
Denisa Qori McDonald, PhD

ML Researcher & Engineer | Representation Learning, Temporal Modeling & Robust Systems

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Summary

Machine Learning Researcher and Engineer specializing in representation learning, temporal modeling, and robust evaluation for real-world sensor and video data, spanning physiological sensing, wearable time-series, and computer vision. I build end-to-end Python and PyTorch systems from data pipelines and model development through subject-independent, leakage-controlled testing and edge deployment. This work includes a CNN-LSTM deployed on an NVIDIA Jetson Xavier NX and a 10,000+ line open-source framework reused across multiple studies and sensing modalities.

Education

Drexel University, Philadelphia, PA

Ph.D. Computer Science	December 2021
M.S. Computer Science	September 2017
B.S. Computer Science, Magna Cum Laude	June 2015

Technical Skills

Modeling: representation learning, temporal deep learning (LSTM, CNN-LSTM), supervised and unsupervised learning, generative models (VAEs, GANs), manifold learning, classical ML

Evaluation: subject-independent and leakage-controlled splits, cross-validation, evaluation under distribution shift, zero-shot robustness testing, low-data regimes

Languages & Libraries: Python, PyTorch, scikit-learn, NumPy, SciPy, pandas, OpenCV, SQL, C/C++

Systems & Deployment: Linux/Ubuntu, CUDA, ONNX, NVIDIA Jetson, real-time inference pipelines, Git, pytest, continuous integration, human-in-the-loop multi-agent development

Signals & Vision: multi-channel sensor time-series, video-based behavior analysis, spatiotemporal feature extraction, wavelet and scale-space analysis, 3D head-pose extraction

Experience

Independent Research — TemporalLens & Ongoing Collaborations

Independent Researcher & ML Engineer	May 2023 — Present
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- Building **TemporalLens** (GitHub), an open-source study of calibration-efficient, subject-independent decoding of surface EMG (sEMG), testing whether a model trained on one set of users transfers to *new* users with no per-subject calibration. Defined leakage-controlled evaluation protocols, frozen

held-out-subject splits, and matched generative and frozen-LLM ablations; implementation of the end-to-end training and evaluation pipeline is in progress.

- Sustained research collaborations with CHOP and Drexel, producing an invited book chapter on advanced manufacturing of touch-sensitive textiles (2024) and a *Journal of Psychiatric Research* paper on automatic measurement of social gaze in autism (2026).

Center for Autism Research — Children’s Hospital of Philadelphia, PA

Postdoctoral Fellow, Computer Vision & Behavioral Machine Learning April 2022 — April 2023

- Developed computational models to extract socially relevant behavioral structure from naturalistic conversational video in neurotypical and autistic populations, using robust 3D face-model fitting to extract head-pose trajectories (yaw, pitch, and roll).
- Built interpretable representations of conversational head movement for age-related and autism-related analysis; dyadic features consistently outperformed monadic across both studies (**80.0% vs. 69.2%** for autism classification; **78.6% vs. 71.4%** for developmental classification).
- Combined supervised and unsupervised methods, including clustering, template matching, and feature-based modeling, to localize meaningful movement patterns in face-to-face interaction.
- Collaborated with clinicians to ensure interpretability, domain relevance, and sound evaluation.

Department of Computer Science & Center for Functional Fabrics — Drexel University, PA

Graduate Researcher, Machine Learning & Wearable Sensing November 2018 — January 2022

- Showed that representation design and temporal modeling can substitute for hardware complexity: established a general framework for touch and gesture inference on minimally wired textile sensors, resolving spatial overlap on a 36-button surface sensed through a single conductive yarn with 2 electrodes, later extended to 4 connection points.
- Built PyTorch models for subject-independent touch localization and gesture recognition, including a CNN-LSTM deployed on an NVIDIA Jetson Xavier NX, achieving **89.8%** held-out accuracy on 12-class gesture recognition and **66%** touch localization on a 36-button sensor (**3% chance**).
- Designed custom algorithms for multi-channel signals: **MSD**, a SIFT-inspired invariant representation, achieving a **39×** improvement in class separability and **50×** reduction in pairwise processing time over raw signal representation, and **ELD**, a generalized sequence distance metric for variable-length continuous signals.
- Designed subject-independent evaluation pipelines with cross-validation, held-out testing, and zero-shot robustness evaluation under EMI, stretching, and on-body conditions.

Advanced Interaction Research Lab — Drexel University, PA

Graduate Researcher, Physiological Computing & Machine Learning October 2015 — August 2018

- Developed **BioHCI** (GitHub), an open-source 10,000-line Python framework for physiological signal processing and ML experimentation — integrating configurable preprocessing, feature construction, model training, cross-validation, and evaluation into a reproducible pipeline across multiple sensing modalities and studies.

- Built a deep learning model for subject identification from fNIRS brain-signal segments across 30 participants, achieving 63% accuracy vs. 3.3% chance — demonstrating stable individual structure recoverable without task engagement.
- Investigated adaptive, human-centered systems using implicit fNIRS input, designing and running user studies, building controlled study protocols, data-collection workflows, and signal-processing pipelines, while studying privacy implications.

Selected Honors

Best Paper Award, EICS/PACM, <i>Top 1% of submissions</i>	September 2020
Best Presentation Award, ICMHI	May 2023
Snap Creative Challenge Award, Snap Inc.	August 2021
Jay Modi Memorial Award for Best PhD Research, Drexel University CS Department	May 2019
International Research Experiences for Students, NSF-funded program	December 2017

Selected Publications

Full list on Google Scholar and personal website.

1. Denisa Q. McDonald, Richard J. Vallett, Erin Solovey, Geneviève Dion, and Ali Shokoufandeh. Knitted Sensors: Designs and Novel Approaches for Real-Time, Real-World Sensing. *IMWUT 2020/UbiComp 2021*. *Acceptance rate: 20–25%*.
2. Denisa Q. McDonald, Richard J. Vallett, Lev Saunders, Geneviève Dion, and Ali Shokoufandeh. Recognizing Complex Gestures on Minimalistic Knitted Sensors: Toward Real-World Interactive Systems. *arXiv 2023*.
3. Richard J. Vallett, Denisa Q. McDonald, Geneviève Dion, Youngmoo Kim, and Ali Shokoufandeh. Toward Accurate Sensing with Knitted Fabric: Technical Considerations and Application Potential. *PACM HCI*, presented at *EICS 2020/2021*. *Best Paper Award (top 1% of submissions)*.
4. Denisa Q. McDonald, Evangelos Sariyanidi, Casey J. Zampella, Ellis DeJardin, John D. Herrington, Robert T. Schultz, and Birkan Tunç. Predicting Autism from Head Movement Patterns during Naturalistic Social Interactions. *ICMHI 2023*. *Best Presentation Award*.
5. Denisa Q. McDonald, Shruti Mahajan, Richard J. Vallett, Erin Solovey, Geneviève Dion, and Ali Shokoufandeh. Interaction with Touch-Sensitive Knitted Fabrics: User Perceptions and Everyday Use Experiments. *ACM CHI 2022*. *Acceptance rate: 24.6%*.

Additional

Mentorship & Outreach: Mentored graduate and undergraduate researchers across ML and HCI; supported RETHink CS@Drexel, expanding research access for educators.

Research Internships: Visiting Graduate Researcher, *LMU Munich*, Human-Centered Ubiquitous Media (2018); Research Assistant, *Drexel University*, Privacy, Security & Automation Lab (2014)

Industry Internships: Engineering Intern, *Comcast Corporation*, Technology and Product Development (2013); Engineering Intern, *PECO, an Exelon Company*, Smart Grid/Smart Meter (2012)

Co-founder, “Frankly, I think”: Built a mobile app for collecting and summarizing public sentiment.