

Payam Mousavi

Physicist / Applied ML Scientist



SUMMARY

I am a multi-disciplinary scientist/engineer who thrives on exploring connections between different domains and industries. I have an academic background in physics and engineering with many years of experience developing software and ML-based solutions for multiple industries such as supply chain, manufacturing, oil & gas, advertising, biology, defense & security, and most recently AI/ML consulting

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Experience



Oct 2021 – present

Applied Research Scientist at Alberta Machine Intelligence Institute (AMII)

(<https://amii.ca>)

SUMMARY

Developing and deploying ML-based solutions for various industries such as supply chain, manufacturing, oil & gas, advertising, biology, defense & security as well as conducting applied research

- Leading the advanced technology group to develop software solutions for industrial clients as well as other departments within Amii
- Researching Physics-Informed Neural Networks (PINNs) and their applications to fluid flow
- Applying RL to industrial control, multi-robot planning for logistics applications, and VLSI routing
- Developing hybrid Operations Research and RL algorithms for the optimization of a 3D warehouse structure with multiple interacting robots
- Developing machine vision models for detection and classification of gas emissions

Jan 2021 – Sep 2021

Senior Data Scientist (R&D Director) at Unbounce Marketing Solutions

(<https://unbounce.com/>)

SUMMARY

Leading the R&D team to develop tools, leveraging deep learning, statistics, classical ML, causal models, and RL to move forward the company strategy in “Conversion Intelligence” within a digital marketing eco-system

- Developing machine vision models for marketing applications
- Developing NLP models to generate/classify text that maximize the conversion rate
- Exploring Reinforcement Learning for designing high-conversion web/landing pages

Languages



English : ★★★★★

Farsi : ★★★★★

Skills



Machine Learning : ★★★★★

Deep Learning Reinforcement Learning

Generative AI/ML Machine Vision

Physics-Informed ML Multi-agent RL

Causal Inference Bayesian Inference

Optimization PyTorch TensorFlow

Python MATLAB

Mathematical Modeling : ★★★★★

Dynamical Systems

Probability and Statistics

Numerical Simulations

Physics : ★★★★★

Optics Electromagnetism

Quantum Mechanics Thermodynamics

Fluid Dynamics Solid State Physics

Statistical Mechanics

Jan 2018 – Sep 2021

Staff R&D Scientist at MDA Systems (<https://mda.space/en/>)

SUMMARY

Applying deep learning to natural images, Earth Observation (EO), and Command & Control (C2)

- Designed/implemented GANs and VAEs (Python/PyTorch/TensorFlow) to synthesize and manipulate imagery and to perform anomaly detection
- Implemented, Supervised (ResNet-based), and Semi-Supervised (FixMatch) models (in PyTorch) for image classification and detection (RetinaNet and Faster-RCNN) of vessels and planes in satellite imagery
- Applied Multi-agent RL in a cooperative setting for applications in Defense (i.e., Command & Control) and surveillance.

Jan 2015 – Dec 2018

Research Scientist at Phase Technology (<https://www.phase-technology.com/>)

SUMMARY

Building optical analyzers for measurement of cold flow properties (mainly of oil and gas)

- Designed/optimized optical imaging systems (TracePro, COMSOL, OpenCV, and MATLAB)
- Developed software (MATLAB and Python) for robotic arm manipulation for sample loading
- Used various machine learning techniques for sample classification

Jan 2008 – May 2014

R&D Scientist (PhD Candidate) at Honeywell Process Solutions (ACS)

(<https://www.honeywell.com/ca/en>)

SUMMARY

Building optical analyzers for measurement of cold flow properties (mainly of oil and gas)

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Education



Jan 2008 – May 2014

PhD in Physics from Simon Fraser University

Jan 2005 – Jan 2008

MSc in Mechanical Engineering from University of British Columbia

Sep 1999 – Jan 2004

BASc in Engineering Physics from University of British Columbia

Publications



Jan 2024

Human-in-the-Loop Reinforcement Learning: A Survey and Position on Requirements, Challenges, and Opportunities (<https://www.jair.org/index.php/jair/article/view/15348>), **Journal of Artificial Intelligence Research (JAIR)**

Jun 2023

RL-Ripper: A Framework for Global Routing using Reinforcement Learning and Smart Net Ripping Techniques (<https://dl.acm.org/doi/10.1145/3583781.3590312>), **Proceedings of the Great Lakes Symposium on VLSI (GLSVLSI)**

Sep 2023

MaskRenderer: 3D-Infused Multi-Mask Face Re-enactment (<https://arxiv.org/abs/2309.05095>), **arXiv: 2309.05085**

Feb 2021

Maximum Likelihood parameter estimation in terahertz time-domain spectroscopy (<https://opg.optica.org/oe/fulltext.cfm?uri=oe-29-4-4912&id=447079>), **Optics Express**

May 2021

A Real-time Bayesian Decision-Support System for Predicting Suspect Vehicle's Intended Target Using a Sparse Camera Network (<https://publications.waset.org/10012089/a-real-time-bayesian-decision-support-system-for-predicting-suspect-vehicles-intended-target-using-a-sparse-camera-network>), **International Conference on Defense, Security, Intelligence (ICDSI)**

Jun 2021

Deep Learning for Vessel Detection and Identification from Spaceborne Optical Imagery (<https://isprs-annals.copernicus.org/articles/V-3-2021/303/2021/>), **ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences**

Sep 2020

Onboard Artificial Intelligence for Space Situational Awareness with Low-Power GPU (<https://amostech.com/TechnicalPapers/2020/Poster/Lim.pdf>), **21st Advanced Maui Optical and Space Surveillance Technologies Conference**

Nov 2020

Human-AI Teaming with the Digital Battlespace Framework

(<https://static1.squarespace.com/static/53bad224e4b013a11d687e40/t/5f9c2197a331735b92eb8214/1604067735595/25th+ICCRTS+Program+10-30-20.pdf>), **25th ICCRTS International Command and Control Research and Technology Symposium**

Nov 2009

Simultaneous composition and thickness measurement of paper using terahertz time-domain spectroscopy (<https://opg.optica.org/ao/abstract.cfm?uri=ao-48-33-6541>), **Applied Optics**

Sep 2007

Chipping into microfluidics (<https://iopscience.iop.org/article/10.1088/2058-7058/20/9/32>), **Physics World**

Oct 2007

A novel flow reactor for studying reactions on liquid surfaces coated by organic monolayers: Methods, validation, and initial results (<https://pubs.acs.org/doi/10.1021/jp075724c>), **The Journal of Physical Chemistry A**

Feb 2013

Continuous referencing for increasing measurement precision in time-domain spectroscopy (<https://patentimages.storage.googleapis.com/7e/b5/98/19cd7f6df3bc8f/US8378304.pdf>), **US Patent 8378304 B2**

May 2012

Time domain spectroscopy (TDS) based method and system for obtaining coincident sheet material parameters (<https://patents.google.com/patent/US8187424B2/zh>), **US Patent 8187424**