

Saeyoung Kim

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Professional Summary

Hands-on hardware-software integration engineer with experience supporting complex experimental systems across embedded electronics, sensors, firmware, PCB development, test infrastructure, and system validation. Built and debugged networked electromechanical platforms for space and research applications using Python, C/C++, and MATLAB, with direct experience in instrumentation, integration testing, and cross-functional technical collaboration. Background spans satellite AIT, embedded sensing platforms, and research software development in university and industry environments.

Technical Skills

Programming: Python, C/C++, MATLAB

Embedded: MCU Firmware, Real-time Systems, Sensors

Electronics: Circuit Design, PCB Layout, System Integration

CAD/Fabrication: Fusion360, AutoCAD, KiCad, 3D Printing, Laser Cutting, CNC

Tools: Git, Docker, Linux

Methods: Space Hardware AIT, Test Planning, MSPC, Freeze-drying

Professional Experience

University of Massachusetts Lowell

Lowell, MA, USA

Postdoctoral Associate | Freeze-drying Modeling and Process Control Software Development

2025.07–Present

- Developed digital twin framework integrating physics-based modeling with MSPC for pharmaceutical manufacturing
- Led real-time quality monitoring system development for mRNA-LNP vaccine production, analyzing 100+ batches
- Built Python software suite replacing commercial platforms (gPROMS, SIMCA) for reproducible process development
- Designed end-to-end data pipeline for multi-day batch cycles with automated quality prediction
- Collaborated across engineering and research stakeholders to translate process needs into usable technical tools
- Co-authoring high-impact journal manuscripts (IF 10+); leading deliverables for government-funded collaboration

Hanwha Systems

Seoul, South Korea

Systems Integration Engineer | Satellite Systems Design & Integration and Testing

2024.02–2025.05

- Led system integration and validation of military SAR satellites across complex test and assembly campaigns
- Developed and executed Electric Test Bed (ETB) procedures for embedded hardware performance and interface validation
- Defined and executed test plans for embedded systems, communications links, and integrated electrical subsystems
- Designed high-level Electrical Ground Support Equipment (EGSE) architecture and integration test plans
- Developed electrical Integrated Systems Test (IST) plans for Flight Model Assembly, Integration, and Testing
- Diagnosed and resolved hardware-software interactions in networked systems
- Contributed to designing a high-throughput satellite manufacturing facility

Education

Korea University

Seoul, South Korea

PhD in Electrical Engineering | CubeSat Embedded Systems & Sensor Integration

2017.03–2024.02

- Secured and managed 300M KRW (\$220K) research grant for CubeSat biological payload R&D
- Designed and fabricated multi-modal electrochemical and optical sensor suite for space applications
- Developed MCU firmware in C/C++ for real-time sensor data acquisition and autonomous operation
- Built and validated embedded system prototypes including circuit design, PCB layout, assembly, and system integration
- Debugged complex hardware-software interactions in networked electromechanical devices
- Published 3 first-author SCI papers (cumulative IF: 17.4) and co-authored 10+ publications

Konkuk University

Seoul, South Korea

BSc in Mechanical Engineering

2013.03–2017.02

- Conducted research at the Smart Materials Nano Lab, focusing on electrochemical sensor development.
- Gained hands-on experience in CAD modeling, PCB prototyping, microfabrication, and academic writing.

Publications

Journal Publications

- **Saeyoung Kim**, Jaewon Lee, Kimia Babaei, Seonkyu Yoon, “Digital Twins in Lyophilization: Advances in Pharmaceutical Process Development and Optimization,” *Biotechnology Advances*, 2026. (Manuscript in Preparation, Target Submission: Q1 2026)
- Jinhwee Kil, **Saeyoung Kim**, James Jungho Pak, “Investigation of thermal management strategies for biological CubeSat payloads,” *Acta Astronautica*, 2024, Art. no. 228. DOI: 10.1016/j.actaastro.2024.11.059.
- **Kim, S.**; Park, S.; Pak, J.J., “Multi-Modal Multi-Array Electrochemical and Optical Sensor Suite for a Biological CubeSat Payload,” *MDPI Sensors*, 2024, 24, Art. no. 265. DOI: 10.3390/s24010265.
- Ji-Hoon Han, Sang Hyun Park, **Saeyoung Kim**, James Jungho Pak, “A Performance Improvement of Enzyme-Based Electrochemical Lactate Sensor Fabricated by Electroplating Novel PdCu Mediator on a Laser Induced Graphene Electrode,” *Bioelectrochemistry*, 2022, 148, 108259. DOI: 10.1016/j.bioelechem.2022.108259.
- **Saeyoung Kim**, Ji-Hoon Han, Beelee Chua, James Jungho Pak, “A pH Sensing Pipette for Cross-Contamination Prevention in Industrial Fermentation,” *IEEE Transactions on Industrial Electronics*, 2022, 69(7), 7461-7469. DOI: 10.1109/TIE.2021.3099251.
- S.D. Raut, N.M. Shinde, B.G. Ghule, **S. Kim**, J.J. Pak, Q. Xia, R.S. Mane, “Room-Temperature Solution Processed Sharp-Edged Nanoshapes of,” *Chemical Engineering Journal*, 2022, 433(2), 133627. DOI: 10.1016/j.cej.2021.133627.
- S.E. Jeong, **S. Kim**, J.H. Han, J. Jungho Pak, “Simple Laser-Induced Graphene Fiber Electrode Fabrication for High-Performance Heavy-Metal Sensing,” *Microchemical Journal*, 2022, 172, 106950. DOI: 10.1016/j.microc.2021.106950.
- Sanghoon Cho, Jungmo Jung, **Saeyoung Kim**, James Pak, “Conduction Mechanism and Synaptic Behaviour of Interfacial Switching AlO_x-based RRAM,” *Semiconductor Science and Technology*, 2020, 35(8), 085006. DOI: 10.1088/1361-6641/ab8d0e.
- Ji-Hoon Han, **Saeyoung Kim**, Jaesung Choi, Sora Kang, Youngmi Kim Pak, James Jungho Pak, “Development of Multi-Well-Based Electrochemical Dissolved Oxygen Sensor Array,” *Sensors and Actuators B: Chemical*, 2020, 306, 127465. DOI: 10.1016/j.snb.2019.127465.

Conference Presentations

- *Thermal Management System for a Fluidic Card in a Small Satellite Biological Payload*, Korean Institute of Electrical Engineers (KIEE) Autumn Conference, 2022.
- *A Pipette with an Integrated pH Sensor for Liquid Sampling Applications*, Korean Institute of Electrical Engineers (KIEE) Summer Conference, 2019.
- *IoT System for Monitoring pH, Dissolved Oxygen, Temperature, and Electrical Conductivity in Liquids*, Korean Institute of Electrical Engineers (KIEE) Summer Conference, 2018.
- *Development Trends of Non-Invasive Glucose Sensor Technology*, Korean Institute of Electrical Engineers (KIEE) Summer Conference, 2017.

Seminar Presentations

- *Bioprocessing in Space: Challenges and Opportunities for Pharmaceutical Manufacturing Beyond Earth*, Lowell Center for Space Science and Technology (LoCSST), UMass Lowell, 2025.