

# Sarthak Kumar Maharana

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## Research Interests

My research interests broadly encompass **multimodal learning** (Vision + X) with a larger focus on the efficient adaptation of models to distributional shifts, and improving their robustness and generalization. Additional interests lie in **data-centric deep learning** (*continual, few-shot, transfer learning*), **computer vision**, and **human-centered AI**.

## Education

- 2023-Present **PhD in Computer Science**, *The University of Texas at Dallas*, Richardson, USA, 4.0/4.0 (core)  
Advisor: Dr. Yunhui Guo; Research Focus: Multimodal Learning, Data-Efficient Deep Learning, Computer Vision, Machine Learning.
- 2021-2023 **MS in Electrical Engineering**, *University of Southern California (USC)*, Los Angeles, USA, 3.85/4.0  
Track: Machine Learning and Data Science.
- 2016-2020 **BTech in Electrical and Electronics Engineering**, *International Institute of Information Technology (IIIT)*, Bhubaneswar, India, 8.32/10, Thesis: 9.85/10.0  
Thesis: *Acoustic-to-articulatory inversion of dysarthric speech by using cross-corpus acoustic-articulatory data.*

## Experiences

- Aug'23- **Data-Efficient Intelligent Learning Lab**, *UTD*, Richardson, USA  
*Research Assistant* — Advisor: Dr. Yunhui Guo
- Enhancing multimodal model adaptation and robustness to distributional shifts.
  - Designed a computationally inexpensive adaptive learning rate continual test-time domain adaptation method based on prediction uncertainty and parameter sensitivity.
  - Proposed a submodular optimization framework for active learning in LiDAR-based object detection.
- May'22- **USC's Mark and Mary Stevens Neuroimaging and Informatics Institute**, *Neuro Imaging Computing Research*, Los Angeles, USA  
July'23 *Student Researcher* — Advisor: Dr. Yonggang Shi
- Developed a tool to perform automatic tractography of the brainstem using d-MRI images.
  - Leveraged image registration and label fusion methods to automatically generate the anatomical ROIs.
- Dec'21- **Signal Analysis and Interpretation Lab (SAIL)**, *USC*, Los Angeles, USA  
Dec'22 *Student Researcher* — Advisor: Dr. Shrikanth (Shri) Narayanan
- Speaker recognition from rt-MRI videos, based on an unsupervised disentanglement representation learning scheme.
- July'20- **Medical Mechatronics Lab**, *National University of Singapore (NUS)*  
Apr'21 *Part-time RA (remote)* — Advisor: Dr. Hongliang Ren
- Semantic segmentation to perform pixel-wise prediction of the needle trajectory in ultrasound images - deep learning using autoencoders and spatiotemporal modules.

- Dec'19- **Signal Processing and Interpretation (SPIRE) Lab**, *Indian Institute of Science*  
Sep'20 (*IISc*), Bengaluru, India  
*Student Researcher* — Advisor: Dr. Prasanta Kumar Ghosh
- Studied acoustic-to-articulatory inversion (AAI) for dysarthric speech at low-resource data conditions involving Indian languages, using joint learning and multi-task training. [ICASSP'21]
  - Conditioned the jointly-trained AAI model with x-vectors to study its benefits on the AAI performance of dysarthric subjects.
- May'19- **Department of Electrical Engineering**, *Indian Institute of Technology, Kharagpur*,  
Jul'19 West Bengal, India  
*Summer Intern* — Advisor: Dr. Aurobinda Routray
- Developed an in-house template-matching algorithm to detect breaths in speech recordings.

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## Publications

**C = Conference, P = Preprint/Submitted**

- P.2 **Enhancing Robustness of CLIP to Common Corruptions through Bimodal Test-Time Adaptation**  
**Sarthak Kumar Maharana**, Baoming Zhang, Leonid Karlinsky, Rogerio Feris, and Yunhui Guo.  
[Under Review]
- P.1 **PALM: Pushing Adaptive Learning Rate Mechanisms for Continual Test-Time Adaptation**  
**Sarthak Kumar Maharana**, Baoming Zhang, and Yunhui Guo.  
[Under Review]
- C.5 **Variational Diffusion Unlearning: A Variational Inference Framework for Unlearning in Diffusion Models**  
Subhodip Panda, MS Varun, Shreyans Jain, **Sarthak Kumar Maharana**, and Prathosh AP.  
*NeurIPS Safe Generative AI Workshop 2024*  
[Paper]
- C.4 **STONE: A Submodular Optimization Framework for Active 3D Object Detection**  
Ruiyu Mao, **Sarthak Kumar Maharana**, Rishabh K Iyer, and Yunhui Guo.  
*Advances in Neural Information Processing Systems 2024 (NeurIPS)*  
[Paper]
- C.3 **Not Just Change the Labels, Learn the Features: Watermarking Deep Neural Networks with Multi-View Data**  
Yuxuan Li, **Sarthak Kumar Maharana**, and Yunhui Guo.  
*European Conference on Computer Vision 2024 (ECCV)*  
[Paper] [Code]
- C.2 **Acoustic-to-articulatory inversion for dysarthric speech: Are pre-trained self-supervised representations favorable?**  
**Sarthak Kumar Maharana**, Krishna Kamal Adidam, Shoumik Nandi, and Ajitesh Srivastava.  
*2024 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) Workshops - Self-supervision in Audio, Speech, and Beyond.*  
[Paper] [Poster]

C.1 **Acoustic-to-articulatory inversion for dysarthric speech by using cross-corpus acoustic-articulatory data**

**Sarthak Kumar Maharana**, Aravind Illa, Renuka Mannem, Yamini Belur, Preetie Shetty, Veeramani Preethish Kumar, Seena Vengalil, Kiran Polavarapu, Nalini Atchayaram, and Prasanta Kumar Ghosh.

*2021 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*  
[Paper] [Poster] [Talk]

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## Selected Projects

Oct'22- **Understanding Multi-Modal Speaker Recognition via Disentangled Representation Learning**, USC  
Dec'22

- Presented an adversarial invariance approach to address multimodal speaker recognition, robust to various sources of variability present in videos and speech. [Code], [Report]

Nov'22- **Understanding Linguistic Patterns for Text-Based Speaker Classification**,  
Dec'22 USC

- Studied various text feature extraction methodologies using pre-trained models and classification algorithms and compared them to build a computationally efficient system targeted for text-based speaker classification. [Code], [Report]

Apr'22- **The Effect of Conditioning of Trigonometric Transformations of Dates with**  
May'22 **Meteorological Data in Forest Fires Prediction: An Experimental Study**,  
USC

- Studied the effects of conditioning a trigonometric transformation of dates with meteorological data, that would aid in predicting the occurrence of forest fires in Algeria. [Code]

Jan'19- **Single Image Haze Removal using Dark Channel Prior**, IIIT-Bh

- Mar'19
- The dark channel is based on the following observation relating to outdoor images: In most of the non-sky patches, at least a certain color channel has at least one dark channel i.e. it has low intensities tending to zero.
  - Redesigned an algorithm regarding this. [Link].

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## Skills

Languages *Advanced*: Python, MATLAB; *Familiar*: C++, Java, Bash

ML Libraries *Advanced*: PyTorch, Keras, TensorFlow; *Intermediate*: OpenCV, scikit-learn

Softwares *Intermediate*: RStudio, ITK-SNAP, BrainSuite

Others Git,  $\text{\LaTeX}$ ; OS: Unix, Windows

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## Talks

**Acoustic-to-articulatory inversion of dysarthric speech by using cross-corpus acoustic-articulatory data**

ICASSP'21

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## Teaching Experience

Aug'23- **Artificial Intelligence, Operating Systems**, *Teaching Assistant*, UTD — Develop-  
Dec'23 ing course materials, grading assignments, and holding doubt-clearing sessions.

Jan'22- **A Computational Introduction to Deep Learning**, *Grader and Mentor*, USC —  
May'22 Grading assignments, holding office hours, monitoring online forums, and project grading.

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## Academic Service

### Invited Reviewer

○ CVPR'25, ICLR'25, NeurIPS-W'24, BMVC'24, CVPR-W'24, ECCV'24.

### Sub-reviewer

○ AAAI'24

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## Volunteer Work

Aug'23- **CORD.ai** — Helping build CORD.ai, an AI research community, as a research advisor and volunteer.

Oct'21- **USC IEEE Graduate Society** — Attended group meetings, strengthened academic  
May'23 and social growth of the members, and hosted workshops.

Aug'20- **PyCon India 2020** — Content writer for social media handles, helped the promotions  
Oct'20 team, and created virtual swags.

Jul'18- **International Association of Engineers (IAENG)** — Student member.

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## Awards

2024 **Oxford Summer School in Machine Learning 2024**, Accepted to the MLx Representation Learning and Generative AI track

2023 **Computer Science PhD Fellowship**, The University of Texas at Dallas

2020 **Governing Body Merit Scholarship**, Award of INR 15k, *Academic year: 2019-2020*, IIIT-Bh

2019 **Dean's List** [Link], IIIT-Bh

2019 **Summer Research Fellowship**, *Indian Academy of Sciences (10% selection rate)* [Link]