

# Bryan Wong

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## RESEARCH INTERESTS

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Computer Vision, Computational Pathology, Multimodal AI, Agentic AI

## RESEARCH STATEMENT

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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

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<b>Korea Advanced Institute of Science and Technology (KAIST)</b> <i>Ph.D., Data Science (GPA: 4.02 / 4.3) [Transcript]</i>	Daejeon, South Korea <i>Aug. 2023 – Aug 2027 (expected)</i>
<b>Korea Advanced Institute of Science and Technology (KAIST)</b> <i>M.S., Data Science (GPA: 3.98 / 4.3) [Transcript] [Diploma]</i>	Daejeon, South Korea <i>Aug. 2021 – Aug. 2023</i>
<b>National Taiwan University of Science and Technology (NTUST)</b> <i>B.S., Computer Science (GPA: 3.87 / 4.3) [Transcript] [Diploma]</i>	Taipei, Taiwan <i>Sep. 2018 – June 2021</i>

## PUBLICATIONS

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### 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

*34<sup>th</sup> 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

28<sup>th</sup> 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

8<sup>th</sup> 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.

## WORK EXPERIENCE

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### 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

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- **Reviewer:** MICCAI 2025
- **Student Volunteer:** MICCAI 2025 [\[Photo\]](#)

## SCHOLARSHIPS & AWARDS

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- **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 (2021.8–2027.8) [\[Certificate\]](#):** 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 for Overseas Community Affairs (2020.12)[\[Certificate\]](#):** Awarded by the Overseas Community Affairs Council, Republic of China (Taiwan), for outstanding academic performance and dedication.

## SUMMER SCHOOL

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- **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

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- **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

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**Prof. Mun Yong Yi**

Ph.D. Advisor (KAIST)

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- [Website](#)

*Daejeon, South Korea*  
*2023.08–*

**Dr. Huazhu Fu**

Mentor & Research Collaborator (IHPC, A\*STAR)

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*Singapore, Singapore*  
*2024.09–*