Tanmay Khandelwal

LinkedIn: linkedin/tanmayy24 Email: tk3309@nyu.edu
GitHub: github/tanmayy24 Website: tanmayy24.github.io

Research Interests

- Sound event detection, Natural language processing, Speech/Audio signal processing, and Machine learning

Education

- **New York University, Courant Institute of Mathematical Sciences** New York, NY
  Master of Science in Computer Science (Incoming) Sept 2023
- **Birla Institute of Technology and Science (BITS), Pilani** Pilani, India
  Bachelor of Engineering in Electrical and Electronics Engineering; *GPA: 8.43/10* Aug 2017 - Jun 2021
  Relevant Courses: Neural Networks and Fuzzy Logic, Information Retrieval, Digital Image Processing, Data Mining, Signals and Systems, Linear Algebra, Calculus, Probability and Statistics, Optimization, Object Oriented Programming, Operating Systems

Publications

- **Tanmay Khandelwal** and Rohan Kumar Das, "Multi-Task Learning Framework for Sound Event Detection using Acoustic Characteristics of Sound Events", in INTERSPEECH, 2023 [pre-print]
- **Tanmay Khandelwal** and Rohan Kumar Das, "Exploring Multi-Task Learning with Weighted Soft Label Loss for Sound Event Detection with Soft Labels", in DCASE Workshop, 2023 [submitted]
- **Tanmay Khandelwal** and Rohan Kumar Das, "Cross-dimensional Interaction with Inverted Residual Triplet Attention for Low-complexity Sound Event Detection", in DCASE Workshop, 2023 [submitted]
- **Tanmay Khandelwal**, Rohan Kumar Das, Andrew Koh and Chng Eng Siong, "Leveraging Audio-Tagging Assisted Sound Event Detection using Weakified Strong Labels and Frequency Dynamic Convolutions", in IEEE Statistical Signal Processing Workshop (SSP), 2023 [pre-print]
- Yang Xiao, **Tanmay Khandelwal** and Rohan Kumar Das, "FMSG Submission for DCASE 2023 Challenge Task 4 on Sound Event Detection with Weak Labels and Synthetic Soundscapes", in DCASE Challenge, 2023 [post-print]
- **Tanmay Khandelwal** and Rohan Kumar Das, "Dynamic Thresholding on FixMatch with Weak and Strong Data Augmentations for Sound Event Detection", in International Symposium on Chinese Spoken Language Processing (ISCSLP), pp. 428–432, 2022 [post-print] [presentation-video]
- **Tanmay Khandelwal**, Rohan Kumar Das and Chng Eng Siong, "Is Your Baby Fine at Home? Baby Cry Sound Detection in Domestic Environments", in Asia-Pacific Signal and Information Processing Association (APSIPA) Annual Summit and Conference (ASC), pp. 275–280, 2022 [post-print] [database]

Research Experience

- **Fortemedia** Singapore
  Research and Development Intern (Advisor: Dr. Rohan Kumar Das) Sep 2021 - Present
  - **Lightweight attention module**: Proposed to incorporate **triplet attention** into an inverted residual network to capture **cross-dimensional interdependencies** in sound event detection; thereby improving the baseline by **34.1%** in terms of the PSDS metrics with only **27.6%** parameters of the baseline
  - **Multi-task framework**: Put forth a multi-task learning framework to aid the sound event detection model using the acoustic characteristics of sound events by incorporating joint-learning with weighted loss and shared layers, improving the SED system by 36.4% in PSDS metrics over the baseline..
  - **Dynamic Thresholding on FixMatch**: Proposed to introduce **dynamic thresholding** into FixMatch using strong and weak **data augmentations** for sound event detection, to incorporate a **curriculum** into the learning of the model; thereby improving the **state-of-the-art** in PSDS metrics by **21.2%**
- **Speech and Language Laboratory, Nanyang Technological University (NTU)** Singapore
  Research Assistant (Advisors: Dr. Chng Eng Siong, Dr. Rohan Kumar Das) Sep 2021 - Aug 2022
  - **DCASE 2022 Task-4 Submission**: Proposed a **two-stage audio-tagging** assisted **sound event detection** system utilizing pre-trained embeddings and Frequency-Dynamic Convolutions to exploit the unlabeled set; achieving **state-of-the-art** results with a **45.5%** increase in PSDS metrics compared to the baseline
  - Developed a **low-complexity** system (104k parameters) for infant cry detection in a domestic environment utilizing **depth-wise-separable convolutions** with highest F-score of **0.738** on the curated strongly labeled dataset from AudioSet
- **CSIR-Central Electronics Engineering Research Institute (CEERI)** Pilani, India
  Research Intern (Advisors: Dr. Nitin Chaturvedi, Dr. Dhiraj Sangwan) Jan 2020 – Apr 2020
  - Optimized MASK-RCNN model for **threat objection detection** and **segmentation** in augmented images obtained from Baggage X-ray scan machines; achieving an accuracy of **81.2%**
  - Curated a subset from the GDXray dataset for the study by **embedding threat objects** into the background images and annotated using **VGG Image Annotator** to create a polygon mask

- **Healthcare Technology Innovation Centre (HTIC)** Chennai, India
  Research Intern (Advisor: Keerthi Ram) May 2019 – Jul 2019
  - Contributed to the connectivity **search tool** prototype being created in the Centre for Computational Brain Research (CCBR) of Indian Institute of Technology Madras (IIT-M), to be used in the Brain Architecture Portal of Cold Spring Harbor Lab, NY
  - Built the prototype using **spaCy** with corpus scraped from neuroscience articles to incorporate types of neuroscience corpora to corroborate visual patterns with **evidence of connectivity** as reported in published literature and **provide a summary** of the selected article

Professional Experience

- **Bajaj Finserv Health Limited** Pune, India
  Backend Developer Intern Jul 2020 - Aug 2021
  - Designed and implemented **microservices** in Java and TypeScript for doctor's practice management system, used by over **1000+** doctors daily for E-consultations
  - Designed and implemented personalized **medication search** module with quick suggestions based on past history and patterns for doctors with **response time** $<$ **50ms** using **Elastic Search**, resulting in reduced E-consultation time
  - Developed automated scripts to scrape data using **Selenium** to construct the database for medication search
  - Integrated modules with third-party services and mitigated code duplicity

- **ShadowFax Technologies** Bangalore, India
  Backend Developer Intern May 2018 – Jul 2018
  - Contributed in integrating **external APIs** and developing **data migration scripts** using Python, Django
  - Developed a **heat map** based on the location of the rider and used **Google map APIs** to visualize
  - Collaborated with co-workers to establish backend conventions, principles and patterns

Teaching Experience

- **Sound Event Detection Session** Online
  Teaching Assistant (Instructor: Dr. Chng Eng Siong) Nov 2021
  - Conducted an online practical session on sound event detection using PyTorch and Google Colab at Diponegoro University, Indonesia
  - The session was aimed at helping around 300 undergraduate and graduate computer science students with their final-year projects

- **Microelectronics Circuit Course** Pilani, India
  Teaching Assistant (Instructor: Dr. Anu Gupta) Jan 2020 – May 2020
  - Earned the position of Teaching Assistant in Microelectronics Circuit after placing in the top 95 percentile
  - Taught and led LTspice simulation sessions for about 250 sophomores with a group of 10 teaching assistants

Technical Skills

- **Languages**: Python, C++, Java, TypeScript, JavaScript, Matlab
- **Frameworks**: PyTorch, PyTorch-Lightning, TensorFlow, NodeJs, SpringBoot, NestJs, Django, MySQL, MongoDB
- **Tools**: Kubernetes, Docker, Git

Relevant Projects

- **Sentence retrieval and ranking system (Course Project: Information Retrieval)**
  Instructor: Dr. Abhishek
  Designed and implemented an efficient and intelligent sentence retrieval framework for text documents using TF-IDF scores, cosine similarity and NLTK for text processing
- **Fast scene understanding for Autonomous Driving (Course Project: Neural Networks and Fuzzy Logic)**
  Instructor: Dr. Surekha Bhanot
  Implemented the paper Fast scene understanding for Autonomous Driving from scratch in Tensorflow and compared the results with state-of-the-art models
- **Raspberry-Pi based water monitoring system using IoT**
  Instructor: Dr. Nitin Chaturvedi
  Constructed a water quality measuring device to remotely transmit the data using pH, turbidity, conductivity sensors and code written in python