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RESEARCH INTERESTS

· Utilizing **heterogeneous medical data** for translational research.
· Developing **deep-learning frameworks**, such as graph neural network (GNN).

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea 2021
Master's in Engineering (GPA: 4.25/4.3)
Department of Bio and Brain Engineering
· Thesis: Graph neural network for predicting Alzheimer's disease (AD).
- Developed a GNN approach, utilizing approximate personalized propagation of neural predictions, to predict AD by incorporating resting-state functional MRI (rs-fMRI) and demographic measures.
- Employing deep learning models to predict genes related to AD.

Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea 2018
Bachelor of Science in Engineering
Department of Bio and Brain Engineering

PUBLICATIONS

1. **Byun, J.**, & Jeong, Y. (2020). Graph neural network-based heterogeneous propagation scheme for classifying Alzheimer's disease using resting-state fMRI and demographic measures. *Medical Image Analysis*. (*Submitted*)
2. Park, H., Kam, T. I., Peng, H., Mehrabani-Tabari, A. A., Chou, S. C., Karuppagounder, S. S., Umanah, G. K., Chang, S., Kim. H., **Byun, J.**, Liu, J. O., Dawson, T. M., & Dawson, V. L. (2020) Therapeutic potential of PAAN inhibition for Parkinson's disease. *Nature*. (*Submitted*)
3. Kang, Y. T., Doh, I., **Byun, J.**, Chang, H. J., & Cho, Y. H. (2017). Label-free rapid viable enrichment of circulating tumor cell by photosensitive polymer-based microfilter device. *Theranostics, 7*(13), 3179.

PRESENTATIONS

1. **Byun, J.**, & Jeong, Y. (2020, November 14). The impact of SNPs on Alzheimer's disease classification based on resting-state fMRI. Korea Dementia Association. Virtual.
2. **Byun, J.**, & Jeong, Y. (2020, November 6). Classification of Alzheimer's disease based on resting-state functional MRI and SNPs. Korean Human Brain Mapping Conference. Virtual.
3. **Byun, J.**, & Jeong, Y. (2020, November 3-4). Graph neural network approach for classification of Alzheimer's disease using resting-state fMRI. Asian Society of Magnetic Resonance in Medicine & International Congress on MRI 2020. Virtual. ***(Best Poster Award)***
4. **Byun, J.**, & Jeong, Y. (2020, June 23-July 3). Automated multi-class classification of Alzheimer's disease with attributed network embedding. Organization for Human Brain Mapping Conference. Virtual.
5. **Byun, J.**, & Jeong, Y. (2019, November 1). Automated multi-class classification of Alzheimer's disease with attributed network embedding. Korean Human Brain Mapping Conference. Virtual.

RESEARCH EXPERIENCE

Laboratory for Cognitive Neuroscience & NeuroImage | *Master Student* Mar 2019 - Present
KAIST, South Korea
Supervisor: Yong Jeong, MD, PhD

- Expanding a GNN model to combine genomic data and structural MRI to predict AD-related genes.
- Developing a deep learning framework (e.g. GNN) to classify AD severity with heterogeneous data: rs-fMRI and demographic measures.
- Analyzing rs-fMRI and diffusion tensor image of Parkinson's disease patients to verify the effects of the Donepezil on memory loss at functional level.

Do-yun Lee's Laboratory | *Researcher* Sep 2016 – Feb 2018
Institute for Basic Science for Cognition and Sociality (IBS), South Korea
Supervisor: Do-yun Lee, PhD

- Focused on understanding social information processes underlying learning and memory at the network and cellular levels.
- Implemented *in vivo* two-photon calcium imaging on mice hippocampus, while conducting social behavior tests.
- Programmed through MATLAB to interpret distinct patterns among captured neurons.

Dawson's Laboratory | *Research Intern* Jun 2016 - Aug 2016
Johns Hopkins University, US
Supervisor: Valina Dawson, PhD

- Characterized the effects of the inhibition of AIMP2 phosphorylation on Parkinson's disease symptoms using mouse models.
- Conducted cellular analysis of dopamine neurons and behavioral tests on mice injected with PFF (to mimic Parkinson's disease).

NanoSentuating Systems Laboratory | *Research Assistant* Sep 2015 - Jun 2016
KAIST, South Korea
Supervisor: Young-ho Cho, PhD

- Examined the genetic expression of captured circulating tumor cells (CTCs) in human blood samples.
- Used fabricated filters to isolate CTCs and rare cell RT-qPCR to identify whether specific genetic markers are expressed or not.

Translational Neurogenetics Laboratory | *Research Assistant* Jun 2015 - Aug 2015
KAIST, South Korea
Supervisor: Jung-ho Lee, MD, PhD

- Investigated the role of primary cilia in neuronal cells of Joubert syndrome patients.
- Created a Tmem138 knockout mouse model using Cre-loxP recombination and *in utero* electroporation.

Cell Signaling and Bio Imaging Laboratory | *Research Assistant* Mar 2015 - Jun 2015
KAIST, South Korea
Supervisor: Chul-hee Choi, MD, PhD

- Identified which optimized *ginsenoside* substance was best at treating breast cancer in mouse models.
- Employed Doxorubicin as a control to compare its medicinal effects with the various *ginsenoside* substances.

POSTECH-Catholic Biomedical Engineering Institute | *Research Intern* Dec 2014 – Feb 2015
School of Medicine, The Catholic University of Korea, South Korea

- Organized methods to treat brain tumors by using mesenchymal stem cells.

Nanoentek | *Internship* Jan 2014 - Feb 2014
Seoul, South Korea

- Developed lab-on-a-chip diagnostic tool for Alzheimer's disease with various metrics including TSH level.

HONORS AND AWARDS

Best Poster Award 2020
ASMRM & ICMRI 2020

National Scholarship 2019 – 2020
4 semesters, KAIST

Best Tutor Awards 2018
Awarded as the best tutor of Global Institute for Gifted Education

KAIST Scholarship 2013 – 2017
8 semesters, KAIST

National Science & Technology Scholarship 2015 -2017
4 semesters, KAIST

Nationwide Nobel Prize Essay Contest 2016
3rd Place, National Science Museum in Gwa-cheon, Korea

Scholarship for Research Internship 2016
Financial support for travel cost, KAIST

TECHNICAL SKILLS

Computer Programming Languages
Python, MATLAB

Experiment Skills
- Mice behavioral tests: open field, pole test, light & dark box, elevated plus maze, 3 chambers, forced swim, novel object recognition, Morris water maze, digging and marble burying, tail suspension.
- Mice surgery: *in utero* electroporation, head plate surgery, virus injection.
- Imaging: two photon microscopy, confocal microscopy, immunohistochemistry.
- Molecular works: Western blotting, plasmid preparation, RT-PCR, qPCR.
- Cellular works: mice primary neuron culture (cortex).

TEACHING EXPERIENCE

KAIST Teaching Assistant Mar 2019 – Present
- Supported as a teaching assistant for several classes – prepare quizzes, teach experiment procedures, answer students' questions, score reports, check attendance.
  - Major: Bioinstrumentation fundamentals, Bioengineering laboratory, Biofusion seminar.
  - Elective courses: Science fiction cinema, Animation in East Asia, Analytical philosophy, Theory of mind, Ethics, Early modern philosophy.

Global Institute for Gifted Education, *Tutor* Feb 2017 – Dec 2017
- Taught science and technology mentoring classes for gifted middle school students.

Samsung, *Dream Class Mentor* Aug 2015 – Jun 2016
- Provided underserved/struggling students with opportunities to enhance their education by teaching English twice a week.

VOLUNTEER ACTIVITIES

KAIST, *Mentor* Sep 2019 - Present
- Serve as a mentor for undergraduate students to help them decide their career goals and relieve stress.

Saint Mary's Hospital, *Volunteer* Apr 2018 – Dec 2018
- Translated Korean to English for international patients and their families.

KAIST, *Student Mentor* Feb 2016 – Feb 2017
- Counseled freshman students at KAIST to help them successfully adapt to a new environment.

KAIST, *Buddy* for international students Mar 2014 - Jun 2014
- Supported international students for a semester by helping them settle into life at KAIST.