Chaeeun Ryu

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EDUCATION

Columbia University — **New York, USA**
Computer Science Master of Science — **Aug. 2024 – Dec. 2025**
- Track: Machine Learning

Sungkyunkwan University — **Seoul, KR**
B.S. Computer Education; Convergence, Data Science — **2018 – 2024**
- Area of Study: Artificial Intelligence, Deep Learning, Machine Learning, Data Science, Computer Engineering, Education

Gwacheon Foreign Language High School (GCFL) — **Gwacheon, KR**
High School — **2015 – 2018**
- Department of English, minor major in Chinese
- **Champion (1st place)** of GCFL English Debate Competition, Judge of GCFL English Debate Competition
- Leader of Analysis Society
- Participated in Cornell-Yonsei Debate Championships as the representative of GCFL.

RESEARCH INTERESTS

- All areas of Computer Vision and Machine Learning
  Self-supervised learning, Contrastive learning, Optimal Loss functions, Segmentation, Image Restoration

PUBLICATIONS

- **C. Ryu** et al., "Trainable Weights for Multitask Learning," in IEEE Access, vol. 11, pp. 105633-105641, 2023, doi: 10.1109/ACCESS.2023.3319072.
- J, Han, **C. Ryu**, and G. Nadarajan, “Exploring Factors Affecting Student Learning Satisfaction during COVID-19 in South Korea”, accepted to 2024 the 10th International Conference on Frontiers of Educational Technologies (ICFET)
- S. Lee, **C. Ryu** and E. Park, "OSANet: Object Semantic Attention Network for Visual Sentiment Analysis," in IEEE Transactions on Multimedia, 2022, doi: 10.1109/TMM.2022.3217414.

RESEARCH EXPERIENCE

Neurophet
Employed as a research scientist in AI Division — **Nov.2023 – Jun.2024**
- Carried out computer vision research on optimal landmark location detection for 4D CT perfusion images of brains, for stroke analysis. This is a task of multiple landmarks localization demanding fast and precise performance.

Laboratory for Image and Data Science — **Korea Institute of Science and Technology (KIST)**
Carried out research with advisor Hyunseok Seo (senior researcher at KIST) — **Feb.2023 – Jun.2023**
- Accepted for industry-academia intern
- Thoroughly studied:
  - DDPM (Denoising Diffusion Probabilistic Models)
  - SR3 (Image Super-Resolution via Iterative Refinement)

Medical Vision Lab — **Seoul National University Hospital (SNUH) / Seoul National University**
Carried out research with advisor Prof. Young-Gon Kim (Assistant Professor, SNUH) — **Jul.2022 – Feb.2023**
- Written paper “*Trainable Weights for Multitask Learning*”
  - Research Details: Proposed an efficient architecture for multitask learning that resembles hard parameter sharing methodology. Shown improved performance in active learning and auxiliary learning settings.
- Participated in projects of segmentation task regarding Pathology (SDP and IgAN)

Data eXperience Lab — **Sungkyunkwan University**
Participated in seminar and carried out individual research — **Dec.2021 – May.2022**
Advisor: Prof. Eunil Park (Associate Professor, SKKU)

- Participated in seminars about data structure, algorithm, machine learning, and GAN; presented on aforementioned subjects, and also problem solved
- Outperformed in Problem Solving Seminars held in the lab (subjects of problems to code in Python: tail recursion, sorting methods, stack, linked list, priority queue, dfs, bfs, searching methods, graph, tree, brute force, greedy, dynamic programming, dijkstra)
- Researched to optimize GAN-based model for generating faces of Asians
- Written paper “OSANet: Object Semantic Attention Network for Visual Sentiment Analysis”

PROJECTS & RESEARCH

Localization task on 4D Spatiotemporal CT Perfusion data **Neurophet**

Supervisor: Hyeonsik Yang (Lead Research Scientist at Neurophet)

- Given 4D Spatiotemporal CT Perfusion images, built a model to find each location for 8 particular vessels.
    - Research details: Successfully compressed the 4D data to 3D and built a robust heatmap regression based architecture (model) that finds all 8 four dimensional locations (x,y,z,t) given 3D data.

Research assistant of professor Gaya Nadarajan **Sungkyunkwan University**

Advisor: Prof. Gaya Nadarajan (Associate Professor, SKKU)

- Written paper “Probing Students’ Preferences and Learning Satisfaction during COVID-19 using Statistical Analysis and Explainable AI” (submitted, waiting for review)
    - Research details: Utilized explainable AI, Explainable Boosting Machine (EBM), to explore students' learning behaviour during the pandemic.
- Best-performed model: Explainable Boosting Machine (f1-score: 0.9409)

Trainable Weights for Multitask learning **Seoul National University Hospital (SNUH)**

Advisor: Prof. Young-Gon Kim (Assistant Professor, SNUH)

- Description: Compared to the conventional architecture for multi-task learning (hard sharing methodology), our methodology is effective in time and memory manner, but also, our architecture leads to higher performance.
- Research Type: Individual Research

Segmentation task of IgAN Data **Seoul National University Hospital (SNUH)**

Advisor: Prof. Young-Gon Kim (Assistant Professor, SNUH)

- Goal: Make a model that exceeds the previous conventional model used for IgAN data segmentation task segmentation for various glomerulus types.
- Description: Need to improve dice coefficient score of segmentation task while handling highly imbalanced data and to make inferences on private datasets from diverse hospitals in Korea.
- Research Type: Team Research/Project
- Methodology: Class-Weighted Ensemble (Build a model for every class that is optimized for one class and perform a majority voting during inference time while giving one additional vote for the model that has predicted class as its confident class). Also did oversampling when training, with loss function as class-weighted dice loss.

Segmentation task of Pathology Data **Seoul National University Hospital (SNUH)**

Advisor: Prof. Young-Gon Kim (Assistant Professor, SNUH)

- Goal: Build an outperforming model that takes input as entire whole-slide images compared to the conventional methodology that takes image patches as inputs.
- Role: Train baseline models for comparisons on public Camelyon16 dataset and private dataset from hospitals. (trying for level 2 and level 4 of the whole slide image, respectively)
- Research Type: Team Research/Project

2022 KISTI-NVIDIA-HACKATHON **NVIDIA**

- Short-term project on Segmentation of OCT images
- Optimize GPU and Memory Usage by automatic mixed precision(AMP) and distributed data parallelization(DDP).
- Optimized GPU for time saving. (6x Increase in speed of training)
- Team name: MVL (SNU) mentor: Hyunggon Ryu from NVIDIA

Lung Segmentation Task **Seoul National University Hospital (SNUH)**

- Research Assignment in Medical Vision Lab in SNU
- **Outperformed** among researchers in the Medical Vision Lab in SNU (in terms of dice coefficient score).

- Dice coefficient: **0.98** (higher than the dice in the paper written with the same lung segmentation task)
- Presentation (oral version), Presentation (report version)

2022 Artificial Intelligence Competition (https://aichallenge.or.kr/competition/detail/1)

- Role: Team Leader (Team name: SKKUAI)
- Task: Classification task of beef images.
- Best Model: EfficientNet + CutMix augmentation
- Metrics: Weighted Kappa score (Quadratic)
- Accuracy: 94.76%

Image Sentiment Analysis **Sungkyunkwan University**

Advisor: Prof. Eunil Park (Associate Professor, SKKU)

- Published Paper "OSANet: Object Semantic Attention Network for Visual Sentiment Analysis"
- Research Type: Team Research (with M.S. Student: SangEun Lee)
- About: Prediction on the emotional response of humans on visual stimuli

Optimal Generation Framework for Asian Faces **Sungkyunkwan University**

Advisor: Prof. Eunil Park (Associate Professor, SKKU)

- Currently designing the model architecture (GAN based)
- Research Type: Individual Research

Image Restoration via Latent Space Encoding **Sungkyunkwan University**

- Main Title: Bringing Old Photos Back to Life
- Based on: Ziyu Wan, Bo Zhang, Dongdong Chen, Pan Zhang, Dong Chen, Jing Liao, and Fang Wen. Bringing old photos back to life. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition.
- Description: Replication of paper for restoration of old photos that suffer from severe degradation through a deep learning approach; enhanced the networks, fixed errors, improved the project, and presented to class

Image Classification Using Chest X-ray Images to Identify Patient's State: Viral Pneumonia, Corona, or Normal

- Test accuracy: 0.954
- Transfer Learning through pre-trained VGG-16 model exploiting ImageNet weights

- Optimization for Working Mechanism of Elevator
- Program for finding location in Sungkyunkwan University

LEADERSHIP & EXTRACURRICULAR ACTIVITIES

Paper Reading Team (딥러닝 논문 읽기 모임)

Image Processing Team **Jan.2023 – Mar.2024**

- Reading paper weekly and presenting the content of papers related to computer vision.
- Presented on "Hyperbolic Image Embedding" (CVPR,2020) (slides) (video)
- Presented on "Data-centric AI: Perspectives and Challenges" (slides)
- Presented on "UniCLIP: Unified Framework for Contrastive Language-Image Pre-training" (NeurIPS 2022) (slides) (video)
- Presented on "Discovering Systematic Errors with Cross-Modal Embeddings" (ICLR, 2022) (slides) (video)

Deep Learning II: Natural Language Processing **Sungkyunkwan University**

Teaching Assistant for Prof. Gaya Nadarajan (Associate Professor, SKKU) **Aug.2022 – Dec.2022**

- Assisted in teaching the course; answered questions posed by students enrolled in the course
- Assessed the final projects, and also selected papers on natural language processing for final projects.
- Designated and graded assignments and exams submitted by students; assist in creating assignments and exams for students

Deep Learning I: Foundations and Image Processing **Sungkyunkwan University**

Teaching Assistant for Prof. Gaya Nadarajan (Associate Professor, SKKU) **Mar.2022 – Jul.2022**

- Assisted in teaching the course; answered questions posed by students enrolled in the course
- Assessed the final projects, and also selected papers of computer vision for final projects.
- Designated and graded assignments and exams submitted by students; created assignments for students

Tobig's (Academic Society for Artificial Intelligence and Data Analytics) **Interuniversity**
Marketing Director and Educator **Jan.2021 – Jul.2021**

- Participated in education for Tobig's
- Participated in project for stock price prediction by machine learning models
- Participated in marketing Tobig's recruitment

Sungkyunkwan University English Parliamentary Debate Association (SKEDA) **Sungkyunkwan University**
President **Jul.2019 – Sep.2020**

- Participated in debate competitions in SKEDA
- Lectured and judged debates for members of SKEDA
- **8th breaking** in SolBridge North-East Asian Debate Championships (NEADC)
- Participated in international debate tournaments such as NEADC, SRT, KNC and competed with other students outside the university
- A Member of the Korea Intervarsity Debate Association (KIDA)

Like Lion (멋쟁이 사자처럼) **Sungkyunkwan University**
Participant **Jan.2019 – Jan.2020**

- Completed education in Like Lion through seminars
- Led project of making a webpage to communicate for used deals
- Participated in Hackathon

[Global C-School] Co-Deep Learning Project **Sungkyunkwan University**
Collaborative Research Project with Prof. OakYoung Han (Assistant Professor, SKKU) **Sep.2019 – Dec.2019**

- Carried out a project to make a program for recommending clubs, societies for students in Sungkyunkwan University, in a team with a professor in Computer Education major

King-go Cheerleader **Sungkyunkwan University**
Marketing Director **Apr.2018 – Mar.2019**

- Not only participated in cheerleading, also led promoting events of cheerleaders

HONORS AND AWARDS

Academic Excellence Scholarship	Spring Semester, 2023
Academic Excellence Scholarship	Fall Semester, 2022
University Innovation Scholarship - Awards and Living Expenses	Fall Semester, 2022
University Innovation Scholarship - Awards and Living Expenses	Spring Semester, 2022
Student Success Scholarship	Spring Semester, 2020
Working Scholarship	Fall Semester, 2018
Outstanding Performance Scholarship	Fall Semester, 2018

ADDITIONAL SKILLS

Languages	English (Fluent), Korean (Native), Chinese (Intermediate, HSK4)
IT Skills	Git, Docker, Professional knowledge in MS Office (Excel, Word, PowerPoint), Basic Adobe Photoshop skills
Programming	Front-end (HTML, CSS, Bootstrap), Programming Languages (Python, C, C++, R), Back-end (Django), MySQL