Anup Singh

Ph.D. Candidate - Ghent University

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Research Interests

Speech Tokenization, Audio Retrieval, Textless-NLP, Audio and Speech Generation, Self-Supervised Learning, Large Language Models

Education

Ghent University

Ghent, Belgium

Ph.D. in Computer Science

January 2019 - Current

- Research Interests: Audio Retrieval, Indexing, Audio Tokenization, Self-Supervised Learning, Representation Learning
- Advisors: Prof. Kris Demuynck (Ghent University) and Prof. Vipul Arora (KU Leuven)
- Courseworks: Signals and Systems, Speech Processing, Advanced Digital Signal Processing

Indian Institute of Science Education and Research- Kolkata

Kolkata, India

Integrated BS-MS in Mathematics and Statistics

August 2013 - June 2018

- CGPA: 7.62/10 (absolute grading)
- Advisor: Prof. Robert John Chandran
- Selected courseworks: Probability and Statistics, Numerical Methods, Data Structure and Algorithms, Statistical Inference, Linear Algebra, Graph Theory, Machine Learning

Publications

Journal Articles

FlowHash: Accelerating Audio Search with Balanced Hashing via Normalizing Flow
Anup Singh, Kris Demuynck, Vipul Arora
IEEE Transactions on Audio, Speech, and Language Processing. 2024

Conference Proceedings

Harmonic Summation-based Robust Pitch Estimation Algorithm
Anup Singh, Kris Demuynck
Under review in IEEE NCC-2026

BEST-STD 2.0: Balanced and Efficient Speech Tokenizer for Spoken Term Detection
Anup Singh, Kris Demuynck, Vipul Arora
Under Review in IEEE ICASSP 2026

Language-Agnostic Speech Tokenizer for Spoken Term Detection with Efficient Retrieval
Anup Singh, Kris Demuynck, Vipul Arora
Interspeech 2025

BEST-STD: Bidirectional Mamba-Enhanced Speech Tokenization for Spoken Term Detection
Anup Singh, Kris Demuynck, Vipul Arora
ICASSP 2025-IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2025

Simultaneously learning robust audio embeddings and balanced hash codes for query-by-example
Anup Singh, Kris Demuynck, Vipul Arora
ICASSP 2023-IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2023

Attention-Based Audio Embeddings for Query-by-Example
Anup Singh, Kris Demuynck, Vipul Arora
23rd International Society for Music Information Retrieval Conference (ISMIR 2022), 2022

Research Experience

Samsung R&D Institute

Bangalore, India

Research Intern

February 2025 - July 2025

- Worked on Audio Foundation Model.

Indian Institute of Technology *Kanpur, India*

Visiting PhD student | Advisors: Prof. Vipul Arora and Prof. Kris Demuynck *December 2021 - Jan 2025*

- Contributed to an industrial R&D project funded by Prasar Bharati, India's largest broadcasting agency, aimed at building state-of-the-art retrieval systems for archival audio content.
- Designed and developed a robust and efficient audio fingerprinting system capable of maintaining high accuracy even under challenging conditions, including high noise and reverberation. video demo
- Currently developing speech tokenization techniques for textless voice search tasks as part of a MeiTY-funded research project.

Ghent University *Ghent, Belgium*

Research Assistant | Advisor: Prof. Kris Demuynck *January 2019 - Present*

- Contributed to the VLAIO Industrial R&D project, SPOTT, in collaboration with Appiness, focusing on developing scalable and personalized advertising technology.
- Developed a novel pitch estimation algorithm for speech audio, which demonstrated superior performance over existing pitch trackers, particularly in challenging environments with high noise and reverberation.
- Worked towards building a graph-based indexing algorithm.

Indraprastha Institute of Information Technology Delhi *New Delhi, India*

Research Associate | Advisor: Prof. Arun Balaji Buduru *May 2018 - October 2018*

- Implemented Capsule Network for the language identification task.
- Partially worked on sensitive text detection in Twitter data.

NICTA (now CSIRO's Data61) *Remote*

Research Intern | Advisor: Dr. Young Lee *November 2016 - December 2016*

- Theoretical study on finding a relationship between Factor Analysis and Probabilistic Principal Component Analysis.

Indian Institute of Technology *Kharagpur, India*

Research Intern | Advisor: Prof. Sudeshna Sarkar *May 2016 - June 2016*

- Implemented a method to find subspace clusters in temporal climate data using the Monte Carlo algorithm.

Indian Institute of Technology *Ropar, India*

Research Intern | Advisor: Prof. Arvind Kumar Gupta *May 2015 - June 2015*

- Modeled stochastic transport systems using the Totally Asymmetric Simple Exclusion Process (TASEP) to study particle flow dynamics.

Skills

Programming Advanced: Python | Familiar: MATLAB

Frameworks PyTorch, PyTorch Lightning, Keras, NumPy, Scikit, Matplotlib, Plotly, Pandas, Montreal Forced Aligner

Tools Git, Slurm, Bash, LaTeX(Overleaf)

Talks

2023 Delivered a tutorial on audio fingerprinting at WiSSAP-2023. slides *IIT-Kanpur*

Service

Reviewer ICASSP 2023, ISMIR 2023, ISMIR 2024, ICASSP 2025, ICASSP 2026, IEEE SPL

Mentorship Provided mentorship to undergraduate students at Ghent University and IIT Kanpur on research projects.

Teaching Assistantship

- Introduction to Machine Learning (EE903, eMasters), IIT Kanpur — Fall 2022
- Introduction to Machine Learning (EE952, eMasters), IIT Kanpur — Spring 2024

Awards and Accomplishments

2022 **Student Author Grant**, Grant to attend ISMIR-2022 conference in Bengaluru, India.

2013-18 **INSPIRE Fellowship**, Offered by DST and Govt. of India for top 1% students in Science.

2013 **Qualified IIT-JEE**, Ranked among the top 1% of the candidates (1.2 million participants) in IIT-JEE 2013.

References available upon request.