Zahra Hosseini

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Summary

Passionate machine learning engineer with a solid academic foundation and extensive hands-on experience in **generative models**, computer vision, and **3D geometry**. Proficient in developing, fine-tuning, and deploying scalable ML models using cutting-edge frameworks like **PyTorch** and **Lightning**. Adept at solving complex problems and collaborating across multidisciplinary teams to deliver innovative solutions.

Education

2022 – 2024 **MASc. Computer Engineering, York University**, GPA: 4/4
Thesis title: *Eye-contact behaviour modeling using Diffusion Models.*
Supervisors: *Dr. Kosta Derpanis and Prof. Niko Troje..*

2018 – 2022 **B.Sc.Computer Engineering, Iran University of Science and Technology**
Thesis title: *Sub-Claim Extraction Using Meta Learning for Fake News detection*.
Supervisor: *Dr. Sauleh Etemadi*

Selected Experience

Sep 2022 – Present **Machine Learning Researcher @ CVIL Lab** - Implemented a visualization tool using Three.js to validate the collected 3D data. Improved the accuracy of the eye tracking system by 35%. Developed a permutation-invariant diffusion model to learn interactive behavior related to eye contact from the collected data. Generated and evaluated eye contact, with 91% of expert evaluators rating it as highly similar to real data.

Sep 2024 – Nov. 2024 **Machine Learning Developer @ TD MDAL, Rotman School of Management.** - Developed LLM-powered tools with LangChain to analyze corporate diversity disclosures. Employed RAG and fine-tuned large language models to improve document classification and extraction by 40%.

Jul 2020 – Mar 2022 **Machine Learning Developer @ IPM Institute For Research In Fundamental Sciences** - Improved object detection by incorporating edge detection techniques such as **Canny** and **Sobel** filters, combined with mask-based methods like **GrabCut**, achieving an 20% increase in detection accuracy. Detected specific body parts using DensePose, and mapped the corresponding garment to the detected regions. Utilized a combination of mapping algorithms and reconstruction techniques to generate **3D outputs** for virtual try-on.

May 2021 – Sep. 2024 **Machine Learning Developer @ University of Toronto** - Analyzed a Persian poetry dataset by extracting text from historical books using **Tesseract**. Developed an **NLP pipeline** to preprocess and analyze the data, applying **BERT** for semantic understanding and **LDA** for topic modeling, achieving 85% similarity between the results of traditional NLP methods and the BERT model.

Sep 2019 – present **Teaching Assistant @ York University & IUST** - TA support (e.g., instructing labs, designing and grading assignments and exams) for different courses.

Nov 2021 – Jul 2022 **Research Assistant @ IUST** - Improved persian fake news detection accuracy 13% by extracting sub-claims, applied meta-learning to T5 and GPT-NEO, and developed an innovative sub-claim extraction method.

Selected Experience (continued)

Jul 2020 - Sep 2020 — **ASR Gooyesh Pardaz Company** - Developed a website using Django to collect a Persian QA dataset. Collaborated with a team using Scrum methodologies, improving delivery speed and team efficiency through daily stand-ups and sprint reviews.

Projects

1. **Unity-Based Eye Contact Visualizer**

Developed a visualizer in Unity to load and display eye contact data generated by diffusion models. Integrated the system with Ready Player Me avatars, enabling dynamic, realistic animations for simulating virtual meeting environments.

2. **Reflection Shader with GLSL**

Developed a 3D reflection shader using WebGL, GLSL, and cube mapping to simulate dynamic environment reflections. (Personal Project)

3. **Mean Shift for Self-Supervised Learning**

Reproduced Mean Shift for Self-Supervised Learning, a paper on unsupervised image clustering with deep neural networks. (Course Project)

4. **Geometric Segmentation of 3D Point Clouds**

Segmented a 3D model of a room. Built Python pipelines for boundary thresholding, k-NN graph construction, and spectral clustering with edge weights based on normal vectors and boundary probabilities. Visualized results in **MeshLab**. (Personal Project)

5. **Back-End Development for Web Platforms**

Collaboratively developed back-end systems for two websites: one enabling marketing teams to manage social media and customer outreach using MTA, and another connecting board game enthusiasts and cafes through a centralized platform. (Personal Project)

Technical Skills

Programming Languages	Python, Bash, GLSL, C++, LaTeX
ML/DL Frameworks and Libraries	PyTorch, Lightning, LangChain
Cloud and Deployment Tools	AWS, Docker, REST APIs
Website Development	WebGL, Django, Django Rest Framework, JavaScript, HTML, CSS
High-Performance Computing	Slurm, HPC Cluster Management
Operating Systems	Linux, MacOS, Windows
Version Control	Git, GitHub, GitFlow
Spoken Languages	English (Fluent), Farsi (Native), Kurdish (Native)
Soft Skills	Multidisciplinary Communication, Creativity, Team Collaboration, Problem-Solving, Adaptability

Awards and Honors

2024 — CUPE 3903 Unit 1 Graduate Student Award

2024 — York University Graduate Student Travel Award

2023 — Vector Faculty Affiliate Researcher

2022 — York University Graduate Scholarship

2017 — National University Entrance Exam (Konkur), Achieved top 1% ranking among 150,000 participants in Mathematics and Physics.