Saeyoung Kim

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PrimaryAnomaly

Professional Summary

Driven by developing resilient, autonomous infrastructure for first-generation Mars colonies. Experienced in embedded systems, sensor integration, hardware/software co-design, PCB development, and system architecture, with skills in sensing, actuation, and communications integration using MATLAB, Python, and C/C++. Previously an Electronic Design Integration and Assembly, Integration, and Testing (AIT) Engineer at Hanwha Systems, handling systems integration, performance validation, and EM/QM/FM test campaigns for military SAR satellites. Currently a postdoctoral researcher at UMass Lowell developing digital twin frameworks with MSPC for real-time monitoring in mRNA-LNP vaccine manufacturing, building process control foundations for life-critical systems in extreme environments.

Technical Skills

Programming: Python, C/C++, MATLAB
CAD/CAM: Fusion360, AutoCAD, KiCad
Hardware: Jigs, PCB, Embedded, Systems Integration
Fabrication: 3D Printing, Laser Cutting, CNC
DevOps: Git, Docker, Linux
Methods: Space Hardware AIT, Freezedrying, MSPC

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
- 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.
- Developed and executed Electric Test Bed (ETB) test procedures for performance and integration.
- Defined and executed test plans for embedded systems and communications.
- 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, 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, Seonkgyu 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 AlOσ-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.

References available upon request.