Hassan Al-Hayawi

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Ontario, Canada

Links: Portfolio Website | LinkedIn | GitHub | Medium page

SKILLS

- **Neuroimaging Expertise:** MRI, fMRI, fNIRS, & EEG
- **Programming:** Python, SQL, R, Matlab, HTML & CSS
- **Machine learning**: TensorFlow, Keras, Scikit-learn, PyTorch, CNN, ANN, LLM, (un)supervised classification, Google Cloud Platform (GCP), & MLOps Azure
- **Research methodology**: Quantitative and qualitative statistics, experimental design, data manipulation, interpretation, and visualization (pandas, numpy, seaborn, matplotlib)

EDUCATION

University of Western Ontario   **Sept. 2022 – Aug. 2024**

Master of Science (M.Sc.) - Cognitive, Developmental and Brain Sciences (cGPA: 4.0)   London, ON, Canada

- Thesis: | Link | "*Machine Learning for Prognosis of Acute Brain-Injured Patients in the ICU Using EEG Complexity Analysis and Naturalistic Narrative Stimuli*"
- Supervisors: Dr. Adrian Owen

King's University College   **Sept. 2018 – Apr. 2022**

Bachelor of Arts (B.A.) - Honours Specialization in Psychology (cGPA: 3.7)   London, ON, Canada

- Thesis: "*Cortical Function of Super Refractory Status Epilepticus: An fMRI Case Study*"

EXPERIENCE

Research Technical Assistant – M31 AI (start up), Toronto, ON, Canada   **Sept. 2025 – Present**

- Designed and executed large-scale GPU-accelerated experiments on HPC infrastructure.
- Development of medical imaging ML workflows and deep learning architectures for 3D MRI analysis.
- Predicting AVM recurrence in pediatric patients as part of a collaboration with the SickKids Hospital.

Machine Learning Research Assistant – The Haeryfar Lab, London, ON, Canada   **May 2025 – Sept. 2025**

- Implement and refine a transfer learning–based convolutional neural network to fully automate the detection and scoring of liver inflammation and fibrosis in histology slides of a preclinical mouse model.
- Leverage automated patch-based classification to replace labor-intensive manual scoring, increasing speed and consistency in histopathological evaluation of liver tissue.

Research Analyst - LHSC / London Health Sciences Centre, London, ON, Canada   **Sept. 2022 – Dec. 2024**

- Collected, organized, & analyzed complex neuroimaging datasets to create predictive models from acquired data.
- Developed and implemented end-to-end ML pipelines, optimized to improve data-driven insights in the ICU.

Data Analyst - The Owen Lab @ Western University, London, ON, Canada   **Oct. 2021 – Aug. 2022**

- Preprocessed & analyzed large high-dimensional datasets with advanced techniques for noise reduction, artifact removal, signal enhancement, statistical testing, optimization algorithms, feature extraction, & data visualization.
- Utilized PCA for dimensionality reduction & ICA to eliminate artifacts & isolate meaningful patterns in the data.

PROJECTS

CNN for Binary Image Classification (Computer Vision) | Link | *PyTorch, Transfer Learning*   **Dec. 2024 – Mar. 2025**

- Model: Developed a model to automatically classify X-rays images of pneumonia-affected lungs, distinguishing them from normal lungs. Achieved 81% accuracy and an F1 score of 83.8%.
- Workflow: Fine-tuned a pre-trained CNN in PyTorch through data manipulation and transfer learning techniques for better classification while minimizing computational resource usage. Delivered modular scripts and clear documentation for data loading, training, and evaluation to streamline reproducibility and enable collaboration.

Automated Image Segmentation (Computer Vision) | Link | *TensorFlow, Keras*   **Dec. 2023 – Jan. 2024**
- <u>Automated Segmentation:</u> Developed a highly efficient pipeline to evaluate MRI images of preclinical mouse models, reducing manual processing time from months to minutes while maintaining high accuracy.
- <u>Deep Learning Model Development:</u> Built a custom U-Net convolutional neural network with a multi-step encoder-decoder architecture, and applied image augmentation to enhance model robustness.
- <u>Impact:</u> Enabled faster, more reliable assessment of cancer growth in preclinical studies.

Machine Learning to Predict Coma Patient Outcomes | Link | *sklearn, Feature Engineering*   **Oct. 2022 – Aug. 2024**
- <u>Prognostic Modelling:</u> Complexity algorithms were used to extract features from EEG brain signal data. Features subsequently used to train classification models that predict clinical outcomes of coma patients with 80% accuracy.
- <u>Model Evaluation:</u> Assessed model performance using cross-validation techniques and various metrics, including Accuracy, Precision, Recall, and area under the ROC curve (AUC).

Improving Analysis & Interpretation of Neuroimaging Data | Link | *TensorFlow, Optimization* **Sep. 2022 – Oct. 2023**
- <u>Innovative Brain Signal Detection:</u> Awarded a Provincial Scholarship for proposing a method that simultaneously integrates EEG and fNIRS data to improve sensitivity in detecting brain activity in ICU patients. This approach considers crucial underlying physiological mechanisms by estimating a patient's hemodynamic response function (HRF) using a gradient descent-based search algorithm that optimizes the correlation between fNIRS and EEG data.

AWARDS, HONORS, & DISTINCTIONS
- 2024 Ontario Graduate Scholarship (OGS) (***valued at* $15,000**).
- 2023 Reva Gerstein Fellowship (***valued at* $4,000**).
- 2023 Wrestling Champion – 1st place OUA; 1st place Greco-Roman Nationals; 2nd place U-Sports Nationals.
- U-Sports Academic All-Canadian Award (2019-2023) – *for national-level athletes who maintain high grades*
- 2022 Ontario Graduate Scholarship (OGS) (***valued at* $15,000**).
- 2021-2022 Ontario Wrestling Carding (***valued* at $3,000**).
- Peter Lockyer Wrestling Award (2018-2022) (***total value of* $10,500**).
- University Dean's List (2019-2022).
- University Continuing Admission Academic Scholarship (2018-2021) (***total value of* $4,500**).
- University Academic Athletic Scholarship (2018-2021) (***total value of* $12,000**).
- 1st place 2021 Ontario Senior Wrestling Provincial Champion.
- 2021 Bronze W Award presented by the University of Western Ontario's Varsity Wrestling Team.
- 2019 & 2020 Most Dedicated Athlete - *awarded by the University of Western Ontario's Varsity Wrestling Team.*

PUBLICATIONS
Manuscripts:
- **Al-Hayawi H**, Kim S, Ma J, Wang B, Quon J: Deep learning prediction of AVM recurrence in children. (*in preparation*).
- Maschke C, Norton L, Duclos C, Dolhan K, Han M, Laforge G, Frantz A, Wang X, **Al-Hayawi H**, Zhang T, Lavoie R, Owen AM, Blain-Moraes S. (2024). EEG response to sedation interruption complements behavioral assessment after severe brain injury. *Annals of Clinical and Translational Neurology.* https://doi.org/10.1101/2024.10.02.24314815

Conference Abstracts:
- **Al-Hayawi H**, Laforge G, Novi SL, Wang X, Debicki DB, Norton L, Owen AM: Leveraging electroencephalography and machine learning for predicting neurologic recovery after acute brain injury. London Health Research Day. London, Canada. May 2024.
- **Al-Hayawi H**, Laforge G, Norton L, Owen AM: Complexity Modulation with Naturalistic Narrative Stimuli for Prognosis of Acute Brain-Injured Patients. Cognitive Neuroscience Society 2024 31st Annual Meeting. Toronto, Canada. April 2024.
- **Al-Hayawi H**, Laforge G, Novi SL, Wang X, Debicki DB, Norton L, Owen AM: Using EEG and machine learning for predicting neurologic recovery after acute brain injury. 51st Annual Lake Ontario Visionary Establishment (L.O.V.E) Conference. Niagara Falls, Canada. February 2024.
- **Al-Hayawi H**, Norton L, Kazazian K, Gofton TE, Owen AM: Cortical Function of Super Refractory Status Epilepticus: An fMRI Case Study. London Health Research Day. London, Canada. May 2022.