Reza Torabi

I specialize in developing and implementing cutting-edge machine learning algorithms, with expertise spanning deep learning, computer vision, reinforcement learning, generative AI, natural language processing, and agentic AI. Combining a solid foundation in the theoretical principles of AI with hands-on engineering experience, I am passionate about creating AI applications and intelligent embedded devices using advanced machine learning techniques that solve real-world challenges.

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GitHub

LinkedIn

GoogleScholar

Canadian

Work Experience

Senior Data Scientist — 2023-Present
Baker Hughes

- Developing an attention-based classifier with **vision transformers (ViT)** to recognize defects, cracks and metal loses in oil and gas pipelines as well as deploying it in the company's desktop application in the production phase.
- Created a growth rate prediction model using **deep neural networks** to predict growth rate of defects in oil and gas pipelines.
- Developed a classifier to discriminate normal, disturbed, and reverberated sensory data and deploying it in the related software in the production phase.
- Developed an effort prediction **application** to predict, visualize and analyze effort.
- Image to image translation of 2D sensory data to 2D laser dig data via **image segmentation** techniques and **UNet** to estimate the size and depth of defects in the pipeline.

Data Scientist — 2021-2023
Aurora Imaging Group/University of Calgary

- Created an **image retrieval** system and image similarity **search ranking engine** for a **web application** using deep neural networks (noisy **Autoencoder**) that recommend space science community members similar phenomena and events in large Aurora image database according to their similarity rank.
- Developed Aurora image classification models for a **web application** using **deep neural networks** and transfer learning that generalized well on large Aurora image database with stat of the art accuracy. **Cloud computing** was used in training phase and Deep Convolutional **Generative Adversarial Networks (DCGAN)** for data augmentation to enhance the accuracy.
- Developed an image labeler and viewer **desktop application** for viewing, filtering, searching, and labeling (for supervised learning) the Aurora images.

Machine Learning Researcher — 2019-2021
Canadian Center for Behavioral Neuroscience

- Developed a deep learning based behavioral recognizer toolbox for analyzing behavioral video data using **CNN** and **RNN (LSTM)** and knowledge extraction tools such as DeepExplain.
- Predicting cognitive score in children using **pose estimation** methods based on analyzing videos of their Lego building.
- Cage monitoring (detecting and tracking animals in their cages) using **object detection** and tracking methods using **computer vision**.
- Developing machine learning algorithms based on how brain works such as recirculation, Hebbian, and backtracking algorithms from the scratch.

Computational physicist — 2018-2019
Complexity Science Group/University of Calgary

- Simulation, computational and statistical analysis of pattern formation.

Lecturer & Researcher — 2010-2018
Tafresh University

- Teaching statistics and researching on statistical physics and network science.

Education

- PhD in Physics, Amirkabir University of Technology.
- MSc in Statistical Physics, Amirkabir University of Technology.
- BSc in Physics, Sharif University of Technology.

Selected ML Publications

• Machine learning applied to data from the THEMIS All-Sky Imager Array: Clouds and APA, AGU conference 2021, New Orleans, USA (2021).

• A Neural Network Reveals Motoric Effects of Maternal Preconception Exposure to Nicotine on Rat Pup Behavior: A New Approach for Movement Disorders Diagnosis, Frontiers in Neuroscience (2021).

SKILLS

Programing language: Python, C++, C#, Java, JavaScript, Bash, SQL, Swift, Matlab

Machine learning algorithms: Linear and Logistic regression, Decision tree, Random Forest, SVM, Naive Bayes, K-means, hierarchical and density-based clustering, Genetic algorithm, PCA, LightGBM, XGBoost, Matrix factorization, Collaborative filtering, Zero-shot classification

Deep learning: Tensorflow, Keras, PyTorch, PyTorch Lightning, Deep Neural Networks, Convolutional Neural Network (CNN), Recurrent Neural Networks (RNN, LSTM, GRU), Transfer learning, Attention Based CNN, Behavioral Cloning (Self-driving cars), graph learning, Class Activation Maps

Computer vision: Image processing, Image recognition, Object detection, Object tracking, Optical flow, Pose estimation methods, Semantic and instance segmentation, Action Recognition

NLP & Agentic AI: Sentiment Analysis, NER, Topic modeling, Question-answering, Translation, Transformers (BERT, GPTs), LangChain

Generative AI: Autoencoders, Variational Autoencoders (VAE), Generative Adversarial Networks (GAN), Transformers, Diffusion models, Vision Transformers, Multimodal models

Reinforcement learning: Q-learning, Deep Q-learning (DQN), Actor Critic Method, Deep Deterministic Policy Gradient (DDPG)

Big data and Cloud computing: AWS, Sagemaker, Microsoft Azure, Google Cloud, PySpark

Development: Git version control, Docker, Django, Flask, FastAPI, Tkinter, PyQt5, Full stack web development, IOS development

Robotics: Raspberry Pi, ROS2

Data Visualization: Plotly, Dash

Databases: MySQL, MS SQL Server, Oracle, MongoDB

Statistics & mathematics: Bayesian statistics, Linear algebra, Probability theory, Monte Carlo method, Network science

Other skills: Recommender systems, learning to rank (LTR), Signal processing, time series analysis, TensorBoard, AutoML, MLflow, AutoGluon, linux, Gradio, Hugging face, Pygame, OpenAI API