Ashkan (Ash) Dehghan PhD

Portfolio ash.dehghan@gmail.com LinedIn GitHub Google-Scholar +1 647-680-1830

About

I am a machine learning engineer and data scientist with over ten years of combined experience in both industry and academia and 8 years of programming in **Python**. I hold a PhD in Theoretical and Computational Physics, and a second PhD in Machine Learning, with seven peer reviewed publications. I have held technical roles in a number of industries, including financial-services (**Bank of Nova Scotia**), technology startup (**Ritual Co, InvestDefy**) and Retail (**Canadian Tire Corp**), developing and deploying production-quality systems and models. I have a deep understanding of data science and machine learning concepts and technologies including: **PyTorch**, **Keras**, **Machine Learning on Graphs**, **Large Language Models (LLMs)** and **Time-Series, Embedding and Generative Models**.

Experience

Lead Machine Learning Engineer
March 2021 – Present

InvestDefy Technologies *Toronto, Canada*

- Built and implemented machine learning solutions (**Time-Series Models**, **Embeddings**, **Large Language Models (LLMs)** and other **Generative Model**) for enhancing the performance of financial strategies and model explainability.
- Designed and built a machine learning experimentation framework with **Flask-API** layer to enable the optimization of various trading-strategy models (built using **PyTorch** and **XGBoost** frameworks) such as time-series anomaly detection and price-range prediction.
- Built and managed end-to-end feature engineering and machine learning model execution framework using **Apache Airflow** and **Metaflow**.
- Developed and maintained an in-house built **analytics** and **simulation** platform for displaying and tracking the performance of various machine learning models and optimizing them.

Lead Data Scientist
June 2019 – March 2021

Canadian Tire Corporation *Toronto, Canada*

- I was a **technical lead** for a team of data scientists and machine learning engineers, building analytics and machine learning solutions focused on predicting customer behaviour (**unsupervised customer segmentation models, customer churn models** and **customer lifetime value models**).
- Developed a **Full-Stack** customer simulation engine for planing marketing optimal campaigns (**customer cohort selection and optimization**).
- Designed and ran an A/B experimentation framework, with weekly reporting to the executive team.

Sr. Data Engineer
June 2018 – June 2019

Ritual Technologies *Toronto, Canada*

- Built time-series forecasting models (**LSTM**) to predict sales and consumer behaviour.
- Implemented full-stack restaurant-menu optimization tool to speed up menu import process by **10x**.
- Built an end-to-end data enrichment pipeline using **Apache Beam** and **Google Dataflow**.
- Designed and developed event driven systems using **Google Cloud PubSub**, **Apache Beam**, **Cloud Dataflow** and **Cloud Functions** to enable live reporting, monitoring and analytics.

Quantitative Analyst
September 2016 – June 2018

Bank of Nova Scotia *Toronto, Canada*

- Developed **Bayesian statistical models** for the bank's balance-sheet and risk management team.
- Designed and implemented Machine Learning bond classification models to identify high-value/low-risk bonds.
- Constructed web-based data visualisation and analytics tools using **JavaScript**, **HTML** and **CSS**.

Technical Skills

Machine Learning:

- Strong knowledge of Machine Learning techniques and concepts [**Generative Models**, **Large Language Models (LLMs)**, **Machine Learning on Graphs**, **Embeddings**, **Time-Series Models**].
- Developed and built production quality models using frameworks such as **PyTorch**, **Keras**, **XGBoost** and **Scikit Learn**.
- Designed and built production quality **Time-Series**, **Embedding**, **Graph-ML (GCN, GNN)** models.
- Working knowledge of **Transformers** and **Computer Vision** models and architectures.
- Developed production quality systems using **LLM APIs** such as **OpenAI** and libraries such as **Hugging-Face**.

Data Engineering:

- Strong working knowledge of data and feature engineering tools such as **Apache Airflow** and **Metaflow**.
- Developed and maintained production quality SQL scripts using **PostgreSQL** and **Google BigQuery**.
- Developed and deployed feature engineering pipelines on cloud (**AWS** and **GCP**).

Programming:

- Strong knowledge of **Python** (8+ years experience) and **SQL** (8+ years experience).
- Working knowledge of **MATLAB**, **Fortran**, **JavaScript**, **HTML** and **CSS**.
- Comfortable using version control **Git** and cloud commputing **AWS** and **GCP**.

Communication:

- Authored **7 peer reviewed scientific articles** in fields of AI and Physics (5 first author and 2 second author).
- Delivered over **20 oral presentations** at national and international conferences.
- Experienced in managing and mentoring a team of data-scientists and engineers, focusing on professional development, project delivery, and innovation.

Education

PhD - Machine Learning on Graphs 2020-Defending:2024

Toronto Metropolitan University *Toronto, Canada*

- **Graph Embeddings:** Designed and implemented an open-source framework (Network Embedding Exploration Tool [PyPi:NEExT]) for building graph embeddings and performing feature importance exploration. I used this framework to research model interpretability for machine learning models built on graph data.[Code]
- **Node Embeddings:** Designed and implemented an open-source node structural embedding algorithm based on the convolutional-autoencoder technique to capture local node structural properties of networks.
- **Embedding Evaluation Framework:** Designed and implemented an open-source unsupervised embedding evaluation framework for exploring and scoring what structural embedding algorithms learn.[Paper]
- **Bot Detection on Social Networks:** Lead the research on developing a new technique for detecting bots on social networks using graph and node embedding (Won best paper award). [Paper]

PhD - Theoretical and Computation Physics 2012-2016

McMaster University *Hamilton, Canada*

- **Modeling Biological Systems:** Developed theoretical and computational models of biological membranes to explore membrane formation and their various physical and elastic properties. [Paper][Paper]
- **Polymer Thin-Films:** Built computational models of polymer thin-films and performed simulations to explore polymer self-assembly under various conditions.[Paper][Paper]
- **Theoretical Framework:** Designed and developed a theoretical framework for explaining the process of hydrogen-bonding in polymer blends and their effects on the self-assembly of polymers in various phases.[Paper]

Publications and Open Source Projects

Publications [7 Peer Reviewed]:

- Unsupervised Framework for Evaluating Structural Node Embeddings of Graphs [**1st Author**, 2023] [Paper].
- Detecting Bots in Social-Networks Using Node and Structural Embeddings [**1st Author**, 2023] [Paper].
- Elastic Property of Membranes Self-Assembled from Diblock and Triblock Copolymers [**2nd Author**, 2019] [Paper].
- Orienting Block Copolymer Thin Films via Entropy [**2nd Author**, 2016] [Paper].
- Effect of Mobile Ions on the Electric Field Needed to Orient Charged Diblock Copolymer Thin Films [**1st Author**, 2015] [Paper].
- Line tension of multicomponent bilayer membranes [**1st Author**, 2015] [Paper].
- Modeling Hydrogen Bonding in Diblock Copolymer/Homopolymer Blends [**1st Author**, 2013] [Paper].

Open Source Projects:

- Network Embedding Exploration Tool [NEExT]. A Python framework for building graph embeddings and exploring/explaining feature importance in graph machine learning.[PyPi] [GitHub]