Fatemeh Ghezloo

Ph.D. Candidate at University of Washington

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Education

University of Washington Sep. 2019 - 2024 (Expected)

Ph.D. in Computer Science and Engineering

Multimodal Representation Learning, Computer Vision, Deep Learning, Machine Learning, and AI

Amirkabir University of Technology Sep. 2014 - Oct. 2018

B.Sc. in Computer Engineering

Experiences

Graduate Research Assistant September 2019 - Present

University of Washington Seattle, WA, USA

- Working on a medical-specific generative AI model with latent diffusion and ControlNet as the foundations for text-conditioned image generation and inpaining tasks.
- Curated Quilt-Instruct, largest image-text instruction-following dataset for histopathology (107K QA).
- Developed Quilt-LLaVA, an instruction-tuned vision-language AI-based agent capable of complex reasoning for histopathology by training a LLaVA model using Quilt-Instruct.
- Curated Quilt-1M, the largest vision-language dataset for histopathology containing more than one million image-text pairs from YouTube videos.
- 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.
- Developed a novel region of interest (ROI) detection pipeline by leveraging a U-Net neural network architecture to assist pathologists in their diagnosis.
- Performed statistical analysis and applied classical machine learning methods to investigate the correlation between pathologists' viewing behaviors and diagnoses accuracy.

Computer Vision and AI Research Intern June - September 2022

Zippin San Francisco, CA, USA

- Attained 89% accuracy in automating the cart verification process of a checkout-free store platform serving millions of shoppers, significantly minimizing reliance on manual audits.
- Developed a multimodal deep learning model by fusing video and image features from MoViNets and EfficientNet models.
- Improved model architecture by integrating squeeze and excitation and Gaussian hard attention maps.
- Curated a large-scale video dataset from Zippin stores' cameras containing 5M datapoints.

Skills

Programming skills: Python, C, C++, Java, MATLAB, 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
AI/CV Methods: Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), Transformers and Attention Mechanism, Latent Diffusion, GAN, Autoencoders (AEs and VAEs), Large Language Models (LLMs), Large Multimodal Models (LMMs), Vision-Language Models (VLMs), Multiple Instance Learning (MIL).

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.

AmbigQA: A Baseline Model for Ambiguous Question Answering
- Reimplemented and adjusted the AmbigQA model to be compatible with limited processing resources, achieving an 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.

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 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.

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 D, Mohammed F, Anand P, Krishna R, Shapiro L. "Quilt-1M: One Million Image-Text Pairs for Histopathology." **NeurIPS (2023) Oral. (2.15% oral acceptance rate)**

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, Brunyé 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)

Teaching

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

Awards

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