S. Shayan Mousavi M.

Ph.D. Candidate | AI Solution Expert
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HIGHLIGHTS OF QUALIFICATIONS

- 3rd-year **Engineering Ph.D. candidate** specialized in **AI-driven designs & solutions in applied physics and engineering**
- Designed, and deployed multiple open-source **Python** scripts for **data deconvolution, classification, segmentation, pattern and feature detection** using **deep learning**, and other **machine learning** algorithms (designed AI-based software: **EELSpecNet CNN**, **LandSlideSeekers CNN & LSTM RNN core**).
- Solid technical skills in **dividing processes**, **defining requirements**, proposing **modular designs**, **constructing software**, **planning tests**, **debugging**, and working with **version control** systems (released software: **SPDFEM**)
- More than **five years** of extensive **research experience** in **materials sci. and eng.**, **applied physics, and data analytics**
- Exceptional **verbal** and **written communication skills** developed by delivering over 10 virtual and physical presentations, teaser videos, and scientific journal papers (**Scipy 2021**, **Photonics North 2018-2021**, **M&M 2021**)
- **Supervised three engineering undergraduate students** in their summer research which has developed my leadership, teaching, time management, creativity, interactive discussion, and problem-solving skills
- **Self-motivated engineer** who can work both **independently and in collaboration** with others, as well as working in a fast-paced environment

EDUCATION

Professional Certification | IBM Artificial Intelligence Engineering **Oct 2021 – Present**

- 6 project-oriented courses on AI, ML, and DL theory and programming using IBM Watson, TensorFlow, and PyTorch

Ph.D. Candidate | Materials Eng. Dept. | McMaster University, Hamilton, Ontario | A+ **May 2019 – Exp. Grd. 2023**

- **Visiting Researcher (User) at Canadian Light Sources Synchrotron Facility**
- **Conducting Ph.D. Research at Canadian Center for Electron Microscopy**
  - Research Title: A data drive insight into plasmon-mediated electronic and photonic phenomena
  - *Keywords: Spectroscopy, AI, computer vision, signal/image processing, deconvolution, resolution restoration*

M.Sc. Candidate | Materials Eng. Dept.| McMaster University, Hamilton, Ontario | A+ **Sept 2017 – May 2019**

- Research Title: Probing surface plasmons using electron microscopy spectral imaging and computational techniques

B.Sc. | Materials Eng. with Secondary Concentration in Theoretical Mathematics Sharif University of Technology, Tehran, Iran | A+ (3.84/4) **Sept 2012 – Sept 2017**

- Research Title: Design, fabrication and performance evaluation of hybrid graphene/metal biosensors

RELEVANT RESEARCH PROJECTS

Super Resolving AI to Enhance Resolution in Diffraction-Limited Synchrotron Maps (Ongoing) **Nov 2021 – Present**

- Investigating optoelectronic properties of plasmonic metasurfaces using synchrotron's infrared beamline
- Exploring multiple AI-driven methods (most probably GAN) to improve the resolution of energy-resolved maps

EELSpecNet: Deep Convolutional Neural Network Solution for Electron Energy Loss Spectroscopy Deconvolution (Manuscript Written) **May 2021 – Jan 2022**

DOI: https://doi.org/10.1017/S1431927621005997

- Designed, deployed, trained, and evaluated U-shaped deep convolutional neural networks of different dimensionalities to reconstruct (deconvolve) EELS spectra using Python-based libraries
- Used various supervised/unsupervised machine learning algorithms for data preparation (PCA, autoencoders)
- Used google platform for GPU and TPU parallelization

LandSlideSeekers: A mobile app with an AI-core to predict and assess the risk of future landslides (link) **Oct 2021**

GitHub repo: https://github.com/shmouses/LandSlide_Seekers_NasaAppChall2021

- As a member of a team of 4 (A406 Titans), developed AI cores for classification and prediction tasks within 48 hr

- Designed, deployed, trained, and evaluated a classifier convolutional neural network to identify and detect landslide related geological features captured in cellphone photos to generate a risk parameter
- Designed and deployed a predictive long short-term memory recursive neural network (LSTM RNN) fed by chosen satellite maps, and local parameters generated by the classifier AI-core to locally predict landslide events

SPDFEM: Surface Plasmon Dynamic Finite Element Method Python Script for Calculating Maxwell's Equations in 3D Media (Released) **Sept 2020 – Aug 2020**

DOI: https://zenodo.org/badge/latestdoi/295775775

- Reformed Maxwell's system of differential equations in space to the discrete finite parametric formulation
- Designed, programed, evaluated, and released a finite element method calculator in Python
- Used FEniCS Python package for setting up a 3D environment, and conducting finite element calculations

Electron energy-loss spectroscopy of surface plasmon activity in wrinkled gold structures **May 2019 – Oct 2020**

DOI: https://doi.org/10.1063/5.0031469

- Conducted boundary element method simulations on hierarchical complex geometries, for calculation of spatial plasmon eigenmodes using MNPBEM package in MATLAB
- Extracted, analyzed, and visualized EELS hyperspectral images using various Python libraries

OTHER EXPERIENCES

Speaker/Guest Speaker (Most recent):

- **AI-assisted electron energy loss spectroscopy signal deconvolution** **Nov 2021**
  Materials engineering department graduate seminar series, McMaster University
- **Role of data-centric AI in the future of nanofabricated devices (Guest Speaker)** **Aug 2021**
  Course: Synthesis, Applications and Environmental Impact of Nanomaterials
  Materials engineering department, McMaster University
- **EELSpecNet, a deep learning solution for EELS spectral data deconvolution** **July 2021**
  SciPy 2021, Oral Presentation

Teaching Assistantship:

- **Electron microscopy specialist for the heat treatable AL-alloys characterization** **Jan 2018 – Present**
  Materials engineering department, McMaster University
- **Fundamentals of Programing (Python)** **Sept 2014 – Jan 2015**
  Computer engineering department, Sharif University of Technology

SKILLS

Programming: Python, MATLAB, C++, SQL, Docker
Data-analytics tools: Scikitlearn, TensorFlow, Keras, Google GPU and TPU parallelization, IBM Watson Studio, Orange Quasar
General tools: GitHub, Jupiter Notebook, Google Colab, Latex, Microsoft Suite

AWARDS & HONORS

- Local People's Choice Winner, NasaSpaceApps 2021 Hackathon **Oct 2021**
- Most innovative team, NasaSpaceApps 2021 Hackathon **Oct 2021**
- Awarded full scholarship, M.Sc., and Ph.D. in Material Eng., McMaster University **Sept 2017 – Aug 2023**
- Recipient of Science and Culture Award from Sharif University of Technology **Feb 2017**
- 4th place, Materials Sci. and Eng. national Olympiad for university students, Iran **Sept 2016**
- 3rd place, Materials Sci. and Eng., the first pole of Iran, Olympiad for university students **May 2016**

RELATED GRADUATE-LEVEL COURSES

- Development of scientific computing software, McMaster University **Sept 2020**
- Neural networks and development tools, McMaster University **Jan 2021**
- Deep learning and applications, McMaster University **Jan 2021**
- Quantum materials, devices, and systems, McMaster University **Sept 2017**

LATEST PROFESSIONAL DEVELOPMENT AND CERTIFICATIONS

- Docker for data scientists, LinkedIn Learning **Nov 2021**
- Machine Learning with Python, by IBM on Coursera **Nov 2021**
- Complete TensorFlow 2 and Keras Deep Learning Bootcamp, Udemy **Aug 2021**
- Programming Foundations: Object-Oriented Design, LinkedIn Learning **Jan 2021**