

Payal Mohapatra

Curriculum Vitae

PhD candidate, Computer Engineering
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Education

- 2021–12/2025 **PhD, Computer Engineering**, Northwestern University, Illinois, USA.
Machine Learning for Human-centred Cyber-Physical Systems
(Expected) Advisor : Dr. Qi Zhu
CGPA : 3.95/4
- 2015–2017 : **Masters (by research), Electrical Engineering**, Indian Institute of Technology Madras, India.
CGPA : 9.31/10
- 2011–2015 : **Bachelor of Engineering, Electronics & Instrumentation**, Madras Institute of Technology, Anna University, India.
CGPA : 9.36/10

Computer skills

- Programming Languages : Python, C++, Shell, Perl, \LaTeX , Verilog, System Verilog, Universal Verification Methodology(UVM)
- Technologies : Pytorch, Tensorflow, Sklearn, Pandas, Seaborn, Librosa, SpecAugment, Signal, Soundfile, PyAudio
- Tools : LabVIEW, Matlab, Spice Simulation & PCB Design, Xilinx Vivado

Publications

- 2024 Payal Mohapatra, Lixu Wang, and Qi Zhu. Phase-driven domain generalizable learning for nonstationary time series. *arXiv preprint arXiv:2402.05960*, 2024.
- 2023 Payal Mohapatra, Akash Pandey, Yueyuan Sui, and Qi Zhu. Effect of attention and self-supervised speech embeddings on non-semantic speech tasks. In *Proceedings of the 31st ACM International Conference on Multimedia*, MM '23, 2023.
- 2023 Payal Mohapatra, Akash Pandey, Sinan Keten, Wei Chen, and Qi Zhu. Person identification with wearable sensing using missing feature encoding and multi-stage modality fusion. In *ICASSP 2023-2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2023.
- 2023 Payal Mohapatra, Bashima Islam, Md Tamzeed Islam, Ruochen Jiao, and Qi Zhu. Efficient stuttering event detection using siamese networks. In *ICASSP 2023-2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2023.
- 2022 Payal Mohapatra, Akash Pandey, Bashima Islam, and Qi Zhu. Speech disfluency detection with contextual representation and data distillation. In *Proceedings of the 1st ACM International Workshop on Intelligent Acoustic Systems and Applications*, 2022.
- 2018 Payal Mohapatra, Preejith Sreeletha Premkumar, and Mohanasankar Sivaprakasam. A yellow-orange wavelength-based short-term heart rate variability measurement scheme for wrist-based wearables. *IEEE Transactions on Instrumentation and Measurement*. IEEE, 2018.
- 2017 Payal Mohapatra, SP Preejith, and Mohanasankar Sivaprakasam. A novel sensor for wrist based optical heart rate monitor. In *2017 IEEE international instrumentation and measurement technology conference (I2MTC)*. IEEE, 2017.

Research Experience

Meta Reality Labs, Part-time student researcher

Oct, 2023 – ***Non-Verbal Discreet Communication Technology for Smart Glasses.***

Dec, 2023 Manuscript preparation and supporting model updates for a product demo of my low-overhead non-verbal event detection algorithm on smart-glasses prototype at Meta internal symposium.

Collaborators: Dr. Morteza Khaleghimeybodi, Dr. Ali Aroudi, Dr. Anurag Kumar

Meta Reality Labs, Research Scientist Intern

June, 2023 – ***Non-Verbal Discreet Communication Technology for Smart Glasses.***

Oct 2023 Kicked off a first-of-a-kind system for Audio Event Detection (AED) on AR glasses. Developed algorithms for AED translating to highly sensitive accelerometers. Deployed a lightweight application-specific purely convolutional inference engine in real time and demonstrated a fully functional working prototype to the team.

Collaborators: Dr. Morteza Khaleghimeybodi, Dr. Ali Aroudi

Northwestern University, PhD Candidate

2024 ***Efficient Multi-Modal Disfluency Detection.***

Developing an architecture to support effective audio-visual learning in unreliable data settings for disfluency detection.

2023 ***Addressing Non-Stationarity for Domain-Generalisation in Time Series Applications.***

Developed a generalizable machine-learning framework by investigating the relationship between non-stationarity and phase in time series. Demonstrated the effectiveness of my method on several time-series classification tasks empirically and with theoretical reasoning. Manuscript under submission to ICML'24

2022 ***Self Supervised Learning Methods to detect Speech Disfluency under Data Constraints.***

Developed a pipeline to use real-world unlabeled disfluency data from multiple domains to learn contextual representations for downstream tasks with a limited labeling budget. Presented preliminary results at the workshop on intelligent acoustics co-located with ACM MobiSys'22 and a proposed small-scale self-supervised pretraining methodology in ICASSP'23.

Collaborators: Dr. Bashima Islam (*Worcester Polytechnic Institute*), Dr. Md Tamzeed Islam (*Amazon Lab126*), Dr. Qi Zhu (*Northwestern University*)

2022-current ***Predictive Models for Human Fatigue and safety - Operator 4.0.***

Developed sample-efficient machine learning methods to predict perceived fatigue levels from biophysical and locomotive sensor data collected from user studies at Northwestern University. Handle fine-grained, lossy, noisy, and missing long-range data from wearable sensors. Demonstrated a functional closed-loop prototype on two factory floors with near-real-time data visualization and obtained user feedback. Manuscript under submission to PNAS Nexus.

Collaborators: Northwestern University, John Deere, Boeing, MxD, University of Buffalo

Indian Institute of Technology Madras, Research Assistant

July, 2015 – ***Wrist-based wearable device to measure heart rate under conditions of physical activity and Heart Rate Variability at stationary instants.***

Oct, 2017

Developed and designed a custom optical sensor board for optimum signal quality in users with varying skin-complexions. Developed motion-artifact rejection algorithm based on normalized least mean squared adaptive filtering for real-time processing and validated with an extensive user study. Studied the effect of pulse rate variability under different orthostatic loads.

Collaborators: Preejith SP (*Healthcare Technology Innovation Centre*), Dr. Mohanasankar Sivaprakasam (*Indian Institute of Technology Madras*)

Professional Experience

Analog Devices Incorporation

Experience as Design Verification engineer on multiple mixed-signal System on Chips (SoC)

March, 2020 – ***Design Verification of Fast DSP in an Audio Noise Cancellation ASIC.***

Sept, 2021

Conducted end-to-end verification and developed reference models for a custom DSP used for biquad operations, audio peripherals like ADCs, DACs & asynchronous sample rate converters

Feb, 2019 – **Subsystem Verification of Scalable Ethernet Switch.**

Feb, 2020 Worked on time sensitive networking protocols and developed reference models for two of the five supported features by the SoC adhering to IEEE 802.1AS (time synchronization) and IEEE 802.1qbv (Scheduled Traffic). Employed verification strategy was selected for presentation at global intra-company conference in 2020. Chip successfully taped out in Feb 2020.

March, 2018 – **Block Level Verification of Beamforming Algorithm in Ultrasound Fingerprint Sensing ASIC.**

Dec, 2018 Developed an error injection mechanism to verify the calibration algorithm of transmitters and receivers in the signal datapath and worked on a synthetic aperture algorithm for beamforming. Demonstrated a system to detect occurrence of touch on the SoC at a company-wide workshop. Chip successfully taped out in Dec 2018.

Nov, 2017 – **Formal Digital Design verification.**

March, 2018 Developed mathematical theorems to describe system behavior without explicit modeling to prove/disprove properties with all possible stimuli using EDA tools.

Teaching Assistantship

Winter, 2017: **EE5400: Analog and Digital Circuits**, IIT Madras.

Fall, 2016: **EE5401: Measurements and Instrumentation**, IIT Madras.

Winter, 2016: **EE3006: Principles of Measurement**, IIT Madras.

Fellowships & Awards

2023 Outperformed baseline in the ACM Multimedia 2023 Computational Paralinguistics Challenge (ComParE)

2023 Placed in top three in e-Prevention: Person Identification and Relapse Detection from Continuous Recordings of Biosignals Challenge in ICASSP'23.

2022 Travel grant of 1000 USD for MobiSys'22

2022 All inclusive grant to attend Computing Research Association Widening Participation (CRA-WP), Grad Cohort Workshop for Women

2021 Best research video award of 100 USD at Design Automation Conference Young Fellowship (DAC YF)

2021 Recipient of Design Automation Conference Young Fellowship (DAC YF)

2019 Spot Award at Analog Devices Inc.(ADI) acknowledging the contribution in scalable ethernet switch verification effort

- Awarded to less than 1% ADI employees globally.

2019 Global finalists and site (Bangalore) winners of Blockchain Innovation Challenge at ADI.

2018 Best Paper in all tracks in IEEE Conference WinTechCon

2017 Winner of Anveshan Design Challenge

- National level competition organized by Analog Devices Inc. annually.

2015-2017 Awarded Research Assistantship fellowship by Govt. of India

Services

Reviewing ICASSP'24, External Reviewer - ASP-DAC'24, EMSOFT'23, ICCPS'23, NSys'22

Journal Club NICO Reading Group, CPS Study Group

Mentoring

Current

Xiaoyuan Zhang (Masters, Northwestern University)

Shamika Likhite (Masters, Northwestern University)

Brooks Hu (Undergrad, Northwestern University)
Kiva Joseph (Undergrad, Northwestern University)

Past

Yueyuan Sui (Masters, Northwestern University)
Devashri Naik (Masters, Northwestern University)
Jinjin Cai (Masters, Northwestern University)
Shangke Liu (Masters, Northwestern University)
Yuqi Ma (Masters, Northwestern University)

Jonathan Li Chen, Ben Forbes, Justin Lau (Undergraduate students, Mechanical Engineering (Mentored for a course project on sensor data analysis for injury detection), Northwestern University)

Interests

Races Completed Chicago Half Marathon(21 km), 2023. Completed Chicago Hot Chocolate Race (15km) 2022

Art Mixed Media, Oil on Canvas, Gouache Painting

Languages Odiya, Hindi, Bengali, Tamizh, English

Reading Cambridge University Press early reader's reviews(Why Does Math Work... If It's Not Real?)