

Subash Khanal

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EDUCATION

Washington University in St. Louis

Doctor of Philosophy in Computer Science

St. Louis, MO, U.S.

2022 - ongoing

University of Kentucky

Doctor of Philosophy in Computer Science

Lexington, KY, U.S.

2020 - 2022

Master of Science in Electrical Engineering (GPA: 4.0/4.0)

2018 - 2020

Nitte Meenakhshi Institute of Technology

Bachelors in Electronics and Communication Engineering (GPA: 9.54/10 - Gold Medalist)

Bengaluru, India

2012 - 2016

WORKING EXPERIENCE

Multimodal Vision Research Lab

Graduate Research Assistant

Washington University in St. Louis

August 2022 - Present

- Training multi-modal deep learning models for geo-spatial understanding of sounds around the world. Built a novel dataset by combining multi-resolution satellite imagery, geotagged sounds, and textual description of sounds.
- Transformer based modality-specific models were contrastively trained creating a tri-modal embedding space. The proposed method significantly outperformed the existing SOTA, with an improvement of satellite image-to-audio Recall@100 from 0.256 to 0.450. The multi-modal embedding space also enabled zero-shot soundscape mapping over any geographic region from either textual or audio query.
- Worked on large-scale self-supervised learning (SSL) methods based on Masked Autoencoders (MAE) to learn useful features for remote sensing tasks such as semantic change detection.

Lin Brain Lab

Graduate Research Assistant

University of Kentucky

August 2020 - August 2022

- Provided applied Machine Learning (ML) and data science support to advance Alzheimer's disease research while working on different modalities such as medical imaging, electronic health records, and genomics.
- Designed CNN and Vision Transformers (ViT) based models trained on MRI/PET imagery. Moreover, with focus on interpretability, designed an inherently interpretable ViT model.
- Built ML models trained on genetics, electronic health records and imaging features for biomarkers discovery and early prediction of Alzheimer's disease.

Speech and Signal Processing Lab

Graduate Research Assistant

University of Kentucky

August 2018 - August 2020

- Performed a thorough literature review and statistical analysis of articulatory differences in speech of native and non-native speakers of English.
- Built Automatic Speech Recognition (ASR) based Mispronunciation Detection and Diagnosis (MDD) framework. ASR was trained using Recurrent Neural Networks (RNN) on articulatory as well as acoustic features.

Kantipur Engineering College

Lecturer

Lalitpur, Nepal

April 2017 - July 2018

- Taught courses: Microprocessor, Instrumentation
- Designed and conducted lab on Digital Signal Processing (DSP), Microprocessor.

KEY SKILLS

- **Languages and Tools:** Python (fluent), Pytorch (fluent), Git (fluent), Docker (familiar), Kaldi ASR (familiar), QGIS (familiar).
- **Research Interests and Relevant Courses:** Machine Learning, Computer Vision, Data Science, Audio Processing, Speech Recognition, Geo-spatial Science, Data Structures and Algorithms.

AWARDS AND ACHIEVEMENTS

- COMPLEX Scholarship offered by the Indian Embassy in Nepal for undergraduate study in India, 2012–2016.
- ECE Gold Medal, 2016 for graduating with Rank 1 in the department.

PUBLICATIONS

- **Khanal Subash**, Sastry Srikumar, Dhakal Aayush and Jacobs Nathan. "Learning Tri-modal Embeddings for Zero-Shot Soundscape Mapping.", Accepted at BMVC, 2023.
- Dhakal Aayush, Ahmad Adeel, **Khanal Subash**, Sastry Srikumar and Jacobs Nathan. "Sat2Cap: Mapping Fine-Grained Textual Descriptions from Satellite Images." arXiv preprint arXiv:2307.15904, 2023.
- **Khanal Subash**, Brodie Benjamin, Xing Xin, Lin Ai-Ling and Jacobs Nathan. "Causality for inherently explainable transformers: CAT-XPLAIN." Accepted for spotlight presentation at the Explainable Artificial Intelligence for Computer Vision Workshop at CVPR 2022.
- Xing Xin, Liang Gongbo, Zhang Yu, **Khanal Subash**, Lin Ai-Ling and Jacobs Nathan. "Advit: Vision transformer on multi-modality pet images for alzheimer disease diagnosis." In 2022 IEEE 19th International Symposium on Biomedical Imaging (ISBI), pp. 1-4. IEEE, 2022.
- **Khanal Subash**, Chen Jin, Jacobs Nathan and Lin Ai-Ling. "Alzheimer's Disease Classification Using Genetic Data." In 2021 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), pp. 2245-2252. IEEE, 2021.
- **Khanal Subash**, Johnson Michael T., Soleymannpour Mohammad and Bozorg Narjes. "Mispronunciation Detection and Diagnosis for Mandarin Accented English Speech." In 2021 International Conference on Speech Technology and Human-Computer Dialogue (SpeD), pp. 62-67. IEEE, 2021.
- Brodie Benjamin, **Khanal Subash**, Rafique Muhammad Usman, Greenwell Connor and Jacobs Nathan. "Hierarchical Probabilistic Embeddings for Multi-View Image Classification." In 2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS, pp. 1011-1014. IEEE, 2021.
- **Khanal Subash**, Johnson Michael T. and Bozorg Narjes. "Articulatory Comparison of L1 and L2 Speech for Mispronunciation Diagnosis." In 2021 IEEE Spoken Language Technology Workshop (SLT), pp. 693-697. IEEE, 2021.
- **Khanal Subash**, "Mispronunciation Detection and Diagnosis for Mandarin Accented English Speech". Theses and Dissertations–Electrical and Computer Engineering. 156, 2020