

Payal Mohapatra

Curriculum Vitae

PhD candidate, Computer Engineering

Northwestern University, Illinois 60202

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Machine Learning Researcher developing intelligent sensing technologies for wearable systems and edge devices, focusing on learning from imperfect time-series under data and resource constraints for human-centric applications.

Skills

Deep Learning	Sequence Modeling (time-series and audio), Multi-modal Learning, Self-Supervised Learning, Large Language Models (Llama2, Llama3), Real-time Inference, On-device deployment, Signal Processing
Sensors	Inertial Measurement Units (IMUs), Audio, Speech, Surface Electromyography (sEMG), Contact Microphone, Vision, Photoplethysmography (PPG), Electrocardiogram (ECG), Electroencephalogram (EEG), Electrodermal Activity (EDA)
Programming Languages	Python, C++, Shell, Perl, Verilog, System Verilog, Universal Verification Methodology(UVM), L ^A T _E X
Tools	LabVIEW, Matlab, Spice Simulation & PCB Design, Xilinx Vivado, Khadas VIM3, Jetson TX2

Employment History

June,2024 – Dec, 2024	Part-time Student Researcher Research Scientist Intern , <i>Meta Reality Labs</i> , Redmond, USA.
June,2023 – Dec, 2023	Part-time Student Researcher Research Scientist Intern , <i>Meta Reality Labs</i> , Redmond, USA.
March,2020 – Sept, 2021	Senior Design Engineer , <i>Analog Devices Incorporation</i> , Bangalore, India.
Nov,2017 – March, 2020	Design Verification Engineer , <i>Analog Devices Incorporation</i> , Bangalore, India.
May,2014 – June, 2014	Research Intern , <i>Indian Institute of Technology Madras</i> , Chennai, India.
May,2013 – June, 2013	Control Systems Intern , <i>Hindustan Aeronautics Limited</i> , Bangalore, India.

Education

2021–2025	PhD, Computer Engineering , <i>Northwestern University</i> , Illinois, USA. Thesis : Empowering Real-World Sensing: Human-Centered Machine Learning for Imperfect Time Series Advisor : Dr. Qi Zhu CGPA : 3.96/4
2015–2017	Masters (by research), Electrical Engineering , <i>Indian Institute of Technology Madras</i> , India. Thesis : An Optical Sensor and Wearable Framework for Wearable Cardiac Monitor Advisor : Dr. Mohanasankara Sivaprakasam CGPA : 9.31/10
2011–2015	Bachelor of Engineering, Electronics & Instrumentation , <i>Madras Institute of Technology, Anna University</i> , India.

Thesis : Advanced Control Schemes for DC Motors

Advisor : Dr. Manamalli Deivasigamani

CGPA : 9.36/10

Selected Awards and Fellowships

- 2025 RCTP-Q Science Communication Workshop, Northwestern University.
- 2024 EECS Rising Stars, Massachusetts Institute of Technology.
- 2023 Top performer in the ACM Multimedia 2023 Computational Paralinguistics Challenge (ComParE).
- 2023 Top performer in e-Prevention: Person Identification and Relapse Detection from Continuous Recordings of Biosignals Challenge in ICASSP'23.
- 2022 1000 USD travel grant for MobiSys'22.
- 2022 CRA-WP Career Mentoring Workshop
- 2021 Best research video award Design Automation Conference Young Fellowship (DAC YF).
- 2018 Best Paper IEEE WinTechCon Conference.
- 2017 Winner of Make-in-India Anveshan Design Challenge, Analog Devices Incorporation.
- 2015-2017 Research Fellowship by Government of India (top 2%).
- 2011-2015 National Merit Scholarship by Government of India.

Publications

In Conference Proceedings

- 2025 **Mohapatra, Payal**, Akash Pandey, Xiaoyuan Zhang, and Qi Zhu. Can llms understand unvoiced speech? exploring emg-to-text conversion with llms. *Under Review at Proceedings of the 63rd Annual Meeting of the Association for Computational Linguistics, 2025.*
- 2025 **Mohapatra, Payal**, Calvin Murdock, Ishwarya Ananthbhola, Ali Aroudi, Anjali Menon, Buye Xu, and Morteza Khaleghimeybodi. Behavior-driven estimation of acoustic zones of interest using smartglasses. *Under Review at Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 2025.*
- 2024 Lixu Wang, Bingqi Shang, Yi Li, **Mohapatra, Payal**, Wei Dong, Xiao Wang, and Qi Zhu. Split adaptation for pre-trained vision transformers. *Under review in the Conference on Computer Vision and Pattern Recognition (CVPR), 2024.*
- 2024 **Mohapatra, Payal**, Shamika Likhite, Subrata Biswas, Bashima Islam, and Qi Zhu. Missingness-resilient video-enhanced multimodal disfluency detection. In *Interspeech 2024, 2024.*
- 2023 **Mohapatra, Payal**, 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 **Mohapatra, Payal**, 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 **Mohapatra, Payal**, 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 **Mohapatra, Payal**, 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.*

- 2017 **Mohapatra, Payal**, 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.

Journal Articles

- 2025 **Mohapatra, Payal**, Lixu Wang, and Qi Zhu. Phase-driven domain generalizable learning for nonstationary time series. *Under review in the Transactions on Machine Learning Research*, 2025.
- 2024 **Mohapatra, Payal**, Vasudev Aravind, Marisa Bisram, Young-Joong Lee, Hyoyoung Jeong, Katherine Jenkins, Richard Gardner, Jill Streamer, Brent Bowers, Lora Cavuoto, Anthony Banks, Shuai Xu, John Rogers, Jian Cao, Qi Zhu, and Ping Guo. Wearable network for multilevel physical fatigue prediction in manufacturing workers. *PNAS Nexus*, volume 3, 2024.
- 2018 **Mohapatra, Payal**, 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.

Preprint Articles

- 2024 **Mohapatra, Payal**, Ali Aroudi, Anurag Kumar, and Morteza Khaleghimeybodi. Non-verbal hands-free control for smart glasses using teeth clicks. *arXiv preprint arXiv:2408.11346*, 2024.

Selected Research Experience

Meta Reality Labs, Research Scientist Intern | Part-time Student Researcher

June 2024 – ***Behavior-Driven Estimation of Acoustic Zones of Interest Using Smartglasses.***

Dec 2024 Designed a data-driven deep learning architecture with hierarchical sensor fusion to extract conversation-focused features primarily from head-orientation data, quantifying the number and location of speakers in a seated conversation.

Collaborators: Dr. Morteza Khaleghimeybodi, Dr. Ali Aroudi, Dr. Calvin Murdock, Dr. Buye Xu, Dr. Anjali Menon

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

Dec 2023 Kicked off a first-of-its-kind system for Audio Event Detection (AED) on AR glasses. Developed algorithms for AED using highly sensitive accelerometers. Deployed a lightweight, application-specific convolutional inference engine in real-time and demonstrated a fully functional prototype at the Meta internal symposium.

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

Northwestern University, PhD Candidate

2022–2025 ***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 through user studies at Northwestern University. Demonstrated a functional closed-loop prototype on two factory floors with near-real-time data visualization and gathered user feedback. Continuing efforts include developing a practitioner's guide to manufacturing safety using commercial sensors to estimate ergonomic risk factors and creating a browsable knowledge repository.

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

2025 ***Aligning Heterogeneous Modalities to Foundation Models.***

Investigating a new perspective on multimodal learning for heterogeneous modalities that carry less mutual information among different modalities observing the same phenomenon. For example, while expanding text-based LLMs to audio is easier, expanding them to other silent-language modalities like unvoiced EMG or lip-reading-based visual speech is more difficult.

2024–2025 ***Low-Overhead Phase Augmentation for General Time Series Analysis.***

Investigating the role of phase in generating augmented views for time series while retaining semantic information for various tasks (classification, forecasting, anomaly detection), and designing low/non-parametric strategies for this diversification.

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

Developed a resilient architecture to support effective audio-visual learning in unreliable data settings for disfluency detection, curated a public multimodal disfluency dataset, and presented at Interspeech 2024.

- Collaborators: Dr. Bashima Islam (*Worcester Polytechnic Institute*), Dr. Qi Zhu (*Northwestern University*)
- 2023 **Addressing Non-Stationarity for Domain Generalization 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 the method on several time series classification tasks empirically and theoretically.
- 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 proposed a 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*)

Indian Institute of Technology Madras, Research Assistant

- 2015–2017 **An Optical Sensor and Wearable Framework for Wearable Cardiac Monitor.**
Designed and developed a custom optical sensor board for optimal signal quality in users with varying skin tones. Developed a motion-artifact rejection algorithm based on normalized least-mean-squared adaptive filtering for real-time processing and validated it with an extensive user study.
- Collaborators: Preejith SP (*Healthcare Technology Innovation Centre*), Dr. Mohanasankar Sivaprakasam (*Indian Institute of Technology Madras*)

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.

Services

- Primary Reviewer IJCNN'25, ICASSP'25, Neurips'24, ICLR'24, IEEE IoT Journal, IMWUT'24, IROS'24, ICASSP'24
- Secondary Reviewing ASP-DAC'24, EMSOFT'23, ICCPS'23, NSys'22
- Technical Book Why Does Math Work. . . If It's Not Real?, Cambridge University Press'23
- Reviewing
- Journal Club NICO Reading Group, Northwestern University, CPS Study Group

Mentoring

Current

- Bingqi Shang (Masters, Northwestern University)
Xiaoyuan Zhang (Masters, Northwestern University)
Talia-Ben Naim (Masters, Northwestern University)
Mark Zhang (Masters, Northwestern University)
Brooks Hu (Undergrad, Northwestern University)

Past

- Kiva Joseph (Masters, Northwestern University)
Shamika Likhite (Masters, Northwestern University)
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 Redmond Harvest Half Marathon 2024, Chicago Half Marathon 2023.

Art Mixed Media, Oil on Canvas, Gouache Painting

Languages Odiya, Hindi, Bengali, Tamizh, English

References

Dr. Qi Zhu Professor of Electrical and Computer Engineering, Northwestern University

Dr. Aggelos Professor of Electrical and Computer Engineering, Northwestern University
Katsagelos

Dr. Ping Guo Associate Professor of Mechanical Engineering, Northwestern University

Dr. Bashima Assistant Professor of Electrical and Computer Engineering, Worcester Polytechnic Institute
Islam