Assefa Wahd

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Introduction

I am a 2nd year Ph.D. student in Radiology and Diagnostic Imaging at the University of Alberta, specializing in medical image analysis. My research focuses on developing advanced deep learning models for segmentation, detection, and classification to improve diagnostic accuracy. With a strong foundation in machine learning and computer vision from my Ph.D. and master's degree, I have experience with semantic and instance segmentation, object detection, and out-of-distribution (anomaly) detection using state-of-the-art techniques such as CNNs and transformers.

I bring a strong technical background and a genuine enthusiasm for pushing the boundaries of AI. I am passionate about leveraging artificial intelligence to solve complex problems in healthcare and contribute to advancements in medical imaging.

Research interest

- Medical image processing
- Computer vision
- Reinforcement learning

Education

University of Alberta *PhD in Radiology and Diagnostic Imaging* — *Sept 2023 – present*
- GPA: 3.7/4.0

University of Science and Technology (UST), South Korea *MEng in Computer Software* — *Sept 2021 – Aug 2023*
- GPA: 4.15/4.5

University of Elec. Science and Tech. of China (UESTC), China *BEng in Electronic Information Engineering* — *Sept 2017 – July 2021*
- GPA: 4.0/4.0

Honors and Awards

Faculty of Medicine & Dentistry 75th Anniversary Award — *Jan 2024 - Dec 2024*
University of Alberta

Faculty of Medicine & Dentistry Delnor Scholarship — *Jan 2024 - Dec 2024*
University of Alberta

Graduation Research Assistantship — *Sep 2023 - Jun 2027*
University of Alberta

Graduate Student Scholarship — *Sep 2021 - Aug 2023*
Korea National University of Science and Technology (UST)

Academic Achievement Award — *2019 - 2020*
University of Science and Technology of China (UESTC)

Academic Achievement Award — *2018 - 2019*
University of Science and Technology of China (UESTC)

Academic Achievement Award — *2017 - 2018*
University of Science and Technology of China (UESTC)

Outstanding Academic Achievement Award — *2016*
Ethiopian Chinese Chamber of Commerce

Experience

Graduate Research Assistant — *Edmonton, Alberta*
University of Alberta — *Sep 2023 – present*
Student Researcher — *Daejeon, South Korea*
Electronics and Telecommunications Research Institute (ETRI) — *Sep 2021 – Aug 2023*

Project Title: *Development of Grasp Manipulation Technology for Flexible Cable Wiring.*

- Implemented several bottom-up approaches for instance segmentation of overlapping industrial wires (metric learning-, affinity-, reinforcement learning-, and RNN-based techniques).
- Developed a new data augmentation technique that exponentially increases the number of ground truth segmentations.
- Experience working with limited data; Semi-Supervised Learning (SSL), Weakly Supervised Object Localization (WSOL), Semantic (WSSS) and Instance Segmentation (WSIS).

Project Title: *Open-World Object Detection.*

- The goal of the project is to predict bounding boxes both known and unknown objects in images. Most object detection models treat objects with no groundtruth as background, however, in real-world we need to know both known and unknown objects (open world).
- I implemented several region proposal networks for open-world object detection (OLN RPN, MVIT RPN, SAM RPN).
- (*Ongoing project*) Unknown object detection using YOLO v5/v8 with SAM proposals.
- (*Ongoing project*) Unknown object detection using Detection Transformer (DETR) with SAM Proposals.

Project Title: *Instance Segmentation of Cables using Actor-Critic Methods.*

- Proposed a novel way that models instance segmentation as a multimodal image-to-image translation (I2I) and a reinforcement learning problem in a continuous action space.
- Developed a working instance segmentation model using BicycleGAN, and actor-critic methods.

Master's Thesis: *On the effectiveness of synthetic data for out-of-distribution detection.*

- Use generative models (StyleGAN2, Diffusion Models, Energy-Based Models) to generate synthetic OOD data
- Evaluate several classification models for out-of-distribution detection
- The models considered include WideResNet, DenseNet, MLP-mixer, ViT-B/16, ViT-L/16.

Publications

A Hybrid of Foundation Model and U-Net for Improved Image Segmentation and Out-of-Distribution Generalization — Sep 2024

Assefa Wahd, Banafshe Felfeliyan, Jacob L. Jaremko , Abhilash Hareendranathan
Submitted to "*(ISBI 2025) 2025 IEEE International Symposium on Biomedical Imaging*".

Sam2Rad: A Segmentation Model for Medical Images with Learnable Prompts — Aug 2024

Assefa Wahd, Banafshe Felfeliyan, Yuyue Zhou,Shrimanti Ghosh,Adam McArthur,jiechen zhang, Jacob L. Jaremko , Abhilash Hareendranathan
Submitted to the Journal of "*Computers in Biology and Medicine*".
arxiv.org/abs/2409.06821

Shoulder Rotator Cuff Tear Detection from Ultrasound Videos using Deep Reinforcement Learning — Sep 2024

Shrimanti Ghosh, Geetika Vadali, Ayush Singh, Banafshe Felfeliyan, Yuyue Zhou, ***Assefa Wahd***, Jessica Knight, Mahesh R. Panicker, Jacob L. Jaremko, Jacob L. Jaremko, Abhilash Hareendranathan
Submitted to "*(ISBI 2025) 2025 IEEE International Symposium on Biomedical Imaging*".

Deep metric learning-based Out-of-Distribution Detection with Synthetic Outlier Exposure Aug 2024

Assefa Wahd
arxiv.org/abs/2405.00631

Semantic AutoSAM: Self-Prompting Segment Anything Model for Semantic Segmentation of Medical Images Dec 2023

Assefa Wahd, Jessica Küpper, Jacob L. Jaremko, Abhilash R. Hareendranathan
Accepted to "*The IEEE Engineering in Medicine and Biology Society (EMBC 2024)*".

Cable Instance Segmentation with Synthetic Data Generation Jan 2023

Assefa Wahd, Donghyung Kim, Seung-Ik Lee
Accepted to "The 21st International Conference on Control, Automation and Systems (ICCAS 2022) (Bexco, Pusan, Korea)".
doi: 10.23919/ICCAS55662.2022.10003680

Low-Likelihood EBM Samples for Out-of-Distribution Detection Feb 2023

Assefa Wahd, Marcella Astrid, Seung-Ik Lee
Accepted to "The 35th Workshop on Image Processing and Image Understanding (IPIU 2023) (Jeju, Korea)".
GDrive

Joint Classification and Normalizing Flow Model for Out-of-Distribution Detection Jan 2023

Assefa Wahd, Donghyung Kim, Seung-Ik Lee
Accepted to "The electronics and information engineers (IEIE 2023) (Jeju, Korea)".
DBpia

Leveraging Class-agnostic Object Proposals for Out-of-Distribution Object Detection June 2023

Assefa Wahd, Minsu Jang, Seung-Ik Lee
Accepted to "Learning by Asking for Intelligent Robots and Agents.".

Skills

Programming Languages: Python, C, Bash, HTML, CSS

Machine Learning: PyTorch, Scikit-learn, OpenCV

Technologies: Git, Linux, LaTeX

Languages: English (IELTS: 8.0), Chinese, Tigrinya, Amharic