

# Tanmay Khandelwal

LinkedIn: [linkedin/tanmayy24](https://www.linkedin.com/in/tanmayy24)

GitHub: [github/tanmayy24](https://github.com/tanmayy24)

Email: [f20170106p@alumni.bits-pilani.ac.in](mailto:f20170106p@alumni.bits-pilani.ac.in)

Mobile: +(91)-7340696967

## RESEARCH INTERESTS

- Passionate individual with research interests in Sound event detection, Natural language processing, Speech/Audio signal processing, and Machine learning

## EDUCATION

- **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 [\[DOI\]](#)
- **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 [\[DOI\]](#)
- **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 [\[DOI\]](#)
- **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 [\[DOI\]](#)

## 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

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- **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

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- **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

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

## RELEVANT PROJECTS

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- **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

## EXTRA CURRICULAR AND VOLUNTARY EXPERIENCE

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- **Hindi Activity Society** Pilani, India  
Representative and Joint Coordinator Aug 2017 - May 2019
  - Hindi Activity Society is a club in BITS-Pilani reckoned for organising debates, quizzes and literary fun activities
  - Headed as the Joint Coordinator to organise events during the Technical Fest of the college APOGEE-2019
  - Coordinator of Mock Parliament, a small-scale event that mimics the Indian Parliament by holding debates and discussions on current issues in our country
- **Nirmaan Organization** Pilani, India  
Volunteer Jan 2018 – May 2018
  - Nirmaan is an organisation devoted to aiding low-family income students to pursue school-level education
  - Taught English and Maths to students in grades 1-5 to help them gain a thorough understanding of the subjects