Bryan Wong

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Research Interests

Computer Vision, Computational Pathology, Multimodal AI, Agentic AI

Research Statement

My current research focuses on **multimodal AI for gigapixel medical images**, advancing how **vision–language models (VLMs) and multimodal LLMs** understand large, complex visual data. Through **HiVE-MIL (NeurIPS 2025)**, vision–language foundation models are integrated within a multiple instance learning framework to explicitly model interactions across different magnifications, enabling more structured multi-scale understanding. However, such pipelines remain inherently static, motivating a shift toward **agent-based multimodal AI** that can dynamically navigate, explore, and reason across vast visual spaces in a more flexible and intelligent manner.

Education

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, South Korea
Ph.D., Data Science (GPA: 4.02 / 4.3) [Transcript] — *Aug. 2023 – Aug 2027 (expected)*

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, South Korea
M.S., Data Science (GPA: 3.98 / 4.3) [Transcript] [Diploma] — *Aug. 2021 – Aug. 2023*

National Taiwan University of Science and Technology (NTUST) — Taipei, Taiwan
B.S., Computer Science (GPA: 3.87 / 4.3) [Transcript] [Diploma] — *Sep. 2018 – June 2021*

Publications

International Conference Publications

C08 Few-Shot Learning from Gigapixel Images via Hierarchical Vision-Language Alignment and Modeling [PDF] [Code] [OpenReview, Poster, Slide & Video]

Bryan Wong*, Jongwoo Kim*, Huazhu Fu, and Mun Yong Yi

The Thirty-Ninth Annual Conference on Neural Information Processing Systems **(NeurIPS)**, 2025.

*(Acceptance rate: 5,290 / 21,575 = **24.52%**)*

TL;DR: We introduce HiVE-MIL, a hierarchical vision–language MIL framework for gigapixel WSIs that models cross- and intra-scale vision–language interactions, enabling efficient WSI classification and interpretable predictions.

C07 Not All Options Are Created Equal: Textual Option Weighting for Token-Efficient LLM-Based Knowledge Tracing [PDF] [Code] [Poster]

Jongwoo Kim*, SeongYeub Chu*, **Bryan Wong**, and Mun Yong Yi

Conference on Empirical Methods in Natural Language Processing **(EMNLP Findings)**, 2025.

*(Acceptance rate: 1,812 / 8,174 = **22.16%** for Main; 1,420 / 8,174 = **17.35%** for Findings)*

TL;DR: We present LOKT, an LLM-based knowledge tracing framework that converts learner option selections into textual weights, enabling token-efficient and interpretable prediction of student performance.

C06 Leveraging Multi-Facet Paths for Heterogeneous Graph Representation Learning [PDF] [Code]

Jongwoo Kim, SeongYeub Chu, Hyeongmin Park, **Bryan Wong**, Keejun Han, and Mun Yong Yi

34th ACM International Conference on Information and Knowledge Management **(CIKM)**, 2025.

*(Acceptance rate: 443 / 1,627 = **27%**)*

TL;DR: We introduce MF2Vec, a heterogeneous-graph representation framework that leverages dynamic, fine-grained multi-facet paths instead of rigid meta-paths to learn robust node embeddings.

C05 MicroMIL: Graph-based Contextual Multiple Instance Learning for Patient Diagnosis Using Microscopy Images [PDF] [Code] [Poster]

Jongwoo Kim*, **Bryan Wong***, Huazhu Fu, Willmer Rafell Quiñones Robles, Young Sin Ko, and Mun Yong Yi

28th International Conference on Medical Image Computing and Computer Assisted Intervention **(MICCAI)**, 2025.
*(Acceptance rate: 1,014 / 3,447 = **29%**)*

TL;DR: We propose MicroMIL, a graph-based multiple instance learning framework that dynamically reduces redundancy and models contextual relationships in microscopy images for robust weakly supervised diagnosis.

C04 Rationale Behind Essay Scores: Enhancing S-LLM's Multi-Trait Essay Scoring with Rationale Generated by LLMs [PDF] [Code] [Poster]

SeongYeub Chu*, Jongwoo Kim*, **Bryan Wong**, and Mun Yong Yi

Annual Conference of the North American Chapter of the Association for Computational Linguistics **(NAACL Findings)**, 2025.

TL;DR: We introduce RMTS, a multi-trait essay scoring framework that integrates LLM-generated trait-specific rationales with a fine-tuned S-LLM to improve scoring accuracy and interpretability.

C03 Rethinking Pre-Trained Feature Extractor Selection in Multiple Instance Learning for Whole Slide Image Classification [PDF] [Code] [Poster]

Bryan Wong, Sungrae Hong, and Mun Yong Yi

IEEE International Symposium on Biomedical Imaging **(ISBI)**, 2025.

TL;DR: We evaluate how the choice of pre-trained feature extractor, considering dataset size and diversity, backbone architecture, and pre-training method, affects MIL performance on gigapixel pathology images (WSIs).

C02 Towards Classifying Histopathological Microscope Images as Time Series Data [PDF] [Poster]

Sungrae Hong, Hyeong Min Park, Youngsin Ko, Sol Lee, **Bryan Wong**, and Mun Yong Yi

IEEE International Symposium on Biomedical Imaging **(ISBI)**, 2025.

TL;DR: We recast microscope images from pathology as time-series sequences, using dynamic time-warping and attention-based pooling to stabilize classification despite varying acquisition lengths.

C01 Analyzing Gender Pay Gap in STEM Fields by Life Trajectory [PDF] [Poster]

Wenchao Dong, **Bryan Wong**, Hasnain Irshad Bhatti, Lanu Kim, and Meeyoung Cha

8th International Conference on Computational Social Science **(IC2S2)** and *Korea Computer Congress* **(KCC)**, 2022.

TL;DR: We analyze gender pay disparities in STEM through life trajectory modeling, highlighting career dynamics contributing to the pay gap.

International Journal Publications

J01 A Predicted-Loss Based Active Learning Approach for Robust Cancer Pathology Image Analysis in the Workplace [PDF]

Mujin Kim, Willmer Rafell Quiñones Robles, Youngsin Ko, **Bryan Wong**, Sol Lee, and Mun Yong Yi

BMC Medical Imaging, 2024.

TL;DR: We introduce a predicted-loss based active learning method that dynamically filters out noisy patches and selects informative ones, enabling robust high-accuracy pathology image classification.

Preprints

P02 Leveraging Spatial Context for Positive Pair Sampling in Histopathology Image Representation Learning [PDF]

Willmer Rafell Quiñones Robles, Sakonporn Noree, Youngsin Ko, **Bryan Wong**, Jongwoo Kim, and Mun Yong Yi

Preprint, 2025.

TL;DR: We propose a spatial context–driven sampling strategy for self-supervised learning (SSL) in pathology that leverages coherence among spatially adjacent patches in gigapixel pathology images (WSIs).

P01 PreMix: Label-Efficient Multiple Instance Learning via Non-Contrastive Pre-Training and Feature Mixing [PDF] [Code]

Bryan Wong and Mun Yong Yi

Preprint, 2024.

TL;DR: We propose PreMix, a label-efficient multiple instance learning framework that uses non-contrastive pre-training and feature mixing to improve WSI classification with limited labels.

Academic Services

- **Reviewer:** MICCAI 2025
- **Student Volunteer:** MICCAI 2025 [Photo]

Summer School

- **Oxford Machine Learning (OxML 2024)** [Certificate] : Selected participant in the OxML 2024 program, focusing on MLx Health & Bio, MLx Representation Learning, and Generative AI tracks.

Work Experience

Data Engineer Intern [Certificate] Oct 2020 – Aug 2021

Commerce Connector by PriceSpider *Taipei, Taiwan*

- Designed and implemented web crawling pipelines to collect pricing data for Buy Now Online (single store) and Buy Now In Stores (multi-store price comparison).
- Migrated ParseHub to an enterprise-scale crawling environment, optimizing efficiency and scalability.
- Integrated PriceSpider crawler by configuring API-based subscriptions, setting up an EC2 receiver, processing raw data through AWS Lambda, and storing structured feeds in Amazon S3.
- Led the Data Engineering team, conducting monthly strategy meetings to enhance data collection and processing workflows.

Back End Engineer Intern [Certificate] July 2020 – Sep 2020

Aurora Tech *Taipei, Taiwan*

- Designed and implemented RESTful APIs using IRIS (Go Web Framework) to facilitate seamless communication between services.
- Integrated multiple game providers, enabling functionalities such as user authentication, balance retrieval, deposit/withdrawal processing, and game result settlement (both settled and unsettled).
- Refactored and optimized game provider code, improving system efficiency, maintainability, and scalability.

Scholarships & Awards

- **Daewoong Foundation Global Scholarship Program (2025.11–2026.02)** [Certificate]: A scholarship awarded by the Daewoong Foundation to support outstanding international students enrolled at universities in Korea.
- **KAIST International Graduate Scholarship (2021–2027)** [Certificate]: Fully-funded Master's and Ph.D. scholarship covering tuition, living expenses, and national health insurance.
- **ICATI Jakarta Scholarship Award (2021)**[Certificate]: Awarded by the Indonesian Taiwan Alumni Association (ICATI) for outstanding performance in the 2020 academic year.
- **Minister's Award for Overseas Community Affairs (2020)**[Certificate]: Awarded by the Overseas Community Affairs Council, Republic of China (Taiwan), for outstanding academic performance and dedication.

Social Service

- **Member of Project Let's Go (2020)** [Photos]: Taught English and STEAM subjects at Chishang Junior High School through hands-on experiments and coding sessions.

References

Prof. Mun Yong Yi *Daejeon, South Korea*

Ph.D. Advisor (KAIST) *2023.08–*

- E-mail: munyi@kaist.ac.kr
- Website

Dr. Huazhu Fu *Singapore, Singapore*

Mentor & Research Collaborator (IHPC, A*STAR) *2024.09–*

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- Website