Ali Abedi

Machine Learning Engineer | University of Toronto

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SUMMARY

7+ years of experience in machine learning, deep learning, data analysis, and predictive modeling. Holds a Ph.D. in Electrical Engineering and Computer Science and completed a Postdoctoral Fellowship at the University of Toronto, demonstrating a strong technical foundation. Skilled in translating complex multimodal data into predictive models, powering software solutions across domains. Proficient in machine learngin and LLM libraries and deploying models in the cloud and on edge devices. Passionate about applying data to real-world challenges.

SKILLS

Programming Languages: Python, Kotlin, Java, JavaScript, SQL, C++, C#
Frameworks & Libraries: PyTorch, OpenCV, Scikit-learn, Pandas, NumPy, SHAP, Grad-CAM
Tools & Platforms: Azure, Google Cloud Platform, Git, Docker, Flask, FastAPI
Machine Learning Domains: Graph, Video, Image, Text (NLP/LLM), Time Series, Multimodal Sensors, Tabular Data, RAG, and Feature Engineering for Classification, Regression, Anomaly Detection

EXPERIENCE

Scientific Associate II | Toronto Rehab Hospital, University Health Network (UHN) | *May 2024 – Present*

- Designed and deployed an ML-driven multimodal sensor platform for remote patient monitoring using smartphones, smartwatches, and sleep sensors. Built feature engineering pipelines and machine learning models on Google Cloud Platform, deployed across multiple hospitals. The models analyzed time-series sensor data to detect social isolation and functional decline, and to predict responsive behaviors.

- Built a web-based rehabilitation platform with an interactive avatar, connected to device cameras for in-home patient care. Applied deep learning and LLMs with prompt engineering on Azure to assess exercise quality from video-based body joint data, enabling real-time feedback. Models supported regression and binary classification for evaluating movement quality and used natural language generation to deliver feedback.

- Developed a hybrid LLM and vision transformer framework with prompt engineering for disease classification and localization in chest X-ray images, improving diagnostic accuracy and interpretability.

- Developed a deep learning framework to analyze facial video data for assessing the affective states of drivers with mild cognitive impairment during autonomous vehicle takeover requests. The system evaluated emotional responses to support safety and behavioral insights.

Machine Learning Engineer | Toronto Rehab Hospital, UHN | *Oct 2022 – Apr 2024*

- Developed ML models for user engagement estimation in tele-health and tele-education virtual meetings, including video-based models such as a hybrid ResNet and TCN model, feature-based models based on valence and arousal from facial videos, and facial-landmarks-based methods based on ST-GCNs.

- Conducted statistical analysis, feature selection, and ordinal classification model development on big tabular data from routine clinical assessments to measure social engagement among residents of long-term care homes in Ontario.

- Developed predictive models for multimodal sensor data analysis to detect and predict agitation in community-dwelling people with dementia with an AUC ROC of 0.94.

Postdoctoral Fellow | University of Toronto | *Oct 2020 – Sep 2022*

- Designed a privacy-preserving deep learning framework combining split learning and federated learning to predict ICU mortality from distributed vital signs data, outperforming centralized models.

- Achieved AUC ROC of 0.98 in detecting distracted driving behaviors using 3D CNNs and supervised contrastive learning on multiview depth and infrared video.

- Developed RNNs and temporal convolutional networks to analyze long multivariate time-series data from wearable sensors for accurate step counting.

Machine Learning Engineer | Quark Software | *Sep 2017 – Aug 2020*

- Developed and deployed ML models on Android devices to recognize character strings from residential electricity meters across provinces, achieving 92% accuracy using the Viola-Jones framework and 2D CNNs.

- Built an automated platform for reading, indexing, and retrieving marks from OMR sheets used in national university entrance exams, leveraging image processing and computer vision techniques.

- Created a Windows application to scan, recognize, and index bank documents across multiple branches of a national bank, using ML-based document classification and retrieval.

- Developed a web application for scanning, recognizing, and archiving business cards using machine learning-driven layout analysis.

EDUCATION

Postdoctoral Fellowship in Computer Science | University of Toronto | *2020 – 2022*
- Focus: Machine learning and Deep Learning for Rehabilitation and Aging

Doctorate Degree (Ph.D.) in Computer Science | Tarbiat Modares University */ 2011 – 2016*

- Dissertation: Machine Learning-driven Document Image Super Resolution

Master's Degree (M.Sc.) in Computer Science | Amirkabir University of Technology */ 2007 – 2009*

- Thesis: Machine Learning-based Document Image Retrieval

Bachelor's Degree (B.Sc.) in Electrical Engineering | Amirkabir University of Technology */ 2002 – 2007*
- Project: Simulation of a CDMA Communication System

PROFESSIONAL SERVICES & AWARDS

- Published over 35+ peer-reviewed journal and conference papers.

- Mentored 29 interns and students at Toronto Rehabilitation Institute and the University of Toronto.

- Co-chaired, organized, and judged 6 conferences and workshops.

- Reviewed several journal and conference papers.

- Experienced in grant writing and research ethics documentation for AI in healthcare.

- Awarded Transform Heart Failure Research Program, 2023 & 2024.

- Awarded Age-Well Postdoctoral Award in Technology and Aging, 2023.

- Awarded Early Professionals Inspired Careers in AgeTech Fellowship, 2023.

SELECTED PUBLICATIONS

- Abedi, A., et al. Multimodal sensor dataset for monitoring older adults post lower limb fractures in community settings. Nature Scientific Data 12, 733 (2025).

- Karlov, M., Abedi, A. & Khan, S.S. Rehabilitation exercise quality assessment through supervised contrastive learning with hard and soft negatives. Medical & Biological Engineering & Computing 63, 15–28 (2025).

- Abedi, A., et al. Artificial intelligence-driven virtual rehabilitation for people living in the community: A scoping review. Nature Digital Medicine 7, 25 (2024).

- Abedi, A., et al. Bag of states: a non-sequential approach to video-based engagement measurement. Multimedia Systems 30, 47 (2024).