Songji Eun

KAIST, Daejeon, Republic of Korea
(+82)010-6448-1003 | esj1003@kaist.ac.kr | Linkedin | Homepage

Research Interests

I aim to advance semiconductor microfabrication techniques for biomedical applications, developing high-precision bioelectronic interfaces and microfluidic systems to enhance diagnostic and therapeutic technologies.

Education

- **Korea Advanced Institute of Science and Technology (KAIST)** Mar. 2021 – Present
  B.S. Electrical Engineering, Minor in Computer Science, GPA: 3.98/4.3 (Major : 4.26/4.3)
- **Georgia Institute of Technology** Aug. 2024 – Aug. 2025
  Exchange Student, Electrical and Computer Engineering, GPA: 4.0/4.0
- **Busan Il Science Highschool** Feb. 2018 – Jan. 2021
  High school for the gifted in science and mathematics, and I majored in biology

Research Experiences

Biomedical Microsystems Laboratory, Georgia Tech Aug. 2024 – Aug. 2025

Undergraduate Researcher & Research Intern (PI: Prof. A. Fatih Sarioglu)

- **Fabrication of Plastic-Based Microfluidic Devices for Low-Cost, Scalable Analytical Systems**
  - Develop microfluidic chip fabrication workflow transitioning from PDMS to plastic to improve scalability, biocompatibility, and enable easier surface functionalization
  - Optimized hot embossing to yield high-precision, reproducible microfluidic channels on PC substrates
  - Developed a deposition–etch electrode fabrication process for lift-off–incompatible plastics, enabling Coulter counter electrodes on plastics
  - Established bio-functionalization on plastic for Annexin V based capture, validating apoptotic Jurkat cells
  - Demonstrated selective CD4+ T-cell capture on functionalized plastic chips for immunophenotyping
- **A New Generation of Coplanar Electrodes Enabling Large Electrical Networks in Microfluidics**
  - Explored fabrication of recessed electrode structures for improved field leveling and reduced fringe effects
  - Optimized process parameters to achieve reliable embedding of interdigitated electrodes in oxide trenches
  - Validated electric field distribution and signal-to-noise improvements through COMSOL simulations
- **SU-8 Patterned Lateral Electrodes for Microfluidic Electrical Spectroscopy**
  - Designed and implemented lateral electrode architecture to improve integration within microfluidic channels
  - Developed fabrication strategies to mitigate shorting and enhance reliability of lateral electrode structures
  - Explored multiple shadow mask approaches for electrode patterning, including etched silicon masks, SU-8/OmniCoat masks, and laser-cut films

Brain/Biomedical Microsystems Laboratory, KAIST Dec. 2022 – Present

Undergraduate Researcher (PI: Prof. Hyeonjoo Jenny Lee)

- **Optimization of ACF Bonder Parameters for Biomedical Applications**
  - Optimized of bonding conditions of ACF bonder for microelectrode arrays and flexible ECoG devices, refining parameters such as temperature, pressure, and time
  - Conducted impedance tests to evaluate the bonding quality, and identified optimal bonding conditions that minimize electrode resistance while ensuring stable electrical connections
  - Developed a precise alignment and bonding strategy to address electrode failures at the edge regions
  - Packaged bonded microelectrode array device using an ACF bonder and detected organoid/brain signals

Work Experiences

Research Internship in Barreleye(Start-up Company) Aug. 2024 – Aug. 2025

AI Team Intern (Advisor: Dr. Oh)

- **AI-based Breast Ultrasound Image Analysis Solution**
  - Developed a body-marker extraction tool for breast ultrasound images using Python/Computer Vision
  - Implemented contour detection and ellipse fitting with exception handling to improve robustness
  - Validated performance on large clinical datasets, including noisy and incomplete images

Honors and Awards

- **Undergraduate Research Spring Symposium** | Plastic Microfluidic Devices — Apr. 2025
- **Best Interdisciplinary Award, Capstone Design Expo** | Tree Tap Project — Dec. 2024
- **2024 Spring, 2023 Fall KAIST Dean's List** — Sep. 2024, Mar 2024
- **Korea-USA High-tech Youth Exchange Support Scholarship** — Aug, 2024 – Aug, 2025
- **Korea Electric Power Corporation Scholarship** — May, 2024 – May, 2025
- **Excellence Award, AI-based Library Service Idea Contest** — Nov, 2024
  Proposal of an image-based book recommendation system

Projects

- **TreeTap: Solar-Powered Mesh Communication for Emergency Response in National Parks**
  - Conducted customer discovery with rangers, hikers, and SAR teams to assess communication needs
  - Built low-power mesh network using LoRa/BLE for SOS and group messaging in parks
  - Developed hardware integrating PCB design, solar harvesting, and rugged enclosure
- **Advanced NMOS Process Simulation**
  - Developed NMOS device simulation using ATHENA and ATLAS for cutting-edge CMOS process modeling
  - Performance analysis through IV curves, Vth, and saturation current for varying gate oxide thickness
  - Fine-tuned channel implantation to achieve precise Vth control

Technical Skills

- **Programming Languages:** Matlab, Java, Python, C, Verilog, Javascript
- **Tools:** COMSOL Multiphysics, KiCAD, AutoCAD, AutoFusion, SolidWorks, Git, React, VS Code
- **Language:** English(Proficient, TOEFL : 103), Chinese(Intermediate), Korean(Native)

Clean Room Experience

- Trained and familiar with microfabrication processes
- Tools : STS Pegasus ICP, STS ICP, Vision RIE, Denton Explorer - E-beam Evaporator, Uniflim Sputterer, CHA E-beam Evaporator, Denton Discovery - RF/DC Sputterer, ADT 7100 Dicing Saw, Heidelberg MLA150, Heidelberg

Extracurricular Activities

- **Young Engineers Honor Society(YEHS) Junior member**
  - Led hands-on engineering activities for elementary students and advised high schoolers on electronics
- **Vice President of KAIST Volunteer Club**
  - Provided academic support to children and organized community activities at local welfare centers
- **KAIST Orchestra 2nd Violin**
- **2023, 2024 KAIST Buddy Program**