

Ankit Shah

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Education

Carnegie Mellon University, School of Computer Science

Masters of Language Technologies

Pittsburgh, PA

August 2019

Relevant Courses: Large Scale Multimedia Analysis, Introduction to Machine Learning, Machine Learning for Signal Processing, Introduction to Deep Learning, Computer Vision.

National Institute of Technology Karnataka Surathkal

Bachelor of Technology in Electronics and Communication Engineering

Mangalore, India

November 2015

GPA: 8.58/10

Relevant Courses: Data Structures and Algorithms, Speech and Audio Processing, Digital Signal Processing.

Online Courses: Coursera - Machine Learning, Udacity - Introduction to Machine Learning, Deep Learning.

Academic Research

Graduate Research Assistant, Carnegie Mellon University

September 2017 - present

Project 1 Deep Intermodal Video Analytics

Mentor: Prof. Alexander Hauptmann

- Deep Intermodal Video Analytics intends to develop robust automated activity detection for a multi-camera streaming video environment.
- Working on the system integration and develop the pipeline provided from Kitware to run an end to end object detection and event localization task.
- Created a docker image with all software dependencies installed with errors resolved working in conjunction with the Kitware Team.

Project 2 Drawing inferences from Acoustic Analysis of Gunshot Recordings

Mentor: Prof. Alexander Hauptmann

- Designed a crawler to crawl the web and search relevant sound samples for training gunshot audio event detectors.
- Performed a literature survey on acoustic analysis of Gunshot recordings and understood how the information could be leveraged to build stronger classifiers.
- Achieved a baseline performance of 20 percent mean average precision to detect type of gun from acoustic analysis of gunshots and draw further inferences from audio analysis
- Developing a user interface to display gunshots and performing testing on the real world incidents such as Las Vegas Mass Shooting attack to validate the results

Research Scholar, CMU-NITK Winterschool

December 2014 - present

Never Ending Learning of Sound [NELS]

Mentor: Prof. Bhiksha Raj and Prof Rita Singh

- Developed a web-based artificial intelligence system to continuously crawl the web, detect and index sounds and automatically learn their meanings, associations, and semantics to events, objects and places with minimal human intervention.
 - Designed a crawler to continuously crawl the web in search of sound samples for self-training audio detectors.
 - Created sound vocabularies and performed audio content analysis using machine learning algorithms.
 - Developed an intuitive web interface to obtain user feedback for semi-supervised learning accessible at nels.cs.cmu.edu.
 - Improving sound detectors through enhanced database of crawled sounds, implementing feature extraction techniques, classifier fusion and artificial neural networks approach.
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Professional Experience

Verification Engineer at ARM

System and Software Group

Bangalore, India

July 2015 - August 2017

- Developed an in-house verification tool to simultaneously verify 52 subsystems delivered to partners.
- Identified and designed directed test cases to verify unique power transition scenarios for multiple IPs.
- Received Bravo award in 2017 and 2016 for flawless execution across delivery cycles and fixed 5 critical RTL bugs impacting multiple teams across the globe.

Component Design Intern at ARM

Systems and Software Group

Bangalore, India

May - July 2014

- Designed a Low Power Interface for AMBA 4 and ACE Protocol, now a fundamental component in ARM designs.
 - Developed a module to handle synchronization of events between CPU's in a multi-cluster CPU configuration.
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Publications

- **Ankit Shah**, Anurag Kumar, Alexander G. Hauptmann, Bhiksha Raj, "A Closer Look at Weak Label Learning for Audio Events", submitted to IEEE Transactions on Multimedia, 2018, [Link](#)
 - **Ankit Shah**, Rohan Badlani, Benjamin Elizalde, Anurag Kumar, Bhiksha Raj, "Framework for evaluation of sound event detection in web videos", 2018 IEEE International Conference on Acoustics, Speech and Signal Processing, (ICASSP) April 2018. [Link](#)
 - Pranay Manocha, Rohan Badlani, Anurag Kumar, **Ankit Shah**, Benjamin Elizalde, Bhiksha Raj, "Content-based Representations of audio using Siamese neural networks", 2018 IEEE International Conference on Acoustics, Speech and Signal Processing, (ICASSP) April 2018. [Link](#)
 - **Ankit Shah**, Benjamin Elizalde, Rohan Badlani, Anurag Kumar, Bhiksha Raj, "NELS - Never-Ending Learner of Sounds", ML4Audio at 31st Conference on Neural Information Processing Systems (NIPS 2017), Long Beach, CA, USA. [Link](#)
 - Annamaria. Mesaros, Toni Heittola, Aleksandr Diment, Benjamin. Elizalde, **Ankit Shah**, Rohan Badlani, Emmanuel Vincent, Bhiksha Raj, and Tuomas Virtanen. "DCASE 2017 challenge setup: tasks, datasets and baseline system" in proceedings of the Detection and Classification of Acoustic Scenes and Events 2017 Workshop (DCASE2017). Nov 2017 [Link](#)
 - **Ankit Shah**, Rohan Badlani, Benjamin Elizalde, Anurag Kumar, Bhiksha Raj, "A Framework towards Large Scale Learning of Sound Events", 2017 Language Technologies Institute Student Research Symposium, August 2017.
 - **Ankit Shah**, Rohan Badlani, Anurag Kumar, Benjamin Elizalde, Bhiksha Raj, "An Approach for Self-Training Audio Event Detectors Using Web Data," 25th European Signal Processing Conference (EUSIPCO 2017) [Link](#)
 - Benjamin Elizalde, Anurag Kumar, **Ankit Shah**, Rohan Badlani, Emmanuel Vincent, Bhiksha Raj, Ian Lane, "Experiments on the DCASE Challenge 2016: Acoustic Scene Classification and Sound Event Detection in Real Life Recording.", Detection and Classification of Acoustic Scenes and Events (DCASE), 2016. [Link1](#), [Link2](#)
 - Anurag Kumar, Benjamin Elizalde, **Ankit Shah**, Rohan Badlani, Emmanuel Vincent, Bhiksha Raj, Ian Lane, "DCASE challenge task 1", Detection and Classification of Acoustic Scenes and Events (DCASE), 2016. [Link](#)
 - **Ankit Shah**, Ajith Bhat, Saurabh Saxena, Rashmin Mantri, "Repeatability and Scalability of Code at Top Level Verification," Regional Engineering Conference 2016, ARM.
 - Saharsh Oza, **Ankit Shah**, Tarun Thokala, Sumam David, "Pipelined implementation of high radix adaptive CORDIC as a coprocessor," 2015 International Conference on Computing and Network Communications (CoCoNet), Trivandrum, 2015, pp. 333-342. [Link](#)
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Awards and Achievements

- 2018 CMU LTI Conference Travel Grant
 - 2017 R D Sethna Education Loan Scholarship
 - 2017 Lotus Education Trust Scholarship
 - 2017 Awarded [Gandhian Young Technological Innovator Award 2017](#) for work on 'Never Ending Learning of Sound' project, amongst **39** projects selected in a pool of over 2915 submissions.
 - 2017 Recognition as Competent Communicator and Competent Leader for exceptional achievements in Toastmasters International Communication and Leader Program
 - 2017 Bravo Award at ARM for exceptional delivery of tasks
 - 2016 Winner of ARM Wearable Design Challenge - Junior Academy
 - 2016 Bravo Award at ARM for fixing critical RTL bugs in multiple key projects
 - 2014 IEEE Student Enterprise Award, Region 10 for project titled "Mapping of greenhouse gases using Wireless Sensor Networks" - \$1500
 - 2013 IEEE Student Enterprise Award, Region 10 for project titled "Quadcopter" - \$1500
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Skills

- Programming: Python, Verilog, Shell Scripting (Bash, awk), C, MATLAB, R, C++ and Java
 - Frameworks: Pytorch, Keras, Tensorflow
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Selected Academic Projects

Action Recognition on a Large Scale in Short Videos - Moments in Time Jan 2018 - May 2018
Large Scale Multimedia Analysis Course Project Mentor: Prof. Alexander Hauptmann and Prof. Florian Metze

- Detected activity on a large scale through Moments in Time dataset using various activity detection frameworks.
- Performed ablation study across various feature representations such as 3D Resnext, I3D features, ResNet features, Temporal Relation Networks as well as detailed analysis of audio features.

AudioNet Feature Visualization for Large Scale Audio Event Recognition Aug 2017 - Dec 2017
Machine Learning for Signal Processing Course Project Mentor: Prof Bhiksha Raj

- Visualized audio features learned at different stages of AudioNet architecture and associated meaning to the features extracted
- Concluded that log mel spectrogram is a superior feature representation for Convolutional Network architecture over Mfcc and spectrogram.

Natural Language Person Search Using Deep Reinforcement Learning Aug 2017 - Dec 2017
Introduction to Deep Learning Course Project Mentor: Prof Bhiksha Raj

Triple Attention Network Architectures for MovieQA Feb 2018 - May 2018
Introduction to Machine Learning Course Project Mentor: Prof. Manuela Veloso and Prof. Pradeep Ravikumar

Sound Event Detection in Real Life Audio: Example-Based Retrieval June 2016 - September 2016
DCASE 2016 challenge - Results Mentor: Prof Bhiksha Raj

- Developed an optimized machine learning pipeline to retrieve test audio label using a trained multi-class classifier.
- Obtained a significant reduction in Segment-based Error Rate of 0.48 as compared to baseline performance of 0.91, thus ranked 9th amongst 87 participants in DCASE challenge.

Hardware Architecture for High-Radix Adaptive CORDIC June 2014 - April 2015
Undergraduate Thesis Mentor: Prof Sumam David

- Developed FSM design of floating point HCORDIC using verilog with performance comparable to CORDIC IP, with improved computation throughput on hardware of trigonometric functions and other mathematical operations used in signal processing applications.
- Achieved multi-fold speed up with HCORDIC, enhancing traditional CORDIC through use of hardware multipliers.

Lossless Compression of Medical Images February 2015 - March 2015
Digital Signal Compression Project Mentor: Prof. Deepu Vijayasanan

- Analyzed and compared compression ratios for various lossless compression techniques and found Discrete Haar Wavelet transform provided an average compression of 2.3 over original image, 30 percent increase over other methods.
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Voluntary Activities

Organizer of Task 4 DCASE 2018 Challenge March 2018 - present
Carnegie Mellon University Mentor: Prof. Alexander Hauptmann

- Organizer of Task 4 "Large-scale weakly labeled semi-supervised sound event detection in domestic environments". Accountable for code development, audio annotation, evaluation of papers and system submissions as well as providing technical support to participants via email and DCASE forum.

Contributor to Task 4 DCASE 2017 Challenge April 2017 - Nov 2017
Carnegie Mellon University Mentor: Prof. Bhiksha Raj

- Contributed to the technical organization of IEEE-DCASE 2017 challenge - Task 4 "Large Scale weakly supervised sound event detection for smart cars". Accountable for data preparation, code development, audio annotation, evaluation of papers and system submissions as well as providing technical support to participants via email and DCASE forum.

Mentor at The Junior Academy, Global STEM Alliance January 2016 - May 2017

- Mentored a team of young students on wearables challenge implementing an innovative water filtration system.
- Demonstrated a working prototype of filter resulting in safe drinking water, thus **won** the wearables challenge.

Peer Mentoring Programme, NITK Surathkal July 2013 - April 2015

- Teaching assistant for Elements of Electronics and Communication [EC 110] during 2013-14 and Data Structures and Algorithms [EC 232] during 2014-15.
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Leadership and Professional Affiliations

- Membership Chair, Indian Graduate Students Association, Carnegie Mellon University - Nov 2017 - present
 - President and Vice President of ARM Talkies - Toastmasters Club at ARM - June 2016 - July 2017.
 - Joint Convener and Treasurer of Robotics Club 2013 - 2015.
 - Executive Member - IEEE NITK Chapter and Computer Society of India, 2012 - 2015.
 - Executive Member of EFOREA (Engineer's Forum for Entrepreneurship Awareness), and member of Electronics Committee NITK 2013 - 2015.
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