

Swapnil Bhosale

☎ +91-7208723191 | 🏠 Mumbai, India

✉ vbhosale.bhosale@gmail.com

🌐 [linked.in/swapnil-bhosale](https://www.linkedin.com/in/swapnil-bhosale) | 📄 [G Scholar](#)

Research Interests:

Machine learning, Audio and Speech Processing,
Multimodal learning, Meta learning, NLP

EDUCATION

Surrey AI Institute, University of Surrey

PhD - Vision, Speech, Signal Processing

Surrey, UK

Sep. 2022 – Present

Walchand College of Engineering

Bachelor of Technology in Computer Science and Engineering [8.54/10]

MH-India

May 2015 – May 2019

RESEARCH EXPERIENCE

Researcher - Speech and NLP Team

Aug. 2019 – Sep. 2022

TCS Research and Innovation

Mumbai, India

Robust Audio Event Detection systems for non-stationary distributions. (ongoing)

- Proposed a semi-supervised few-shot learning paradigm, for robustness towards unseen classes by mining episodic triplets as opposed to conventional [triplet loss](#).
- Adapting continual learning architectures to classify novel classes, while simultaneously retaining classification performance towards base classes.
- Substantial improvements observed over existing supervised models as well as existing few-shot approaches. *Outcome:* TCS-FiSound, A system for detecting audio patterns in the wild; [(pre-print)[1](#)].

Fusing multimodal cues for Emotion recognition

- Improved speech emotion performance by combining acoustic features with linguistic cues obtained from intermediate layers of pre-trained Speech-to-Text models.[\[3\]](#)
- Proposed a calibration free EEG signal based emotion recognition method by consolidating existing meta-learning based models with a multi-head attention mechanism to learn subject invariant embeddings, capable of incorporating spatio-temporal relationships across adjacent EEG electrodes. [\[1\]](#)

Pathological Speech Processing: Automated Intelligibility Assessment

- Developed an intelligibility assessment system for dysarthric subjects by combining acoustic features with patterns within erroneous ASR transcriptions. Designed a cost minimization approach to quantify minimum number of words required for reliable intelligibility estimation using acoustic features, and [Visible Speech](#) representation.[\[4, 5\]](#)

Research Intern - Speech and NLP Team

Jan. 2019 – May 2019

TCS Research and Innovation

Mumbai, India

Spoken Language Understanding for low-resource scenarios.

- Explored transfer learning for low resource spoken language understanding without Speech-to-Text conversion, by localizing speaker invariant features learned by intermediate layers of pre-trained ASR models.
- Substantial improvements achieved over conventional MFCC-based features even when evaluated in language mismatched test setups.[\[6\]](#)

Machine Learning Intern

Mar. 2018 – Sep. 2018

Chainrule.ai (now, Datanudge.ai)

Remote

Automated Classification from chest Radiographs using Deep Learning.

- Developed classification and segmentation models using Deep Learning for medical data(X-Rays, CT scans, MRI scans).
- Majorly contributed in,
 1. Chest Xray cancer detection and segmentation [NIH Dataset]
 2. Pancreatic Cancer Survival Rate Prediction [MICCAI 2018-PDAC]
 3. Brain Tumor Segmentation Challenge [BraTS 2018]

Summer Research Intern

Jun. 2018 – Jul. 2018

TCS Research and Innovation

Mumbai, India

Speech Command Recognition using End-to-End Deep models.

- Carried out experiments and analysis on Deep Learning models for classifying spoken commands and spoken utterances (on lines of spoken language understanding without ASR).
- Experimented with various architectures - Convolutional Neural Networks, LSTMs, CNN-LSTMS, Hierarchical Networks on speech datasets.
- Mainly focused on deriving meaningful intuitions by visualizing the layer weights, and using manifold learning algorithms(PCA,T-SNE) for dimensionality reduction.

PUBLICATIONS

1. **Bhosale, Swapnil***, Upasana Tiwari*, Rupayan Chakraborty, and Sunil Kumar Kopparapu. Contrastive Learning of Cough Descriptors for Automatic COVID-19 Preliminary Diagnosis. In *Special Session DiCOVA at Interspeech 2021* ([link](#))
2. Upasana Tiwari*, **Bhosale, Swapnil***, Rupayan Chakraborty, and Sunil Kumar Kopparapu. Deep Lung Auscultation Using Acoustic Biomarkers For Abnormal Respiratory Sound Event Detection. In *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2021* ([link](#))
3. **Bhosale, Swapnil**, Rupayan Chakraborty, and Sunil Kumar Kopparapu. Deep Encoded Linguistic and Acoustic Cues for Attention Based End to End Speech Emotion Recognition. In *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2020*, pages 7189–7193 ([link](#))
4. Ayush Tripathi, **Bhosale, Swapnil**, and Sunil Kumar Kopparapu. Improved Speaker Independent Dysarthria Intelligibility Classification Using Deepspeech Posteriors. In *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2020*, pages 6114–6118 ([link](#))
5. Ayush Tripathi, **Bhosale, Swapnil**, and Sunil Kumar Kopparapu. A Novel Approach for Intelligibility Assessment in Dysarthric Subjects. In *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2020*, pages 6779–6783 ([link](#))
6. **Bhosale, Swapnil**, Imran Sheikh, Sri Harsha Dumpala, and Sunil Kumar Kopparapu. End-to-End Spoken Language Understanding: Bootstrapping in Low Resource Scenarios. In *Interspeech 2019*, pages 1188–1192 ([link](#))
7. Ayush Tripathi, **Bhosale, Swapnil**, and Sunil Kumar Kopparapu. Automatic Speech Intelligibility Assessment in Dysarthric Subjects (Demo). In *The Fourteenth International Conference on Digital Society. IARIA*, 2020 ([link](#))

JOURNAL PAPERS

1. **Bhosale, Swapnil**, Rupayan Chakraborty, and Sunil Kumar Kopparapu. Calibration free Meta learning based approach for Subject Independent EEG Emotion Recognition. In *accepted (Oct 23, 2021) at Biomedical Signal Processing and Control*.
2. Ayush Tripathi, **Bhosale, Swapnil**, and Sunil Kumar Kopparapu. Automatic Speaker Independent Dysarthric Speech Intelligibility Assessment System. *Computer Speech & Language*, 69:101213, 2021 ([link](#))

PRE-PRINTS

1. **Bhosale, Swapnil**, Rupayan Chakraborty, and Sunil Kumar Kopparapu. Semi Supervised Learning For Few-shot Audio Classification By Episodic Triplet Mining. *arXiv preprint arXiv:2102.08074*, 2021 ([link](#))

PATENTS - FILED

1. **Bhosale, Swapnil**, Rupayan Chakraborty, and Sunil Kumar Kopparapu. Methods and Systems For Building A SemiSupervised Few-Shot Model. Indian Provisional Patent Ser. No. 202021034689, filed 12 August 2020
2. Tripathi, Ayush and **Bhosale, Swapnil** and Kopparapu, Sunil Kumar. Methods and Systems For Assessment of Speech Intelligibility in Dysarthric Subjects. Indian Provisional Patent Ser. No. 202021008649, filed 28 February 2020

TECHNICAL SKILLS

Languages: Python, R, Java, C/C++, JavaScript, HTML/CSS

Deep learning Toolkits: PyTorch, Keras, Tensorflow

Frameworks: Flask, Django

Developer Tools: Git, PyCharm, IntelliJ, Eclipse

ACHIEVEMENTS

Predict-X, Mindspark-College of Engineering, Pune - Winner Sep. 2017

- Category : *Time Series Prediction, Natural Language Processing (NLP)*
- Involved two problem statements, Uni-variate Time Series prediction on stock prices and developing a rating system for products by sentiment analysis on Amazon product reviews.

Smart India Hackathon 2018 - Finalist Apr. 2018

- Category : *Recommendation system, Clustering, Churn Prediction*
- Developed an Online Incubator platform for Skill Development and Entrepreneurship Ministry of India. Built recommendation systems based on location and job preferences for registered members.

E-Yantra, IIT Bombay - Semi Finalist 2017 - 2018

- Category : *Path planning, swarm robotics, Arduino programming*
- Built a system of fully autonomous weeder bots using ATmega256 controller, in an attempt to implement the concepts of swarm robotics for farming.

AWS Deep Learning Hackathon, IIT Madras - Placed 6th Jan. 2018

- Category : *Deep Learning, Machine Learning, Feature Engineering*
- Task 1: Developed a driver distraction detection system with Geo-tagging deployed using AWS lambda endpoints.
- Task 2: Predict the maintenance date for Rolls Royce water pumps using past history and process logs.

National Robotics Championship 2016, IIT Bombay - Zonal Winner Mar. 2016

- Category : *Arduino programming, Micro controllers*
- Developed Arduino based autonomous line follower bots.

PROJECTS

Web Template Image to code Generation | Python, Flask, Keras

- * Trained an End-to-End model to jointly learn the spatial characteristics from a snapshot (image) of a webpage and sequential information from its corresponding HTML code template.
- * Encoded vectors for image and text (code) are generated using two separate convolutional and RNN encoders respectively, and later fused using an attention mechanism

Face Sketch to Photo-realistic Images using GANs | Python, Flask, Keras

- * Trained a model based on Deep convolutional conditional Generative Adversarial Networks, to generate realistic images from hand-drawn face sketches.
- * Later extended to generate enhanced images from poorly lit images, or blurry images.
- * Incorporated separate gender prediction and age estimation models over the generated image, -particularly, important from the forensic identification perspective.

Driver Distraction Detection System | *Python, Tkinter, Keras*

- * Built a system to detect a distracted driver and alert him/her through a computer generated voice.
- * The system used a model trained using CNNs to classify the driver's actions into a set nine predefined distractions. The model took multiple frames from a streaming video feed captured from a dashboard camera.

LANGUAGES

English: Fluent (IELTS: Band-8 (Dt: Oct 24, 2020))

Marathi: Fluent (Native)

Hindi: Fluent