teacher Guardian, Class Teacher
- Organizing committee member for various Staff Development Programs & National, International Conferences
- Coordinator of Academic monitoring Committee
- Project Guide for BE & ME students
- NBA Criterion 5 Co-Ordinator
- Departmental Staff student data coordinator
- Departmental coordinator for newsletter Quantum
- IQAC coordinator of the department
- Departmental Coordinator for Sinhgad Students Council

DECLARATION:

I hereby declare that all the above information furnished by me are true to the best of my knowledge.

Date: 9/ 2 / 2024 Signature