

WORKTYPE

AI/ML

Multi-modal Learning

Medical Imaging

PORTFOLIO

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EDUCATION

2024.03 - Present **POSTECH**

GPA 3.93/4.30

2019.03 - 2024.02 **Inha University**

GPA 4.22/4.50

2022.09 - 2023.02 **University of Hull, England**

RESEARCH INTEREST

- Multi-modal Learning
- Computer Vision
- Medical Imaging
- Large Language Model

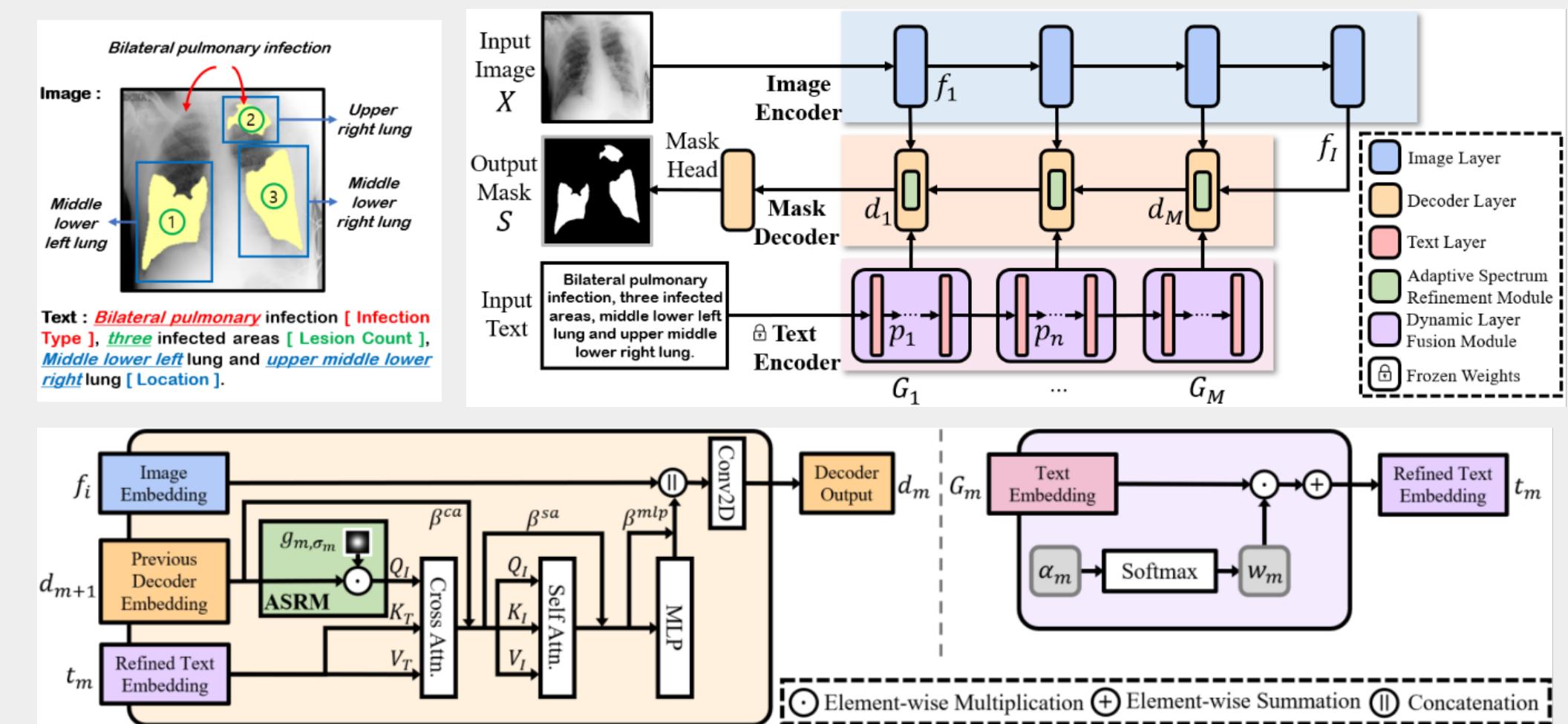
Publication

HiMix : Hierarchical Visual-Textual Mixing for Segmentation (WACV 2026)

Soojin Hwang*, Jaeyoon Sim, Won Hwa Kim

• Overview

- Lesion segmentation aids in diagnosing diseases but is limited by the cost and availability of annotated medical datasets.
- Recent methods using clinical texts to guide segmentation are limited by reliance on single text embedding, which don't fully utilize linguistic details.



• Key contributions

- Hierarchical Fusion: HiMix integrates high-level semantics from text with fine-grained visual features throughout the process.
- Dynamic Layer Fusion (DLFM): Dynamically aligns text features with corresponding decoder stages.
- Adaptive Spectrum Refinement (ASRM): Enhances global and local visual features by adjusting feature resolution at each decoding stage.

Publication

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- Results

- Superior Performance: Outperforms both uni-modal (image-only) and multi-modal baselines, including SOTA models.
- Few Parameters: Performs well with only 44.7M parameters, fewer than SOTA.

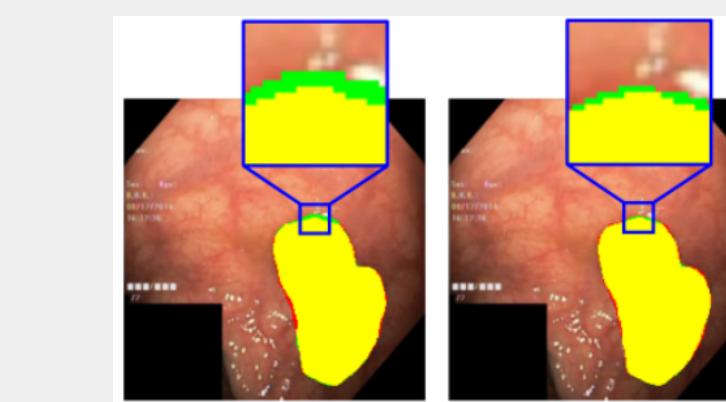
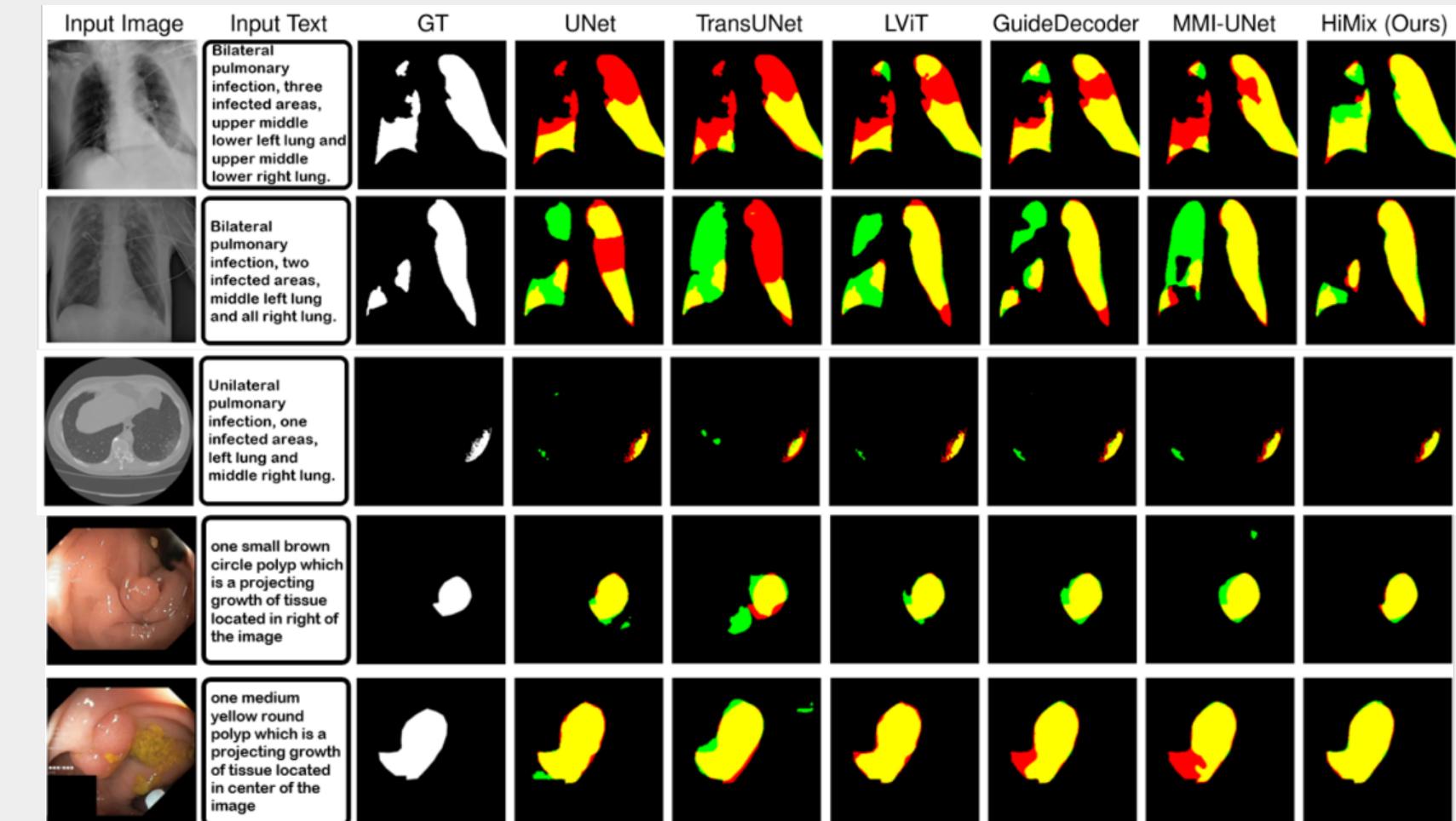
- Key Findings

- Hierarchical Alignment: Aligning hierarchical text features with visual decoding stages provides more accurate and contextually grounded segmentation.
- Generalization: The model generalizes well to unstructured text formats, showing robustness in real-world clinical applications.

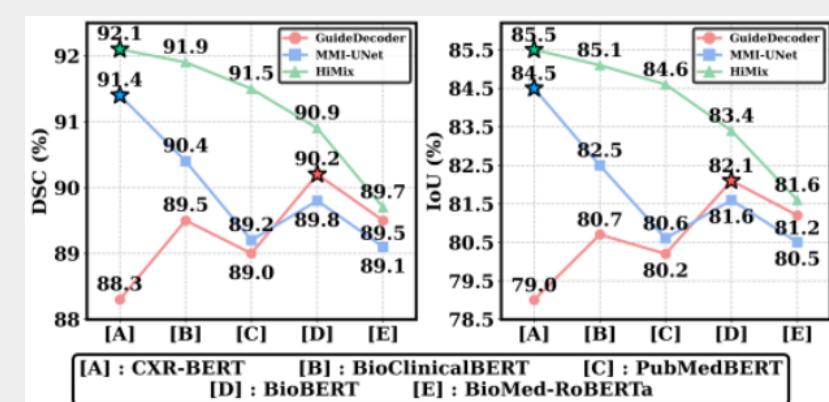
- Conclusion

- HiMix shows that hierarchical fusion of text and image modalities leads to fine-grained and context-aware lesion segmentation, across diverse datasets and text formats.

"Outstanding Award at the 39th KSIIM Annual Conference"



Results without ASRM (left) and with ADRM (right)



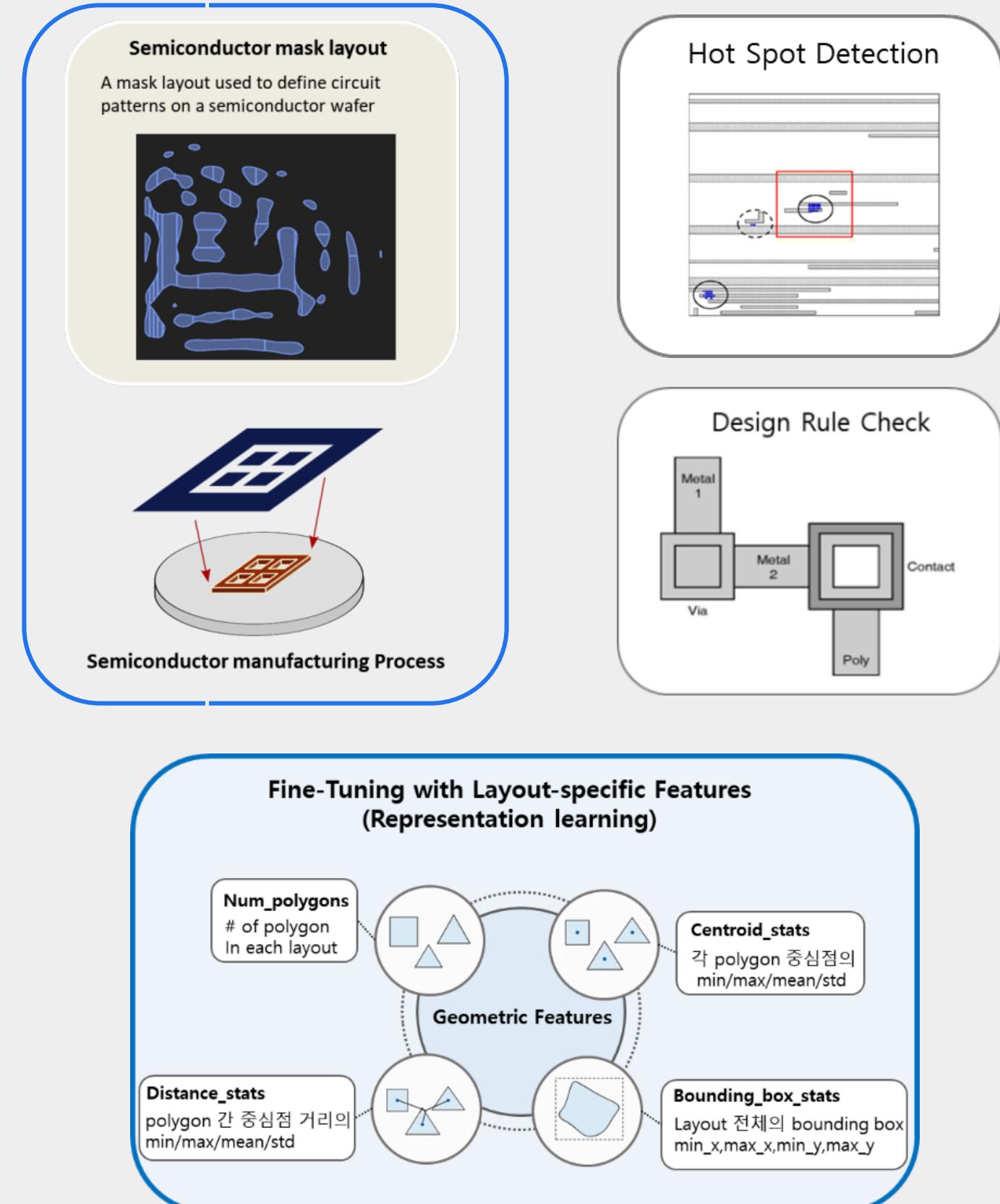
Variation of Text Encoder

Project

Semiconductor unified task

Joint Research with Samsung DS AI center (2025.04 - Present)

- Goal
 - Develop a unified model for various semiconductor layout (GDSII) design tasks (e.g., hotspot detection, design rule check, optical proximity correction)
- Key Contributions
 - Representation Strategies for Polygon-based Layout Data
 - Developed methods to capture the relationships between polygons within GDS layouts and the interactions between points within each polygon.
 - Metric Learning for Boosting Geometric Reasoning
 - Integrated geometric metrics to evaluate the model's spatial reasoning, providing objective criteria for understanding layout geometry beyond hotspot detection.
- Impact
 - Developed pytorch pipeline for Large-Scale Training (GPU A6000, A100, H100)
 - Advancement in lithography foundation models integrating text + layout reasoning



Publication

GTAD : Transformer-Guided Adaptive Diffusion for Multi-Modal Brain Networks (under review)

Jaeyoon Sim*, Soojin Hwang*, Guorong Wu, Won Hwa Kim

- Overview

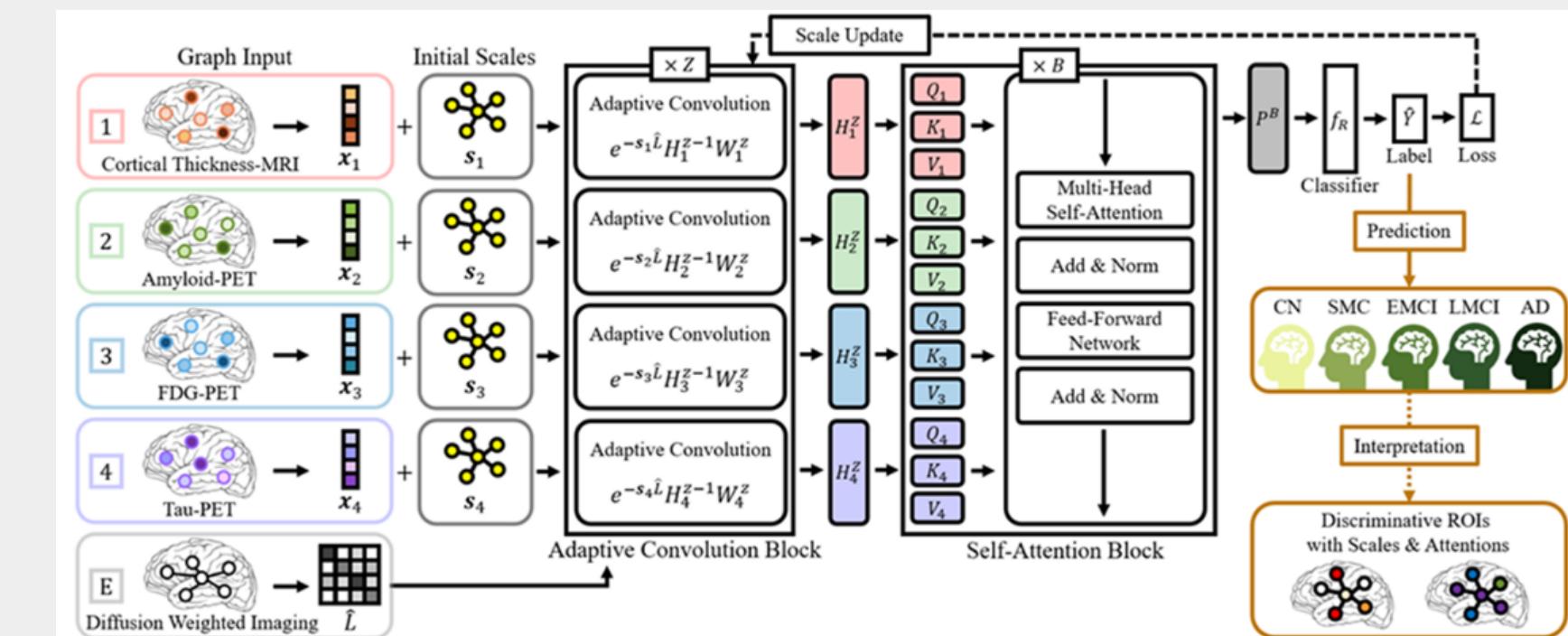
- GTAD is a multi-modal graph neural network for Alzheimer's Disease (AD) classification, integrating multiple neuroimaging modalities (e.g., MRI, PET).
- It uses a transformer-guided diffusion process to capture both local and global dependencies in brain networks.

- Key Contributions

- Graph Diffusion: Aggregates local features using heat kernels.
- Transformer Guidance: Uses multi-head self-attention to capture long-range dependencies.
- Modality-Specific Analysis: Improves interpretability by processing each modality separately.

- Results

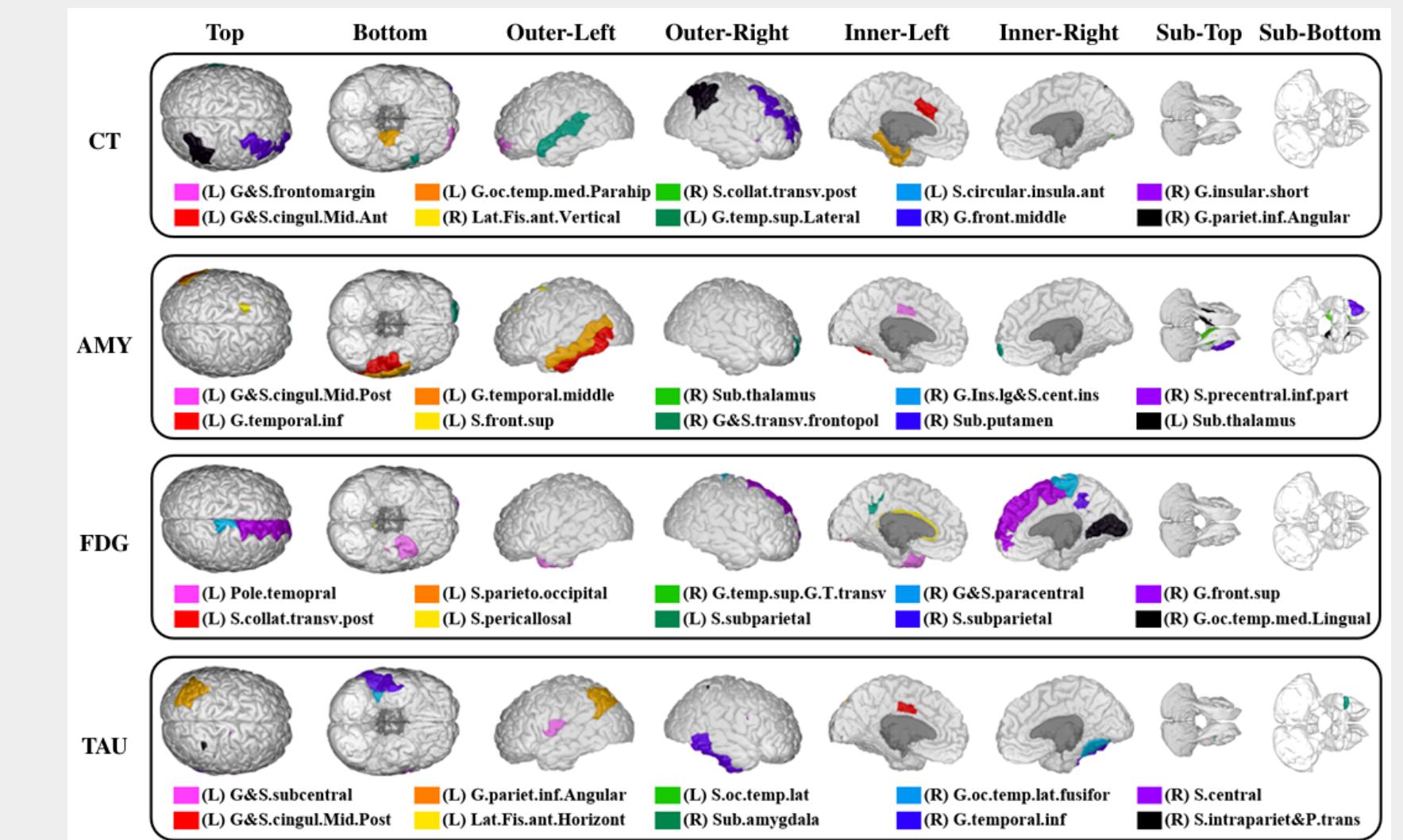
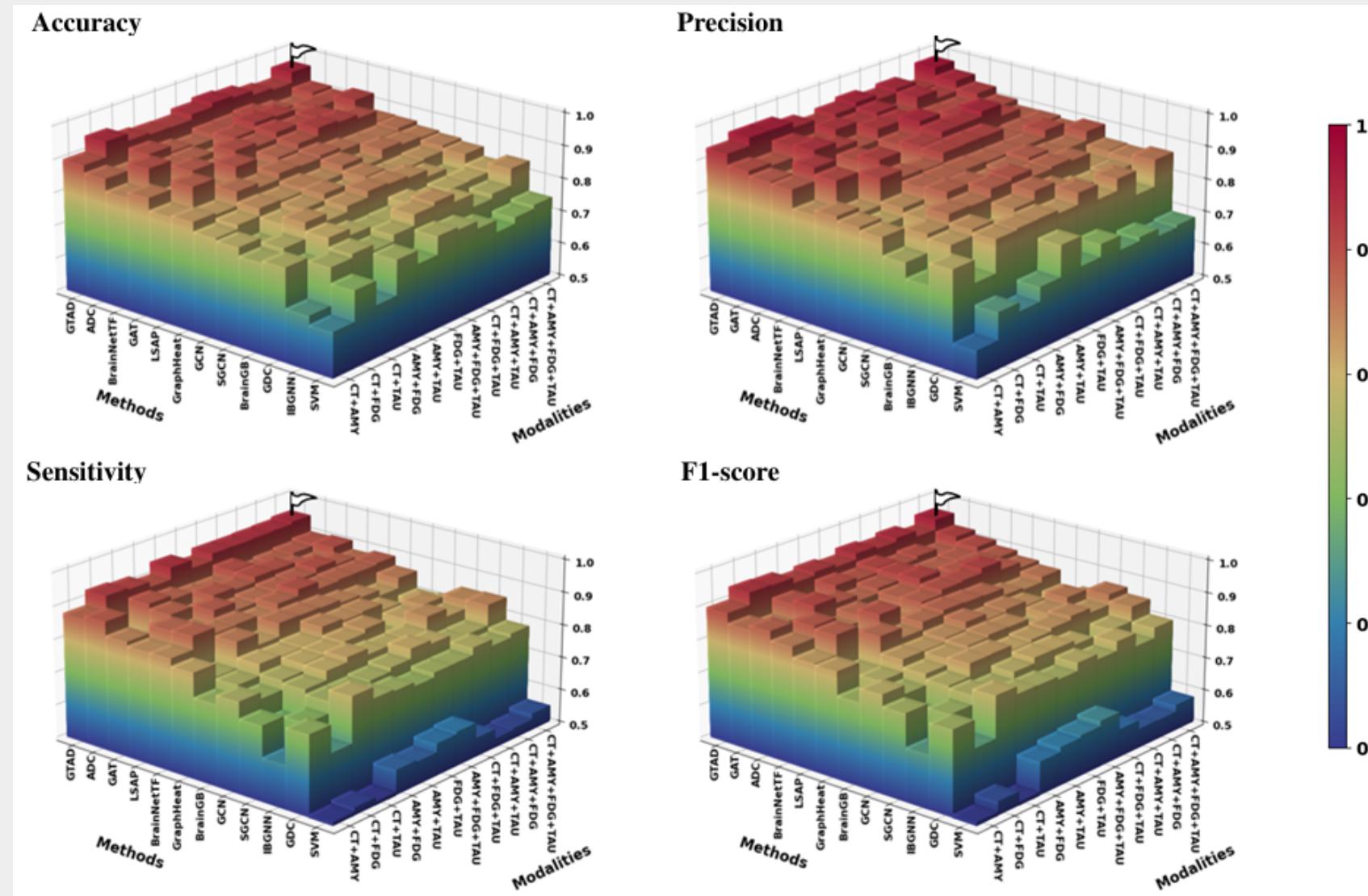
- GTAD outperforms SOTA models in AD classification, identifying key ROIs linked to AD progression across modalities.
- It offers an interpretable framework, leveraging multi-modal data and adaptive learning for improved diagnosis and interpretation of Alzheimer's Disease.



Publication

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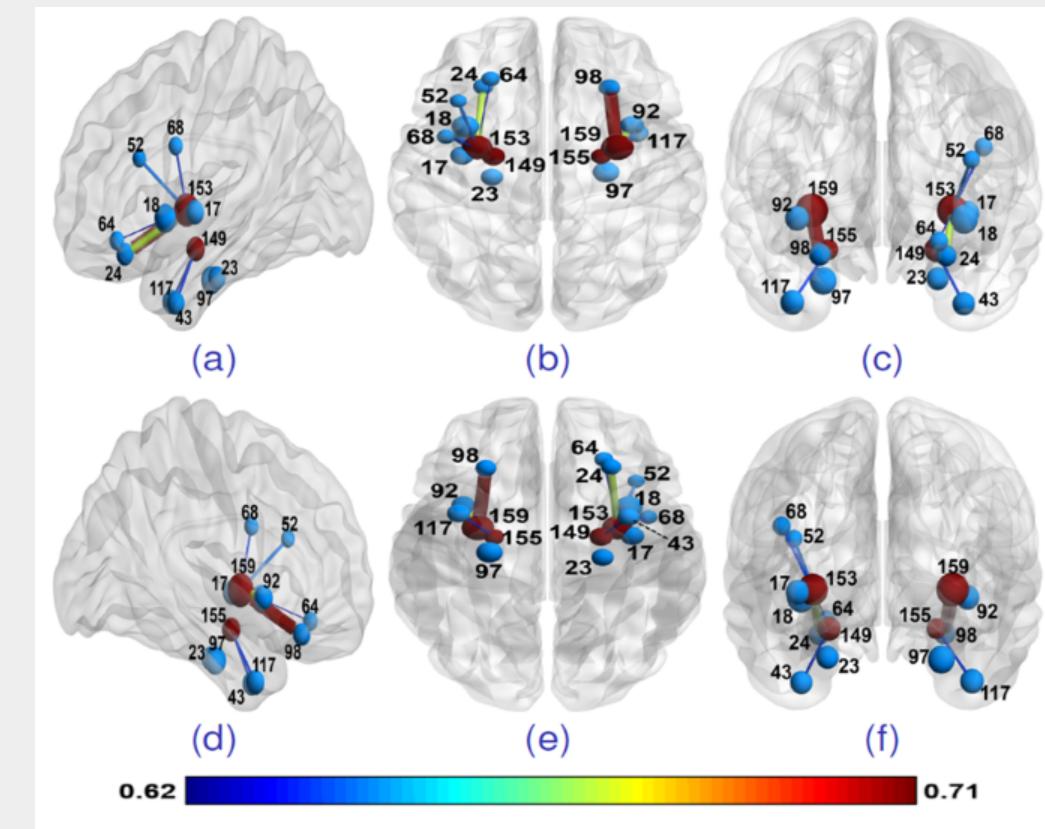
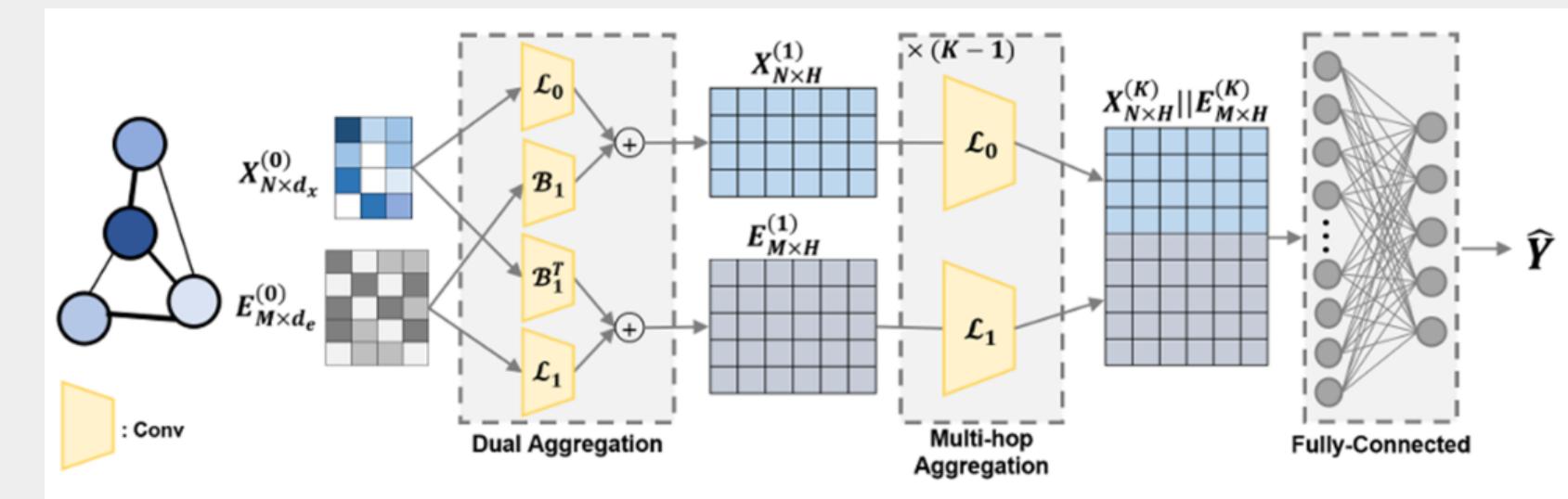


Publication

Multi-order Simplex-based GNN for Brain Networks (MICCAI 2024)

Yechan Hwang, Soojin Hwang, Guorong Wu, Won Hwa Kim

- Overview
 - The paper introduces a Multi-order Simplex-based Graph Neural Network for brain network analysis, incorporating both node and edge features via a dual aggregation framework using an incidence matrix.
 - Key Contributions
 - Dual Aggregation: Simultaneous aggregation of node and edge features.
 - Separate Node/Edge Representation: Direct learning of node and edge embeddings.
 - Interpretability: Uses Grad-CAM to identify key ROIs and connectivities linked to Alzheimer's disease.
 - Results
 - Outperforms SOTA models on the ADNI dataset with improved classification performance and interpretability.

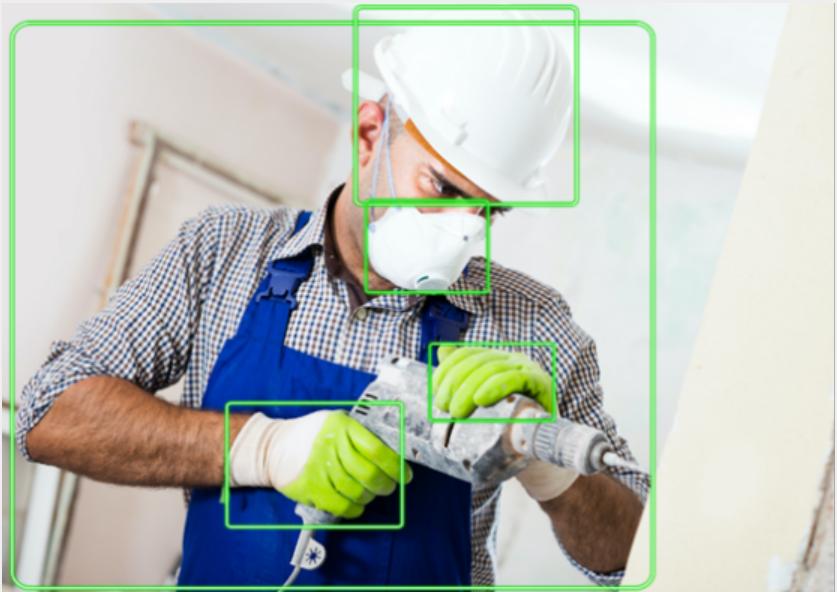


Project

KIST Internship : AWS-based Video Analysis

(2021.12 - 2022.02)

- Overview
 - Built an end-to-end AI pipeline on AWS
 - Amazon Rekognition, S3, Kinesis Video Stream, SNS/SQS
 - Integrated Gstreamer + Ubuntu for real-time webcam streaming
 - Utilized double3 for automated object detection and real-time video streaming
- Key Contributions
 - Automated PPE(Personal Protective Equipment) detection and face recognition using Rekognition APIs
 - Designed custom label models for domain-specific object detection
 - Integrated real-time video feeds from double3 robot for continuous surveillance and monitoring
- Impact
 - Hands-on experience in cloud-based AI service development
 - Practical understanding of real-time multimodal pipeline



Thank you for your time



AI Researcher Porfolio
by Soojin Hwang

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