Pranav Deshpande

Curriculum Vitae

"Strength is Life, Weakness is Death!" - Swami Vivekananda

Education

2013–2015 **Masters of Technology**, *Indian Institute of Technology*, Bhubaneswar, *CGPA – 8.3*.
Electronics and Communication

2006–2010 **Bachelor of Engineering**, *University of Mumbai*, Mumbai, *Percentage – 66.39*.
Electronics Engineering

Masters Thesis

Title *Glottal Instant Detection from Speech & EGG Signals*

Supervisor Dr. M. Sabarimalai Manikandan (Asst. Prof.), SES, IIT Bhubaneswar

Description In this thesis, we attempt to develop an unified framework using variational mode decomposition (VMD) and autocorrelation feature based post-processing techniques for automatically detecting glottal closure instants (GCIs) and glottal opening instants (GOIs) from speech and EGG signals including both voiced speech and non-speech portions. The major objective of this thesis is to develop an unified VMD based filtering framework for extracting the glottal waveform feature signal meanwhile suppressing the background noises. In this work, we investigated a set of autocorrelation features for designing a post-processing technique to improve overall accuracy by reducing the number of false positives during non-speech portions without significantly reducing identification rate during voiced segment of EGG and speech signals.

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Experience

Industrial Research

2017–Present **Associate Research Engineer**, Brigosha Technologies, Bengaluru.

Since last **1 year**, serving as an Algorithm Developer at **Robert Bosch Engineering and Business Solutions Pvt. Ltd. (RBEI), Coimbatore** which is one of the client location. Learned and got good command over motion sensors basics, motion signal filtering, offset removal or calibration, sensor fusion and scrum based practices. Delivered good algorithm solutions as par the requirements. Also assisted some projects apart from regular assignment which include machine learning and image processing.

Projects Handled:

1. **Motion and Orientation Sensing for Robot Applications**
   - Team size: 3
   - Period: ongoing.
   - Platform: MATLAB, Python, C.
   - Customer: iRobot.
2. **Motion and Orientation Sensing for Drone Applications**
   - Team size: 3
   - Period: 5 months
   - Platform: MATLAB, Python, C.
   - Customer: Open Source Release-Product Promotion.
3. **9DoF based Heading angle correction under slowly varying magnetic field: Feature addition to Bosch Sensor Fusion (BSX3.0) library**
   - Team size: 2
   - Period: 2 months
   - Platform: MATLAB, Python, C.
   - Customer: Huawei and others.
   - The feature added was innovative and looking forward to file a patent.
4. **Harsh acceleration and sudden braking detection with only Accelerometer sensor for driving quality assessment**
   - Team size: 1
   - Period: 2 months
   - Platform: MATLAB, Python, C.
   - Customer: Reliance Jio.
5. **Object to lens distance estimation using binocular computer vision for AR/VR Applications**
   - Role: Assistance
   - Period: 1 month
   - Platform: MATLAB, Python with openCV.
6. **Motion activity recognition**
   - Role: Assistance
   - Period: 4 months
   - Platform: MATLAB, Python with scikit-learn.

2016–2017 **Research Scientist**, Atreya Innovations Pvt. Ltd., Pune.

Had an experience of **10 months**. Primarily worked on the development of multi-modal signal analysis framework, i.e. Naadi (the Radial Artery Pulse), Voice and Image of the subject, for Naadi and other Parikshas (Pulse based Diagnosis in Ayurveda). For this, we interacted with a team of Ayurvedic Doctors. The main tasks include data collection (, i.e. Pulse signals, Face and tongue images, voice) at medical camps and analyzing them by feature extraction and machine learning algorithms.

Projects Handled:

1. **Voice based Prakruti Analysis: Machine Learning Approach**
   - Team size: 1
   - Period: 10 months
   - Platform: MATLAB, Python with scikit-learn.
   - Key Result Areas:
     - Designed sentences for voice samples of subjects (, i.e. Recording content).
     - Given technical specifications for audio clip recording, such as sampling rate, number of channels etc.
     - Implemented signal conditioning and feature extractions for voice samples.
     - Classified data using different supervised and unsupervised machine learning algorithms.
     - Set up relation between of Ayurvedic definitions and voice specific parameters.
2. **Pulse Rate Variability (PRV) and its correlation with Prakruti: Machine Learning Approach**
   - Team size: 1
   - Period: 10 months
   - Platform: MATLAB, Python with scikit-learn.
   - Key Result Areas:
     - Read literature on Ayurveda and understood basics theory and terminology of Ayurveda.
     - Implemented preprocessing and signal conditioning modules for pulse signals.
     - Implemented time and frequency domain features extraction modules.
     - Guided two intern M.Sc. projects related with pulse parameter and rate variability with machine learning approach.
3. **Tongue and Face features and their correlation with Prakruti: Machine Learning Approach**
   - Role: Assistance
   - Period: 10 months
   - Platform: MATLAB, Python with openCV.

Academic Research

2013–2016 **Research Scholar**, Indian Institute of Technology, Bhubaneswar.

Had around **03 years** of research experience while working as a M. Tech. scholar and Ph.D. scholar at IIT Bhubaneswar. Published one conference and two journals. Explored areas like stochastic signal modeling, speech and biomedical signal processing and analysis, Image processing.

Teaching

2010–2016 **Teaching Assistant and Lecturer**.

Had around **05 years** teaching experience which helped me a lot to enhance my basic understanding and concepts of subjects like signal processing, microprocessors and analog circuit design.

Extra Certifications

2018 **Machine Learning** by Andrew Ng, Stanford University on Coursera, (https://www.coursera.org/account/accomplishments/verify/JBRXBMHC86RY)

2018 **Learn Python: The Complete Python Automation Course!** on Udemy, (https://www.udemy.com/certificate/UC-25GBXWUQ/)

2018 **Introduction to Parallel Programming using GPGPU and CUDA** on Udemy, (https://www.udemy.com/certificate/UC-76HISUU8/)

Publications

International Journals

2017 **Pranav S. Deshpande** and M. S. Manikandan, "Effective Glottal Instant Detection and Electroglottographic Parameter Extraction for Automated Voice Pathology Assessment", *IEEE J. Biomed. Health Inform.,* vol.PP, no.99, pp.1-1, Jan 2017.

2018 **Pranav S. Deshpande** and M. S. Manikandan, "Glottal Opening Instants Detection from Speech Signals Using Variational Mode Decomposition", *IEEE Trans. Instrum. Meas.,* (To be submitted), 2017.

2015 M. S. Manikandan, B. Ramkumar, **Pranav S. Deshpande**, T. Choudhary, "Robust Detection of Premature Ventricular Contractions Using Sparse Signal Decomposition and Temporal Features", *IET Healthcare Technology Letters,* vol.2, no.6, pp.141-148, Nov 2015.

International Conference

2015 **Pranav S. Deshpande** and M. S. Manikandan, "Improving Accuracy of Glottal Closure Instant Detection Methods in Nonstationary Noise", in *Proc. IEEE Int. Conf. on Signal Processing and Integrated Networks (SPIN-2015)*, Feb. 2015

Skills

Domain

Signals — Biomedical and Audio Signal Processing, Image Processing, Motion Sensor Signal Processing and Fusion

Data Science — Feature Extraction, **Machine Learning**, Soft and Evolutionary Computing

Filtering — Digital filter design, Filter Banks, Adaptive Filtering

Basics — Random Signal Modeling, Estimation Theory, Convex Optimization,Linear Algebra

Tools

MATLAB — Code conversion (Coder), Simulation and Scripting with Toolboxes: Signal Processing, DSP System, Statistics and Machine Learning, etc.

PYTHON — NumPy, SciPy, pandas, matplotlib, **OpenCV**, **scikit-learn**, TensorFlow (Learning)

C/C++ — Basic coding with openCV and DSP libraries, openMP & CUDA (Learning)

Hardware — Basic analog circuits design, STM32F407 Discovery Board, Arduino UNO, Raspberry Pi 3 etc.

Others — basics of Shell Scripting, GNU Make, SQLite, Jenkins, Multisim, VHDL, PSPICE.

Office

O.S. Basic user level proficiency with **Ubuntu** and Microsoft Windows.

Office Git, LaTeX, OpenOffice, scrum practices.

Extras and Achievements

Academic

2013 Secured **All India Rank 800** with score 649 in GATE 2013.

Leadership and Management

2014-2015 Worked as a **Mess Wing Counselor** at IIT Bubaneswar Boys' Hostel; Madanpur.

2014-2015 Worked as M.Tech. Electrical **Student's Representative at Career Development Cell** of IIT Bhubaneswar.

2008-2010 Worked as **Field Officer, Assistant Coordinator and Coordinator** for the Publicity Comity of national level competition *Brainwaves*.

2008 Worked as **Field Officer** for Orchestra Comity of cultural gathering *Utopia*.

Music and Literature

2017 Authored an article on Marathi News Portal Smart Maharashtra (http://smartmaharashtra.online/aai/).

2013 Worked as **Assistant Music Director** for the Music Album *Na Jaanu Kaisa Ishq Hai* in the year 2013 (https://www.youtube.com/watch?v=oBRXNt58pvE).

2005 Got **First Class** in Pune Bharat Gayan Samaj's first year classical Singing exam in the year 2005.

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Interests

- Daily 52 sets of Surya Namaskar
- Singing and composing songs, Poetry Writing
- Playing Guitar and Harmonium
- Cooking, Swimming

Languages

Marathi	**Mothertongue**	*Conversationally fluent*
Hindi	**Fluent**	*Conversationally fluent*
English	**Fluent**	*Medium of education after 10^{th} std. class*

References

1. Dr. M. Sabarimalai Manikandan

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2. Dr. Barathram. Ramkumar

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