

Glenn Fernandes

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RESEARCH EXPERIENCE

Health-Aware Bits (HABits) Lab, Northwestern University, Chicago, IL, Graduate Student

Sept 2020 – Present

HabitSense: Privacy-aware AI-enhanced multi-modal wearable camera for health-risk behavior detection

- Led an interdisciplinary team of 8 to design an RGB-Thermal-IMU wearable for health-risk behavior detection.
- Coordinated dataset curation and annotation of 768 hours, ~13 million frames from 15 participants in-the-wild.
- Implemented state-of-the-art deep learning architectures (vision-transformers, YOLOv8) for video understanding and hand-to-mouth gesture detection in activity-oriented video achieving F1-scores of over 85%.
- Implemented novel on-device real-time vision algorithms to obfuscate background and bystanders for privacy.
- Designed a novel on-device optimization algorithm that improved battery-life by 30% and 47% storage savings.
- Using open-source vision language models to extract behavioral contexts preemptively, enabling early prediction and intervention in health-risk activities such as eating and smoking.

Generative-AI based privacy for wearable camera systems

- Evaluated the tradeoff between privacy-preserving obfuscation algorithms and utility of wearable camera footage.
- Developed a new cartoonization pipeline using cartoon-GAN, head orientation estimation and human-mask segmentation (YOLO v8) with in-wild data from a study with 49 participants wearing a wearable camera.
- Deployed crowdsourced survey (n=60) using qualtrics and prolific to evaluate privacy-utility tradeoff.
- Conducted statistical analysis revealing 90% of participants noted reduced privacy concerns without utility loss.

PRIMO: Transforming obesity care with explainable AI (XAI)

- Developed an explainable AI tool for clinicians that predicts weight-loss 6 months early with accuracy of 81%.
- Enhanced clinicians' decision-making, achieving 89.3% agreement between clinicians and explanations.
- Designed and implemented interactive uncertainty visualizations for PRIMOs explanations using D3.js.
- Conducted qualitative analysis through 14 clinician interviews to improve PRIMO functionality.

HealthSense: Predicting physiological and perceived stress using a flexible ECG-PPG chest sensor

- Designed and led stress-induction studies with a novel flexible ECG-PPG chest sensor on 20 participants.
- Developed a semi-supervised annotation tool, accelerating annotation and model building time by over 50%.
- Developed an autoencoder noise detection model (f1-score: 91%) to detect noisy segments in ECG signals.
- Implemented signal processing pipelines and evaluated machine learning models for stress detection using ECG, PPG, and combined features like pulse arrival time (PAT), achieving F1-scores exceeding 80%.

WORK EXPERIENCE

DOLBY Laboratories - Advanced Technology Group (ATG), Sunnyvale, CA, Research Intern

Jun 2023 – Aug 2023

- Designed and developed a wearable haptic system synced with audio-visual content.
- Collaborated with neuroscience PhD student to evaluate the system on 15 participants in psychophysics studies.

Fluid Interfaces, Massachusetts Institute of Technology (MIT), Cambridge, MA, Researcher

Jan 2019 – Jan 2020

PAL: Personalized Active Learner, multi-modal wearable sensor system for habit formation

- Developed a multi-modal wearable system (video,motion,heart-rate) for behavior change using context detection.
- Built on-device vision models for object, face and custom contexts using low-shot training with >80% accuracy.

SKILLS

Software: Python, C/C++, HTML, CSS, JS, Tensorflow/PyTorch, AI/ML, Computer Vision, Signal Processing, Linux - CLI

Hardware-design: Embedded Dev/Prototyping, Soldering, Circuit Design - KiCAD, AutoCAD, 3D design, 3D printing

EDUCATION

Northwestern University, Ph.D. Computer Science, GPA: 4.0/4.0 <i>Awards: Presidential, IBM Research, and Google Research Fellow Nominee</i>	Sept 2020 – Spring 2025
Northwestern University, M.S. Computer Science, GPA: 4.0/4.0	Sept 2020 – Sept 2022
BITS Pilani, Dual Degree, B.E. Electrical & Electronics and M.Sc. Biological Sciences	Aug 2014 – Jul 2019

PUBLICATIONS (6/14) [Google Scholar Link](#)

HabitSense: A Privacy-Aware, AI-Enhanced Multimodal Wearable Platform for mHealth Applications, *ACM IMMUT Jul 2024*
Fernandes, G., Zheng, J., Pedram, M., Romano, C., Shahbi, F., Rothrock, B., Cohen, T., Zhu, H., Butani, T., Hester, J., Katsaggelos, A. & Alshurafa, N. (2024)

An Explainable AI Tool for Clinicians involved With Obesity Treatment, *JMIR (Impact factor: 7.4), [Link](#)* Sept 2023
Fernandes, G., Choi, A., Schauer, J., Pfammatter, A., Spring, B., Darwiche, A. & Alshurafa, N.

Experience: Barriers and Opportunities of Wearables for Eating Research, *ACM CHI, [Link](#)* Sept 2023
Pedram, M., Fernandes G., Romano, C., Wei B., Sen S., Hester J. & Alshurafa, N.

Does Cartoonized Vlogging Increase Adoption of Wearable Cameras?, *ACM CHI, [Link](#)* Apr 2023
Fernandes, G., Zhu, H., Pedram, M., Schauer, J., Shahi, S., Romano, C., Gergle, D. and Alshurafa, N.

Preventing Prototyping Pitfalls and Going Beyond: Modular Wearable Embedded Systems, *ACM CHI, [Link](#)* Apr 2023
Fernandes, G., Pedram, Alshurafa, N.

PAL: Wearable system for visual context detection using on-device deep learning, *ACM UMAP, [Link](#)* Jun 2021
Khan, M., Fernandes, G., Vaish, A., Manuja, M. & Maes, P.

LEADERSHIP

Web Chair, IEEE Body Sensor Networks Conference (BSN)	Since 2024
Collaborator, Center for Advancing Safety of Machine Intelligence (CASMI), Northwestern University	Since 2023
Leading the Future of Health and Computing Collective (FHCC), Northwestern University	Since 2022