Dr. Abeer Badawi

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Highlights of Qualifications

- **Research interests:** Machine Learning, Large Language Models (LLM), LLM Evaluation Systems, Responsible AI, Bias and Fairness in LLM, Health and Mental Health Systems, Digital Biomarkers, and Signal Processing.
- **Publications:** I have 25 publications including **ICML** position paper, **EMNLP**, **JMIR** Journal, and **IEEE** Conferences.
- **Collaboration with Leading Institutions:** I collaborated with Vector Institute, University Health Network, University of Toronto and Ontario Shores Mental Health Institute teams in advancing AI solutions for healthcare.
- **Teaching Experiences:** I have experience since 2016 as a lecturer and teacher assistant; I taught **20 courses** at Guelph University, Ontario Tech University and Arab Academy for Science and Technology in computer engineering.
- **Industrial Experiences:** I worked in the industry as a **Machine Learning Specialist** at Vector Institute to use LLM to improve mental health support and a **Data scientist** at BetterCart Inc. to use Natural Language Processing (NLP) to track food industry prices in Canada.
- **Mentorship:** I have a proven mentorship experience as I mentor 2 Ph.D., 2 master, and 1 undergraduate students with 5 publications.
- **Awards:** Recipient of competitive awards, including the Connected Minds CFREF Postdoctoral Scholarship (2025–2027), nomination for the best thesis award, Ontario Graduate Scholarship (2022–2023), Canada's Career Ready internship funding, and IEEE-HKN Outstanding Chapter Award.

EDUCATION

PhD in Electrical and Computer Engineering, Ontario Tech University **May 2020 - May 2024, Oshawa, Canada**

- Thesis: Leveraging Artificial Intelligence to Predict Neuropsychiatric Symptoms (NPS) in a Clinical Demonstration Unit (CDU).
- Nominated for the best thesis award, GPA 4.22/4.3, and received **Ontario Graduate Scholarship (OGS).**

MSc. in Electronics and Communication Engineering, Arab Academy for Science and Technology **Sep 2016 - Jan 2019, Alexandria, Egypt**

- Thesis: Multimodal Human Activity Recognition from Wearable sensors using Machine learning and a Feature Selection approach, GPA: 3.96/4.0, Excellent with Honor.

B.Eng. in Electronics and Communication Engineering, Arab Academy for Science and Technology **Sep 2011 - June 2016, Alexandria, Egypt**

- Graduation project: PortaCare: IoT-Based Portable-Intensive-Care-Unit. The project aims to design a prototype for a low-cost portable intensive care unit. The project won two national funds, GPA: 3.95/4.0, Excellent with Honor.

WORK EXPERIENCE

- Postdoctoral Fellow at York University and Faculty Affiliate Researcher at Vector Institute

York University and Vector Institute **February 2024 – Present, Toronto, Canada**

- Received the Connected Minds CFREF Scholarship, funded by the Canada First Research Excellence Fund.
- Develop innovative solutions for integrating Large language models to investigate mental health problems. The goal is to design frameworks and algorithms that enable AI models to make fair, transparent, and contextually aware health recommendations.
- Primary Supervisor - Dr. Elham Dolatabadi, Co-supervisors - Dr. Laleh Seyyed-Kalantari, External Collaborator (York University and Vector Institute) - Dr. Stephanie Ameis (Psychiatrist at CAMH), and Dr. Frank Rudzicz (Vector Institute & Dalhousie University).

- Machine Learning Researcher

I4H Research Lab, York University **October 2024 – February 2025, Toronto, Canada**

- Develop innovative solutions for integrating Large language models to investigate mental health problems.
- Design frameworks and algorithms that enable AI models to make fair, transparent, and contextually aware health recommendations
- **Skills:** Python, Large Language Models, Llama 3, AWS, Text data pre-processing, chain of thoughts, and system prompt.

- Machine Learning Specialist

Vector Institute and Kids Help Phone **May 2024 – August 2024, Toronto, Canada**

- Collaborate with Vector Institute and Kids Help Phone to implement Large Language models to classify and predict mental health issues in young people to reduce the administrative burden on counselors.
- The model outperformed the crisis responder's analysis and was able to find new insights from mental health problems using the chain of thoughts with high-performance evaluation.
- **Skills:** Python, Large Language Models, Llama 3, AWS, Text data preprocessing, and system prompt.

- Research Assistant

Ontario Shores Mental Health Institute **Jan 2023 - May 2024, Whitby, Canada**

- Led the project Collaboration between Ontario Shores Mental Health Institute and Ontario Tech University titled Leveraging AI to detect, predict, and manage Neuropsychiatric Symptoms (NPS) in People with Dementia (PwD).
- Successively cooperated with the hospital team to accept the project by the Research Ethics Board and implement an entire detection system in the dementia unit.
- **Skills:** Python, SQL, Project management, semi-supervised learning, data preprocessing, and biomedical signals.

- Research Assistant

University Health Network and University of Toronto **Jan 2022 - June 2023, Toronto, Canada**

- Research Trainee at the KITE Research Institute and IATSL lab at the University of Toronto on the project titled Multimodal Human Activity Recognition from Wearable Inertial Sensors using Machine Learning.
- We investigated features and ML to detect aggressive behavior and results outperformed state-of-the-art results.
- **Skills:** Python, SQL, machine learning, data preprocessing, and signals.

- Data Scientist

BetterCart Technologies Inc. **July 2021 - July 2022, Saskatchewan, Canada**

- I worked as a data scientist to code, debug, and optimize the BetterCart platform and enhance existing systems.
- Built natural language processing (NLP) using Name entity recognition (NER) to extract grocery store data and create a product the company currently uses a matching algorithm using classification techniques with high accuracies and the model.
- **Skills:** Python, SQL, NLP, machine learning, supervised learning, and NER.

- Research Assistant

Ontario Tech University **Jan 2020 - May 2024, Oshawa, Canada**

- Leveraging Artificial Intelligence to Detect and Manage Neuropsychiatric Symptoms (NPS) in a Clinical Demonstration Unit (CDU).
- Real-time data Streaming with Apache Kafka and Machine Learning for high accuracy of Health Risk ECG signal prediction.
- Develop AI techniques for real-time traffic analysis from live video streams with high performance.
- Pre-trained Deep Learning Models for COVID-19 prediction in X-ray images that outperformed the state-of-the-art results.

TEACHING EXPERIENCE

- Instructor

Computer Engineering - Guelph University **September 2025 - current, Guelph, Canada**

- DATA*6400*01 Machine Learning for Sequential Data Processing: This course emphasizes machine learning for sequential data processing. It covers common challenges and pre-processing techniques such as text, biological sequences, and time series data.
- UNIV*6080 Computational Thinking for Artificial Intelligence: Foundations of Artificial Intelligence and Machine Learning – Covered linear algebra, geometry, matrix decompositions, vector calculus, probability, optimization, and data–model integration; built strong mathematical and computational foundation for AI/ML research.

- Instructor

Computer Engineering - Ontario Tech University **May 2024 - current, Oshawa, Canada**

- Introduction to Programming ENGR 1200U: Learn C++ programming language (350 students).
- Web Programming SOFE 2800U: HTML, CSS, JavaScript, and Databases (150 students)
- Graduate course Software Engineering Studio ENGR 5990U: Git, Jira, LLM, Cloud Platforms, and Databases (SQL)

-Teacher Assistant

Computer Engineering - Ontario Tech University **Sep 2020 - May 2024, Oshawa, Canada**

- I delivered tutoring support to students, assisting them with coursework assignments, projects, and exam preparation. I instructed tutorials and lab sessions, held office hours, and evaluated assignments, quizzes, and final projects.
- **Four Courses**: Introduction to Programming ENGR1200, Microprocessor and Computer Architecture ELEE3450, Introduction to Artificial Intelligence SOFE 3720U, and Software and Computer Security SOFE 4840U.

-Teacher Assistant

Electrical and Computer Engineering - Arab Academy for Science and Technology **Sep 2016 - June 2019, Alexandria, Egypt**

- Teacher Assistant for **13 different** Computer, Electrical, and Electronics courses: Digital Microprocessor, Introduction to Computer, Introduction to Communication Systems, Statistical Communication Theory, Electronics II, Circuits I & II, Mathematics I, Selected topics in Communication, Photonic Devices, Analog and Digital Signal processing, Electronic Amplifiers, and Microelectronics.

PUBLICATIONS

1. Badawi, A., Rahimi, E., Laskar, M. T. R., Grach, S., Bertrand, L., Danok, L., Huang, J., Rudzicz, F., & Dolatabadi, E. (2025). *When Can We Trust LLMs in Mental Health? Large-Scale Benchmarks for Reliable LLM Evaluation*. Submitted to ACL 2026.
2. Badawi, A., Laskar, M. T. R., Huang, J. X., Raza, S., & Dolatabadi, E. (2025). *Beyond Assistance: Reimagining LLMs as Ethical and Adaptive Co-Creators in Mental Health Care*. Proceedings of the 41st **International Conference on Machine Learning (ICML**). **Accepted** (Acceptance rate: 19.7%).
3. Rahimi, E., Sajjad, H., Rosati, D., Badawi, A., Dolatabadi, E., & Rudzicz, F. (2025). *Not Lost After All: How Cross-Encoder Attribution Challenges Position Bias Assumptions in LLM Summarization*. **Accepted to EMNLP 2025**.
4. **Badawi, A**., Elmoghazy, S., Choudhury, S., Elgazzar, K., & Burhan, A. A novel multimodal system to predict agitation in people with dementia within clinical settings. **Journal of Medical Internet Research (JMIR) Aging**. Accepted (Acceptance rate 25%).
5. Badawi, A., Laskar, M. T. R., Rahimi, Rudzicz, F., Huang, J., & Dolatabadi, E. (2025). *From Empathy to Action: Benchmarking LLMs in Mental Health with MentalBench-10 and a Novel Cognitive-Affective Evaluation Approach*. **Submitted to ICLR 2025**.
6. **Badawi, A**., Elmoghazy, S., Choudhury, S., Elgazzar, K., & Burhan, A. Semi-supervised learning approaches for predicting neuropsychiatric symptoms in people with dementia. **Journal of Alzheimer's Association (Submitted).**
7. **Badawi, A**., Elmoghazy, S., Choudhury, S., Elgazzar, K., & Burhan, A. (2023). Investigating multimodal sensor features importance to detect agitation in people with dementia. In **2023 IEEE Canadian Conference on Electrical and Computer Engineering (CCECE).**
8. **Badawi, A**., Badr, A., Elmoghazy, S., Elgazzar, K., & Burhan, A. A real-time system for monitoring and managing neuropsychiatric symptoms in dementia patients. **2024 6th International Conference on Communications, Signal Processing, and their Applications (ICCSPA).**
9. **Badawi, A**., Elmoghazy, S., Choudhury, S., Elgazzar, K., & Burhan, A. (2023). Artificial intelligence and features investigating to detect neuropsychiatric in patients with dementia: A pilot study. In IEEE Symposium Series on Computational Intelligence.
10. **Badawi, A**. A., Al-Kabbany, A., & Shaban, H. A. (2020). Sensor type, axis, and position-based fusion and feature selection for multimodal human daily activity recognition in wearable body sensor networks. **Journal of Healthcare Engineering.**
11. **Badawi, A**., & Elgazzar, K. (2021). Detecting coronavirus from chest X-rays using transfer learning. COVID, 1(1).
12. **Badawi, A.** A., Badr, A., & Elgazzar, K. (2021). ECG real-time monitoring and heart anomaly detection reimagined. In **2021 IEEE 7th World Forum on Internet of Things (WF-IoT).**

13. **Badawi, A.** A., Al-Kabbany, A., & Shaban, H. (2018). Multimodal human activity recognition from wearable inertial sensors using machine learning. In 2018 **IEEE-EMBS Conference on Biomedical Engineering and Sciences (IECBES).**
14. **Badawi, A.** A., Al-Kabbany, A., & Shaban, H. (2018). Daily activity recognition using wearable sensors via machine learning and feature selection. In 2018 **13th International Conference on Computer Engineering and Systems (ICCES).**
15. Choudhury, S., **Badawi, A.,** Elgazzar, K., & Burhan, A. M. (2023). Identifying pre-agitation biometric signature in patients with dementia: A feasibility study. International Psychogeriatrics, 35(S1), 40–41.
16. Choudhury, S., **Badawi, A.,** Blair, M., Elmi, S., Elgazzar, K., & Burhan, A. M. (2023). Identifying pre-agitation biometric signature in dementia patients: A feasibility study. **International Psychogeriatrics,** 35(S1), 260.
17. Choudhury, S., **Badawi, A.,** Elgazzar, K., Kumar, S., & Burhan, A. M. (n.d.). Profile of NPS in neurocognitive disorders: Sex differences, and identifying targets for digital biometrics. In **Alzheimer's Association International Conference**.
18. Burhan, A. M., Sun, W., Chiu, M., Choudhury, S., **Badawi, A**., & Elgazzar, K. (2023). Technology-enabled care for neuropsychiatric symptoms of dementia: Implementation at the point of care. **International Psychogeriatrics,** 35(S1), 40.
19. Badr, A., **Badawi, A.,** Rashwan, A., & Elgazzar, K. (2022). XBeats: A real-time electrocardiogram monitoring and analysis. **Signals**.
20. Badr, A., **Badawi, A.,** Rashwan, A., & Elgazzar, K. (2022). 12-lead ECG platform for real-time monitoring and early anomaly detection. In 2022 **International Wireless Communications and Mobile Computing (IWCMC**).
21. Ouda, H., **Badawi, A.,** Hassanein, H. S., & Elgazzar, K. (2022). Energy saving on constrained 12-leads real-time ECG monitoring. In GLOBECOM 2022 - 2022 **IEEE Global Communications Conference**.
22. El Aziz, A., & **Badawi**, A. (2019). Education development employing latest free-space optical research papers for communication engineering students in class and examination. In 15 Conference on **Education and Training in Optics and Photonics: ETOP**.
23. Elewah, A., **Badawi,** A. A., Khalil, H., Rahnamayan, S., & Elgazzar, K. (2021). 3D-radviz: Three-dimensional radial visualization for large-scale data visualization. In 2021 **IEEE Congress on Evolutionary Computation (CEC**).

Mentorship and Supervision

- Somayya Elmoghazy (PhD Student, Computer Engineering, Ontario Tech University)
- Elahe Rahimi (PhD Student, Computer Science, Dollhouse University)
- Sheri Grach (Graduate Program in Health, York University)
- Prathiba Dhanesh (Bachelor of Computing, University of Guelph)

SCHOLARSHIPS and AWARDS

- Connected Minds Postdoctoral Scholarship Canada First Research Excellence Fund (CFREF), (140,000 $ plus 17,000$ research allowance for two years) 2025-2027.
- Ontario Graduate Scholarship for academic excellence, 2022-2023. (15,000 $)
- Canada's Student Work Placement Program (SWPP), TECHNATION Canada Career Ready fund for internship, 2021-2022.
- PhD scholarship from Ontario Tech University, 2020-2024.
- Outstanding Chapter Award, IEEE Eta Kappa Nu (IEEE-HKN) — Mu Beta Chapter at Arab Academy for Science and Technology College, the first chapter in Africa and Egypt, 2019.
- National funding from (ITIDA) Information Technology Industry Development Agency and the National Telecommunications Regulatory Authority (NTRA) of Egypt for one of the best functional prototypes, 2015-2016.

INVITED TALKS

- Endless Summer School (ESS) session: Responsible AI Development - Bias & Fairness seminar, Vector Institute, 2025.
- AI Is Not Your Therapist: Measuring Trust and Reliability in Mental Health LLMs, Course Invited Speaker EECS 1001: Research Directions in Computing , Lassonde School of Engineering, York University, 2025.
- Responsible AI Development: Bias and Fairness, Vector Institute, November 2025
- AI for AGITATION: Predicting Behavioural Distress in Dementia Care, International Long-Term Care Policy Network (ILPN), London School of Economics and Political Science (LSE), UK September 23, 2025.

- The Future of Mental Health in the Age of LLMs, Agentic AI, and Ethical Design TechnoMind, York University, Toronto, Canada, Invited to present ICML 2025 paper, 2025.
- Moderate for a panel discussion in Responsible AI, Canadian Undergraduate Conference on AI (CUCAI), 2024.
- "Lead without Limits From a woman in STEM". Women in STEM, Ontario Tech University, Canada, 2021.
- "Apache Spark vs Apache Storm: Side-by-Side Comparison", Ontario Tech University, Canada, 2021.
- "Apache Kafka Architecture & Fundamentals Explained", Ontario Tech University, Canada, 2020.
- "Panel Discussion about Engineers Life Style", IEEE AAST Alexandria Student Branch, AAST, Egypt, 2019.
- "Python, Machine learning, and deep learning: A beginner's guide". IEEE HKN MU BETA, AAST, Egypt, 2018.

SERVICES

- Mentor, Women in AI Hackathon 2025 – supervised multiple projects.
- Reviewer- ICLR conference, The Journal of Supercomputing (Springer), BMJ digital health and AI, IEEE GCAIoT 2023, IWCMC 2022, ICCSPA 2022.
- **Volunteer in Conference-** Volunteered in the ICML, Machine learning for healthcare 2024, and IEEE smart mobility 2024 conferences.
- **Former President of IEEE-HKN Mu Beta Chapter-** The president and founder of the IEEE Eta Kappa Nu (IEEE-HKN) — Mu Beta Chapter at Arab Academy for Science and Technology College, the first chapter in Africa and Egypt. Won the Outstanding Chapter Award in 2019, Alexandria, Egypt.
- **Team Leader in AIESEC youth organization-** Talent Management team leader to guide members in setting and fulfilling their goals from a professional perspective, Alexandria, Egypt.

REFERENCES

- Dr. Elham Dolatabadi, Assistant Professor at York University, Faculty of Health, School of Health Policy and Management. A faculty affiliate at Vector Institute and cross-appointed with the Institute of Health Policy, Management, and Evaluation (IHPME) at the University of Toronto, Postdoctoral Supervisor.
- Dr. Khalid Elgazzar, PhD supervisor and Canada Research Chair on the Internet of Things (IoT), Ontario Tech University. Email: khalid.elgazzar@ontariotechu.ca.
- Dr. Frank Rudzicz, Associate Professor, Faculty of Computer Science, Dalhousie University, Faculty Member at Vector Institute, and Canada CIFAR Artificial Intelligence Chair, Postdoctoral Co-Supervisor.
- Dr. Amer Burhan, Department of Psychiatry, University of Toronto. Collaborated with for PhD project at Ontario Shores Hospital, Canada. Email: burhana@ontarioshores.ca.