



# Fatemeh Ghezloo

Ph.D. Candidate at University of Washington

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## Objective

As a **Ph.D. candidate** in **Computer Science** specializing in multimodal representation learning, computer vision, and machine learning, I am seeking a **Research Scientist/Engineer** position for **Summer 2024**. I'm passionate about developing cutting-edge computer vision and multimodal technologies, with a proven track record in vision-language processing and AI research.

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## Education

<b>University of Washington</b> Ph.D. in Computer Science and Engineering Multimodal Representation Learning, Computer Vision, Deep Learning, and Machine Learning	Sep. 2019 - 2024 (Expected)
<b>Amirkabir University of Technology</b> B.Sc. in Computer Engineering	Sep. 2014 - Oct. 2018

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## Experiences

<b>Graduate Research Assistant</b> University of Washington	September 2019 - Present Seattle, WA, USA
<ul style="list-style-type: none"><li>• Conducting research in a fast-paced, collaborative and interdisciplinary environment.</li><li>• Working on a medical-specific latent diffusion model for text-conditioned image generation, ControlNet-based modality generation, and targeted inpainting tasks.</li><li>• Developed an instruction-tuned multimodal histopathology chatbot leveraging LLaVA model.</li><li>• Curated a large multimodal instruction-following dataset including conversational, complex reasoning, abductive reasoning, and detailed description QA pairs.</li><li>• Developed QuiltNet, a state-of-the-art model utilizing CLIP for zero-shot and few-shot classification and cross-modal image-text retrieval for histopathology domain.</li><li>• Curated Quilt-1m, the largest vision-language dataset for histopathology containing more than one million image-text pairs.</li><li>• Developed a novel ROI detection pipeline by leveraging a U-Net architecture for reconstructing pathologists' attention maps.</li><li>• Performed statistical analysis and applied classic machine learning methods to investigate the correlation between pathologists' viewing behaviors and diagnostic accuracy.</li></ul>	
<b>Computer Vision and AI Research Intern</b> Zippin	June - September 2022 San Francisco, CA, USA
<ul style="list-style-type: none"><li>• Attained a 89% accuracy in automating the cart verification process of a checkout-free store platform, significantly minimizing reliance on manual requests.</li><li>• Developed a multimodal network by fusing video and image features leveraging models like MoViNets and EfficientNet.</li><li>• Improved model architecture by integrating squeeze and excitation and hard attention techniques.</li><li>• Curated a large-scale dataset from Zippin stores' database containing 5-million datapoints.</li><li>• Collaborated with cross-functional teams to develop AI and computer vision solutions.</li></ul>	

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## Skills

**Programming skills:** Python, C, C++, Java, SQL, HTML/CSS  
**Machine Learning Tools:** PyTorch, TensorFlow, OpenCV, scikit-learn, NumPy, pandas, matplotlib  
**Developer Tools:** Jupyter Notebooks, Git, Google Cloud Platform, VS Code, Azure

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## Projects

### Data Augmentation Using CycleGAN

- Trained CycleGAN, an image-to-image translation model, to augment and balance the training set of the FER2013, a facial expression recognition dataset.
- Improved the accuracy of facial expression recognition for 'disgust' and 'anger' expressions by 10% by effectively leveraging the augmented data.
- **Technologies and models used:** Python, PyTorch, TensorFlow, OpenCV, CycleGAN, CNN.

### AmbigQA: A Baseline Model for Ambiguous Question Answering

- Reimplemented and adjusted the AmbigQA model to be compatible with limited processing resources, achieving a F1 score (39.58) close to the original paper's (39.7).
- Conducted several ablation studies on hyper-parameters impact on the inference time.
- Evaluated the model's performance on an additional QA dataset.
- **Technologies and models used:** Python, PyTorch, Transformers, BERT, seq2seq, BART.

### Interactive Data Visualization webpage

- Designed and built a webpage for an interactive visualization tool to investigate how pathologists view a skin biopsy image.
- Developed a MIL model to classify skin cancer and visualize attention maps using GradCAM.
- **Technologies and models used:** Python, Python, D3.js, HTML/CSS, Multiple Instance Learning (MIL), VGG16, Grad-CAM.

### Real-Time Facial Expression Recognition

- Designed and developed a deep convolutional neural network for facial expression recognition.
- Enabled real-time face detection and facial expression recognition on computer's camera input.
- **Technologies and models used:** Python, OpenCV, TensorFlow, Convolutional Neural Network (CNN).

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## Publications

**Ghezloo F**, Chang OH, Knezevich S, Reisch LM, Shapiro LG, Elmore JG. "Robust ROI Detection in Whole Slide Images guided by Pathologists' Viewing Patterns." Submitted to Diagnostics (2023)

**Ghezloo F\***, Ikezogwo WO\*, Seyfioglu MS\*, Geva DS, Mohammed FS, Anand PK, Krishna R, Shapiro L. "Quilt-1M: One Million Image-Text Pairs for Histopathology." **NeurIPS (2023) Oral.**

Nofallah S, Wu W, Liu K, **Ghezloo F**, Elmore JG, Shapiro LG. "Automated analysis of whole slide digital skin biopsy images." Journal of Pathology Informatics (2022)

**Ghezloo F**, Wang PC, Kerr KF, Bruny  TT, Drew T, Chang OH, Reisch LM, Shapiro LG, Elmore JG. "An analysis of pathologists' viewing processes as they diagnose whole slide digital images." Journal of Pathology Informatics (2022)

Kamkar S, **Ghezloo F**, Moghaddam HA, Borji A, Lashgari R. "Multiple-target tracking in human and machine vision." PLoS computational biology (2020)

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## Teaching

<b>CSE344</b> Introduction to Data Management	2023
<b>CSE455</b> Computer Vision	2020, 2021
<b>CSE473</b> Introduction to Artificial Intelligence	2020
<b>CSEP501/CSE401</b> Compiler Construction	2019, 2020

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## Awards

Microsoft Accelerate Foundation Models Research Program	2023
NeurIPS 2023 Scholar Award	2023
University of Washington Graduate Student Conference Presentation Award	2023