

# Bryan Wong

✉ [bryan.wong@kaist.ac.kr](mailto:bryan.wong@kaist.ac.kr) | 🌐 [bryanwong17.github.io](https://bryanwong17.github.io) | 🔗 [linkedin.com/in/bryanwongg](https://linkedin.com/in/bryanwongg)

## 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** 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

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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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- 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.

**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

*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.

## PREPRINTS

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**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]  
*Commerce Connector by PriceSpider*

Oct 2020 – Aug 2021  
*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)

*Daejeon, South Korea*

*2023.08–*

- E-mail: [munyi@kaist.ac.kr](mailto:munyi@kaist.ac.kr)
- [Website](#)

### Dr. Huazhu Fu

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

*Singapore, Singapore*

*2024.09–*

- E-mail 1: [hzfu@ieee.org](mailto:hzfu@ieee.org)
- E-mail 2: [fu\\_huazhu@a-star.edu.sg](mailto:fu_huazhu@a-star.edu.sg)
- [Website](#)