Anthony Rinaldi

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Education

University of Toronto, Department of Computer Science 2022 – 2023
M.Sc. in Applied Computing
GPA: 4.0/4.0

Western University, Department of Statistical and Actuarial Sciences 2017 – 2022
B.Sc. in Statistics (Honours)
GPA: 96/100

Work Experience

Sunnybrook Research Institute Toronto, ON
Research Software Developer *Jan 2024 – Present*
- Led the development of a novel 3D deep learning model that can segment any part of medical images, inspired by a 2D version originall proposed by Meta [Kirillov et al., 2023]
- Extended the lab's brain scan processing software (MIRACL) to include a Vision Transformer-based model to segment active neurons from light sheet fluorescence microscopy images of a mouse's brain

Metabob Inc. Santa Clara, CA (Remote)
AI Researcher *May 2023 – Dec 2023*
- Researched 10 unsupervised deep graph learning methods for coarsening codebase augmented abstract syntax trees (ASTs)
- Developed and implemented an auto-encoding graph neural network (GNN) that reduced the memory of ASTs by 92.75%, improving storage and information retention over the current coarsening approach by using a data-driven approach
- Established a robust parallelized data generation pipeline utilizing Bash scripting for a supervised multiclass code bug-detection GNN model involving cloning thousands of GitHub pull requests (PRs), AST parsing, AST coarsening, and labelling via BERTopic modelling of PRs
- Parallelized the multi-head implementation for efficient parameter scaling

University of Toronto Toronto, ON
Research Assistant *Sep 2022 – Jun 2023*
- Explored fine-tuning pre-trained multilingual models (mBART) for neural machine translation of low-resource languages

Vector Institute for Artificial Intelligence Toronto, ON
Automation Intern *Sep 2022 – Jan 2023*
- Automated the Institute's data collection related to AI talent initiatives using web-scraping Python libraries

Western University London, ON (Remote)
Undergraduate Student Researcher *May 2022 – Sep 2022*
- Continued undergraduate thesis under the supervision of Dr. Cristián Bravo Roman

Research Experience

Abstract Syntax Tree Coarsening via Deep Attention-Based Node Pooling Networks May 2023 – Present
- Introduced a novel auto-encoder graph neural network to condense abstract syntax trees, used in subsequent classification
- Investigated prevailing graph coarsening literature, identifying and addressing limitations through architecture improvements
- Conducted extensive experiments to evaluate model performance scalability with size, leveraging DeepSpeed for efficient distributed computing and training large models effectively within limited GPU capacity

Neural Machine Translation for Low-Resource Languages Sep 2022 – Jun 2023
- Determined the best ways to fine-tune pre-trained multilingual sequence-to-sequence models (mBART) for translating between language pairs with less than 500k parallel data
- Explored and evaluated fine-tuning approaches such as two-stage and multi-domain
- Assessed the impact of training corpus size, as well as the divergence between training set and test set on model performance

A Transformer-Based Classification for Volcanic Seismic Signals Sep 2021 – Sep 2022
- Considered the use of the novel NLP technique self-attention for predicting volcanic event types from raw seismic signals
- Designed a DNN architecture that enables superior signal classification compared to traditional approaches
- Utilized different neural network layers such as convolutional, residual-convolutional, and long short-term memory

Projects

Anomaly Detection with Auto-Encoders | *GitHub* 2023

- Investigated the sensitivity of deep auto-encoder anomaly detection methods to architecture and hyperparameter changes

Locally Weighted Random Forests | *GitHub* 2022

- Proposed an ensemble decision tree training algorithm that makes predictions based on the similarity of a given query point to the training set on which individual decision trees were built on

End-to-End Negotiator with Transformers | *GitHub* 2022

- Extended a Meta research paper [Lewis et al., 2017] to use a Transformer-based architecture instead of its original RNN-based architecture

Skills

Languages: Python, R, MATLAB, SQL, JavaScript, Java

Libraries: PyTorch, PyTorch Lightning, PyTorch Geometric, NumPy, Pandas, Matplotlib, Seaborn, WandB, DeepSpeed, Scikit-Learn, Hydra, TensorFlow, Keras

Relevant Coursework

Graduate coursework: Neural Networks and Deep Learning, Introduction to Machine Learning, Data Science Methods, Natural Language Computing, Computational Linguistics

Undergraduate coursework: Thesis Project in Statistical Sciences, Advanced Statistical Computing, Statistical Programming, Statistical Learning, Partial Differential Equations, Time Series, Mathematical Statistics, Intermediate Probability, Generalized Linear Models, Calculus for Statistics, Probability & Statistics I-II, Calculus I-II, Linear Algebra, Introductory Data Science, Data Analytics & Visualization, Advanced Data Analysis, Data Analytics Consulting

Awards & Achievements

Mitacs Accelerate Research Grant - $30,000 2023
Mitacs

Vector Scholarship in Artificial Intelligence - $17,500 2022
Vector Institute for Artificial Intelligence

Second Place Student Poster Presentation 2022
Statistical Society of Canada

Northern Life Assurance Gold Medal - Highest Average in Statistics Program 2022
Western University

Dean's Honour List 2018 – 2022
Western University

Scotiabank HBA1 Award - $11,000 2019
Ivey Business School, Western University

Andrew and Sarah Hamilton Scholarships - $1,800 2018
Western University

Western Continuing Admission Scholarship - $10,000 2017
Western University

Publications and Talks

Publications

- Nayak, S., ..., **Rinaldi, A.**,..., Lee, E. A. (2023). *Intermediate Task Fine-tuning of Sequence-Sequence Language Models with Auxiliary Domain Parallel Data for Low-resource NMT*. International Conference on Learning Representations [PML4DC].
- Mora-Stock, C., **Rinaldi, A.**, ..., Bravo, C. (2023, May 7 – 10). *A Transformer-Based Classification System for Volcanic Seismic Signals* [Conference Presentation]. Annual Meeting of the CGU, Banff, Alberta, Canada.

Talks

- Neural Machine Translation for Low-Resource Languages, *Toronto Machine Learning Summit 2022*