JUNYOUNG YANG

Email: jyyang@yonsei.ac.kr Website: https://sites.google.com/ust.ac.kr/jyang/ Google Scholar Profile

EDUCATION

University of Science and Technology (UST) **South Korea**
M.S. in Polar Science 2022 - 2024
- Affiliated Research Institute: Korea Polar Research Institute (KOPRI)
- *Thesis: Development of a Hyperspectral Library and Spectral Unmixing-based Analysis for Arctic Plant Species*
- Advisor: Dr. Yoo Kyung Lee

Yonsei University **South Korea**
B.S. in Bioengineering & Biotechnology 2018 - 2020
- Advisors: Prof. Insuk Lee and Prof. Ho Jeong Kwon

Jeju National University **South Korea**
B.S. in Molecular Biotechnology 2011 - 2018
- Advisor: Prof. Jung-Sup Kim

RESEARCH INTERESTS

1. Spectroscopic identification and interpretation of organic signals (biotic and abiotic) in Martian samples
2. Machine learning applications in planetary remote sensing and in-situ data (e.g., CRISM, SHERLOC)
3. Mars and polar environments as terrestrial analogues for astrobiology
4. Geochemical evolution of Mars and its influence on planetary habitability

PEER-REVIEW PUBLICATION

1. **Yang, J.**, Lee, Y. K., Chi, J., (2023). 'Spectral Unmixing-Based Arctic Plant Species Analysis using a Spectral Library and Terrestrial Hyperspectral Imagery: A case study in Adventdalen, Svalbard'. *International Journal of Applied Earth Observation and Geoinformation* (IF: 8.6, Journal Citation Reports (JCR) Top 10% in Remote Sensing) DOI: https://doi.org/10.1016/j.jag.2023.103583

FIRST AUTHOR TALKS

1. **Yang, J.** et al., (2024). 'Spectral Unmixing-Based Mapping of Arctic Plant Species Using an Unmanned Aerial Vehicle Spectral Library and a Worldview-3 Satellite Image'. *COSPAR - Committee on Space Research*. Busan, South Korea
2. **Yang, J.** et al., (2023). 'Mapping Arctic Vegetation Abundance using Spectral Unmixing Analysis with WorldView-3 and UAV Images'. *Korean Society of Remote Sensing Fall Meeting*. Gyeongju, South Korea
3. **Yang, J.** et al., (2023). 'Analysis of Arctic Plant Species based on Spectral Unmixing using Ground-based Spectral Library, *GeoAIdata Fall meeting*, Jeju, South Korea.
4. **Yang, J.** et al., (2023). 'Classification of Arctic Vegetation using Terrestrial Hyperspectral Imagery', *Korean Society of Remote Sensing Fall Meeting*, Pusan, South Korea.

FIRST AUTHOR POSTERS

1. **Yang, J.** et al., (2023). 'Advances in Spectral Unmixing-Based Hyperspectral Analysis for Arctic Plant Species Monitoring: Developing a Spectral Library'. *AGU Annual Meeting 2023*. San Francisco, CA, USA
2. **Yang, J.** et al., (2023). 'Mapping Capability of Hyperspectral Information on Dominant Arctic Vegetation Species using Terrestrial Hyperspectral Imagery'. *IGARSS - IEEE International Geoscience and Remote Sensing Symposium*. Pasadena, CA, USA

3. **Yang, J.** et al., (2023). 'Machine learning-based classification for mapping Arctic plant species using terrestrial hyperspectral imagery'. *The Annual Meeting of the Korean Association of Biological Sciences*. Chuncheon, South Korea
4. **Yang, J.** et al., (2023). 'Spectral Analysis and Classification of Arctic Vegetation using Terrestrial Hyperspectral Imagery', *The 27th International Symposium on Polar Science*. Incheon, South Korea
5. **Yang, J.** et al., (2022) 'Spectral Characteristics of the Arctic Vegetation in Adventdalen, Svalbard'. *Arctic Science Summer Week*, Tromso, Norway.

RESEARCH EXPERIENCE - PROJECTS (SELECTED)

Mars2020 SHERLOC Data Analysis | Independent Research (2025 - Present)

- Conducted a field campaign in Svalbard (2022), acquiring 300+ spectral
- Developed a VNIR spectral library (400-1000 nm)
- Classified ten classes to distinguish Arctic plant species using machine learning models (RF/SVM/CNN)

Spectral Library Development and Vegetation Classification | KOPRI (2021 - 2024)

- Conducted a field campaign in Svalbard (2022), acquiring 300+ spectral datasets from drone/ground sensors
- Developed a VNIR spectral library (400-1000 nm) for Arctic vegetation and surface features
- Classified ten classes to distinguish Arctic plant species using machine learning models (RF/SVM/CNN)

Drone and Satellite Spectral Mapping and Data Fusion | KOPRI (2022 - 2024)

- Generated vegetation maps by fusing drone-based hyperspectral and LiDAR data (94% accuracy)
- Developed a spectral unmixing pipeline using Worldview-3 satellite imagery for large-scale mapping (>10 km²)
- Enhanced mapping accuracy through multi-modal data integration and spectral abundance estimation

Future Korean Lunar Mission | KOPRI (2022 - 2024)

- Contributed to the conceptual design process of a test-bed for lunar subsurface drilling and rover exploration
- Developed guidelines for preventing biological contamination in future Korean missions by adapting NASA planetary protection protocols
- Drafted initial versions of project reports and documentation

**Full list of projects is available at https://sites.google.com/ust.ac.kr/jyang/*

TECHNICAL SKILLS

Programming, Markup Languages, & Machine Learning (ML)

- Python, R, Bash/Shell, LaTeX, HTML
- ML Frameworks: Tensorflow (with Keras API), PyTorch, Python Libraries

Geoinformatics & Spectroscopy

- Remote Sensing: Ground-based, drone, and satellite data analysis, image processing and classification
- Spectral Analysis: Signal processing, classification, unmixing, validation, and statistical analysis
- Multimodal data integration and analysis (Hyperspectral and LiDAR)

Bioinformatics

- Network Analysis: Microbial community clustering and gut microbiome interaction analysis
- Metagenomic Assembly: De novo assembly and co-binning workflows (MetaBAT2 and Mash)

Laboratory & Analytical Chemistry

- Molecular Biology: DNA/RNA extraction, Protein electrophoresis, PCR, Cell line culture
- High-Performance Liquid Chromatography (HPLC), Gas Chromatography (GC)

Languages:

- Korean (native), English (professional working proficiency)

HONORS AND AWARDS

1. Outstanding Paper Award, University of Science and Technology - KOPRI — May 2024
2. Best Oral Presentation Award, GeoAI Data Society — November 2023
3. Outstanding Poster Award, Korean Association of Biological Sciences — September 2023
4. National Scholarship, Korea Student Aid Foundation — 2015 - 2020
5. Jeju Local Honor Scholarship, Jeju National University — 2016 - 2017
6. JNU Merit-based Scholarship, Jeju National University, — 2015

TEACHING ASSISTANTSHIP AND FIELD WORK

Teaching Assistant, Statistics — Fall Semester 2022
University of Science and Technology

- Provided explanations and assistance for R programming and coding
- Graded assignments and prepared instructional materials

Field Work in Adventdalen, Svalbard, Arctic (78.2°N, 15.9°E) — June 28 - July 13, 2022

- Collected aerial and ground-based remote sensing data for Arctic vegetation
- Conducted ground-based hyperspectral scanning (Specim IQ) and botanical survey
- Assisted with multi-sensor drone scanning (DJI Matrice 600 Pro): hyperspectral (Headwall Nano-Hyperspec) and 3D point cloud data (Velodyne Puck Hi-Res LiDAR)

RELEVANT COURSEWORK

1. Online (Coursera): The Science of the Solar System, Prof. Mike Brown, California Institute of Technology
2. Planetary: Planetology and spatial information, Space Exploration, Polar Science, Remote Sensing Monitoring
3. Data Science: Artificial Intelligence, Deep Learning, Statistics. Data Analysis
4. Bio & Chemistry: Organic chemistry, Molecular Biology, Biochemistry, Analytical Chemistry

PREVIOUS EMPLOYMENTS

Korea Polar Research Institute (KOPRI) — **Incheon, South Korea**
Research Assistant (2020-2022, 2024) & Graduate Student (2022-2024) — *2020 - 2024*

- Remote sensing and GIS research on the spectral characteristics of Arctic vegetation
- Development of image classification algorithms for monitoring Arctic ecosystems
- Involvement in the future Korean lunar mission for rover exploration and ISRU
- Study on DNA extraction of Antarctic soil microorganisms for ecological analysis in glacier retreat areas.

Korea Institute of Science and Technology (KIST) — **Seoul, South Korea**
Research Intern — *Winter 2020*

- Technician for biological research on stem cell induction based on biochemistry
- Laboratory biological experiments involving gene expression

Yonsei University — **Seoul, South Korea**
Undergraduate Researcher — *2018 - 2019*

- Bioinformatics, Network biology, data analysis, and statistics evaluation for microbial community analysis
- Biochemical research on cancer treatment using natural compounds

EXTRACURRICULAR ACTIVITIES AND OUTREACH

1. Mentor | Korea Association of Persons with Physical Disabilities — 2018 - Present
2. Network Member | Life in Cosmos Exploration Group, KASI — 2023 - Present
3. Korea Executive Committee Member | Association of Polar Early Career Scientists — 2023
4. Mentor | Seoul Local Youth Center — 2021