Mohamed Harmanani

Ph.D. Student, Vector Institute/Queen's University

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EDUCATION

PhD. in Artificial Intelligence   2024 – Present
Queen's University & Vector Institute   *Kingston, Canada*

- **Supervisor**: Prof. Parvin Mousavi

MSc. in Artificial Intelligence   2022 – 2024
Queen's University & Vector Institute   *Kingston, Canada*

- **Supervisor**: Prof. Parvin Mousavi
- **Thesis**: Towards a Reliable Deep Learning Framework for Prostate Cancer Diagnosis using Ultrasound

BSc. (Hons.) in Computer Science   2016 – 2021
University of Toronto   *Toronto, Canada*

- **Minor**: Philosophy

RESEARCH EXPERIENCE

Vector Institute/Queen's University   Toronto, Canada
Doctoral Researcher   *2024 – Present*

- **Supervisor**: Prof. Parvin Mousavi
- Researching and developing **trustworthy deep learning methods** for computer-assisted diagnosis and interventions at the point-of-care

Graduate Research Assistant   *2022 – 2024*

- **Supervisor**: Prof. Parvin Mousavi
- Designed an integrated system for clinically applicable detection of prostate cancer using **uncertainty estimation**
- Improved detection of prostate cancer from weakly labelled ultrasound data by 15% using **self-supervised learning**
- Developed a **novel multi-objective learning algorithm** for ultrasound-based cancer detection, improving performance by 10% over the baseline

University of Toronto   Toronto, Canada
Research Intern   *May 2021 – Sep 2021*

- **Supervisor**: Prof. Lisa Zhang
- Implemented **deep learning** methods (RNN, BERT) for **natural language processing** (NLP) and **automated bug detection** in student code

Research Assistant   *Sep 2020 – May 2021*

- **Supervisor**: Prof. Katharina Bräutigam
- Implemented a data pipeline for transcriptome analysis using Slurm, Bash and Python, reducing task turnaround time from 1 week to 2 days

INDUSTRY EXPERIENCE

Flinks   Montréal, Canada
Data Scientist   *Sep 2021 – Sep 2022*

- Accelerated the development of MLOps tools using DVC & Google Dataflow ETL to build data processing pipelines for NLP
- Optimized deep learning models (BERT) for financial language modelling using PyTorch and AWS SageMaker, resulting in a 33% increase in performance metrics

Venngage   Toronto, Canada
Software Engineer   *May 2019 – May 2020*

- Implemented probabilistic algorithms for design generation in TypeScript, React & Fabric.js, increasing quality metrics by 13%

★,† indicates equal contribution

Peer Reviewed Journal Publications

J1. **M. Harmanani**, P.F.R. Wilson, M.N.N. To, M. Gilany, A. Jamzad, F. Fooladgar, B. Wodlinger,
P. Abolmaesumi★, P. Mousavi★.
TRUSWorthy: Towards Clinically Applicable Deep Learning for Confident Detection of Prostate Cancer in Micro-Ultrasound.
Under review at: **Int. J. Computer Assisted Radiology and Surgery (IJCARS), 2024**. (IF: 3.0)

J2. P.F.R. Wilson, **M. Harmanani**, M.N.N. To, M. Gilany, A. Jamzad, F. Fooladgar, B. Wodlinger,
P. Abolmaesumi, P. Mousavi.
Towards Confident Prostate Cancer Detection using Ultrasound: A Multi-Center Study.
Int. J. Computer Assisted Radiology and Surgery (IJCARS), 2024.(IF: 3.0)
(Best Paper Runner-up)

J3. M.N.N. To, F. Fooladgar★, P.F.R. Wilson★, **M. Harmanani**★, M. Gilany, A. Jamzad, S. Sojoudi,
S. Chang, P. Black, P. Mousavi†, P. Abolmaesumi†.
LensePro: Label Noise-Tolerant Prototype-Based Network for Improving Cancer Detection in Prostate Ultrasound with Limited Annotations.
Int. J. Computer Assisted Radiology and Surgery (IJCARS), 2024. (IF: 3.0)

Peer Reviewed Conference and Workshop Publications

C1. P.F.R. Wilson, M.N.N. To, A. Jamzad, M. Gilany, **M. Harmanani**, T. Elghareb, F. Fooladgar,
B. Wodlinger, P. Abolmaesumi, P. Mousavi.
ProstNFound: Integrating Foundation Models with Ultrasound Domain Knowledge and Clinical Context for Robust Prostate Cancer Detection.
Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024.
(Early Accept, Top 11%)

C2. M. Gilany, **M. Harmanani**, P.F.R. Wilson, A. Jamzad, M.N.N. To, B. Wodlinger, P. Abolmaesumi,
P. Mousavi.
Calibrated Diverse Ensemble Entropy Minimization for Robust Test-Time Adaptation in Prostate Cancer Detection.
Machine Learning in Medical Imaging Workshop (MLMI) — Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024.

C3. **M. Harmanani**, P.F.R. Wilson, F. Fooladgar, A. Jamzad, M. Gilany, M.N.N. To, B. Wodlinger,
P. Abolmaesumi, P. Mousavi.
Benchmarking Image Transformers for Prostate Cancer Detection from Ultrasound Data.
SPIE Medical Imaging 2024.

C4. **M. Harmanani**.
Modelling the Spread of COVID-19 in Indoor Spaces using Probabilistic Automated Planning.
Scheduling and Planning Applications woRKshop (SPARK) — International Conference on Automated Planning and Scheduling (ICAPS), 2023.

C5. S. Fujimori, **M. Harmanani**, O. Siddiqui, L. Zhang.
Using Deep Learning to Localize Errors in Student Code Submissions.
ACM Technical Symposium on Computer Science Education (SIGCSE), 2022.

Teaching

- **Head Teaching Assistant**   Queen's University
  CISC 365 - *Algorithms I*   *Winter 2024*

- **Teaching Assistant**   Queen's University
  CISC 452 - *Neural and Genetic Computing*   *Fall 2023, Fall 2024*
  CISC 151 - *Intro to Data Anlytics*   *Winter 2023*

Awards

- **Bruce Mitchell Research Fellowship**, Queen's University (2024-Present)
  Awarded to doctoral trainees "above and beyond the normal graduate trainee complement"

- **Vector Institute Research Grant I** (2023, 2024)

- **Robert Sutherland Fellowship**, Queen's University (2022-2023)
  Awarded to outstanding students belonging to a visible minority

- **Undergraduate Research Award**, University of Toronto (2022)

- **Undergraduate Entrance Award**, University of Toronto (2016)

Academic Service and Leadership

- **NSERC MediCREATE Training Program**
  Mentored a team of 3 PhDs and 1 MSc student through a 3-week challenge on surgical video analysis

- **Queen's University Med-i Lab**
  Organized the lab's weekly meetings and seminars (50+ people), and facilitated discussion of key topics

Skills

Programming: Python, PyTorch, C, SQL, R, MATLAB, Java, JavaScript, HTML, CSS
Tools: PyTorch, Keras, BigQuery, Google Dataflow, GCP, AWS (S3, SageMaker), React, Node.js, Seaborn
Algorithms: CNN, ResNet, Transformers, Vision Transformers, Large Language Models (BERT, GPT)
Languages: English (fluent), French (fluent), Arabic (fluent), Spanish (intermediate)