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** reason over large and complex visual data. The first study, **HiVE-MIL (NeurIPS 2025)** [**C08**], integrates VLMs into a multiple instance learning framework to explicitly model interactions across different magnifications, enabling hierarchical and multimodal understanding of gigapixel images. The second study moves beyond cancer diagnosis and static, black-box pipelines, focusing on **multimodal agentic reasoning** that dynamically explores informative regions of gigapixel images in a clinician-like 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

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.

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.

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.

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.

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.

Academic Services

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

Scholarships & Awards

- **Outstanding Award (Best Runner-up), GSDS, KAIST (2026.01)**: Selected as a top-performing doctoral student at the Graduate School of Data Science (GSDS), KAIST, based on the 2025 Annual Research Performance Evaluation.
- **Daewoong Foundation Global Scholarship Program (2025.11–2026.02)** [Certificate]: A scholarship awarded by the Daewoong Foundation to support outstanding international students enrolled in universities in Korea.
- **KAIST International Graduate Scholarship (2021.08–2027.08)** [Certificate]: Fully funded Master's and Ph.D. scholarship covering tuition fees and living expenses.
- **ICATI Jakarta Scholarship Award (2021.02)** [Certificate]: Awarded by the Indonesian Taiwan Alumni Association (ICATI) for outstanding performance in the 2020 academic year.
- **Minister's Award, Republic of China (Taiwan) (2020.12)** [Certificate]: Awarded by the Overseas Community Affairs Council, Republic of China (Taiwan) for outstanding academic performance and dedication.

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.

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–*
- E-mail 1: hzfu@ieee.org
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- Website