

Jihong Min

Postdoctoral researcher in Medical and Electrical Engineering, with a concentration in Wearable and Ingestible Electrochemical Sensors

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Education

- 2024 - present **iCMB NIH T32 Postdoctoral Research Fellow in Medical and Electrical Engineering**
California Institute of Technology, Pasadena, CA, USA
University of California, Los Angeles, CA, USA
Advisors: Prof. Azita Emami, Prof. Wei Gao, Prof. Tzung Hsiai
- 2018 - 2023 **Ph.D. in Medical Engineering**
California Institute of Technology, Pasadena, CA, USA
Advisor: Prof. Wei Gao
- 2014 - 2017 **B.S. in Electrical Engineering**
University of Illinois at Urbana-Champaign, IL, USA
Advisor: Prof. Joseph Lyding
- 2012 - 2014 **High School Diploma**
Khartoum American School, Khartoum, Sudan

Research & Work Experience

- 2024- **iCMB NIH T32 Postdoctoral Research Fellow, Caltech and UCLA Medicine, USA (Advisors: Prof. Azita Emami, Prof. Wei Gao, Prof. Tzung Hsiai)**
- Development of ingestible electronic systems with electrochemical sensors based on aptamers and enzymes for real time monitoring of metabolites and neurotransmitters in the gastrointestinal tract.
 - Development of a wearable Electrical Impedance Tomography (EIT) belt for accessible liver screening, targeting early detection of non-alcoholic fatty liver disease (NAFLD) with a flexible and fully autonomous system incorporating a conductive polymer hydrogel and a micro-electrode array.
- 2018-2023 **Graduate Researcher, Caltech, USA (Advisor: Prof. Wei Gao)**
- Development of robust and cost efficient wearable triboelectric nanogenerator and a flexible solar cell based on a quasi-2D perovskite layer with α -methylbenzylamine (MBA) as an additive for efficient and sustainable powering of wearables.
 - Development of novel electrochemical sensors based on enzymes, ion-selective electrodes, antibodies tagged with gold nanoparticles, and molecularly imprinted polymers on laser printed graphene (LEG) and inkjet printed carbon/gold electrodes for sensitive and selective molecular detection in biofluids.
 - Design of miniaturized and low-power wearable/ingestible electronic systems and integration of energy harvesting modules and electrochemical sensors for wireless monitoring of physiochemical biomarkers.
- 2016-2017 **Undergraduate Researcher, UIUC, USA (Advisor: Prof. Joseph Lyding)**
- Self-assembly of centimeter scale polystyrene microsphere monolayers using Langmuir Blodgett transfer.
 - Fabrication of gold-graphene-gold bowtie structure for exploration of large scale plasmonic field enhancements.
- 2016-2016 **Summer Undergraduate Researcher, GIST, South Korea (Advisor: Prof. Jae-Hyung Jang)**
- Fabrication of the Metal-Insulator-Metal structure ReRAM devices.

Honors

09/2024	Nature and Health Conference Best Poster Award
08/2024	NextProf Nexus Fellow
03/2024	MIT Technology Review's 2024 list of 35 Innovators Under 35 Semi-finalist
03/2024	SPIE Soft Mechatronics and Wearable Systems Best Paper Award
03/2024 –	iCMB NIH T32 Fellowship, Caltech
11/2023	MRS Graduate Student Award
09/2018 – 08/2019	Andrew and Peggy Cherng Endowment Fellowship, Caltech
12/2017	Graduated with high honors, UIUC

Teaching and Mentoring

Teaching Assistant	Spring 2018. Theory and Fabrication of Integrated Circuits. ECE 444, UIUC Spring 2020. New Frontiers in Medical Technologies. MedE 205, Caltech Winter 2021. Sensors in Medicine. MedE 202, Caltech
Guest Lecturer	Winters 2023, 2024. Sensors in Medicine. MedE 202, Caltech Summer 2024. Crash Course on Wearables for DIVE Veteran Students, Caltech
Research Mentor at Caltech (7 female students)	Ahyeon Cho (ChemE), Visiting Graduate Student Yonglin Chen (MedE), Graduate Student Hyehyun Kim (MSE), Visiting Graduate Student Hyunah Ahn (ChemE), Visiting Graduate Student Wenzheng Heng (MedE), Graduate Student Rinni Bhansali (EE), Amgen Fellow Nicole Heflin (EE), SURF Fellow Tara Porter (EE), Undergraduate Student Kaliden Drango (EE), SURF Fellow

Conference Presentations, Poster Sessions, Invited Talks, and Workshops

1. **(Invited)** Oral & Poster Presentation: Nature and Health Conference, Brown University, Providence, RI, September 2024 (**Best Poster Award**).
2. Workshop: NextProf Nexus, University of Michigan, Ann Arbor, MI, August 2024.
3. **(Invited)** Seminar: Caltech's DIVE (Diversification Initiative through Veteran Education) program, Pasadena, CA, August 2024.
4. **(Invited)** Seminar: Korea Advanced Institute of Science and Technology (KAIST), Chemical Engineering, Daejeon, South Korea, July 2024.
5. **(Invited)** Seminar: Gwangju Institute of Science and Technology (GIST), Mechanical Engineering, Gwangju, South Korea, July 2024.
6. Oral Presentation: SPIE Soft Mechatronics and Wearable Systems Conference, Long Beach, CA, Mar 2024 (**Best Paper Award**).
7. Poster Presentation: Caltech Medical Engineering 10th Year Anniversary Symposium, Pasadena, CA, May 2024.
8. Oral Presentation: MRS Fall Meeting & Exhibit, Boston, MA, Nov 2023 (**Graduate Student Award**).
9. Poster Presentation: IEEE International Flexible Electronics Technology Conference, San Jose, CA, Aug 2023.

Academic Service

- Reviewer for Journals and Conferences:
Biosensors and Bioelectronics, ACS Photonics, ACS Applied Nano Materials, Scientific Reports, Analytical Chemistry, Talanta, IEEE Consumer Electronics Magazine, Electrochemistry Communications, ACS Applied Materials & Interfaces, IEEE Open Journal of Engineering in Medicine and Biology, Sensors & Diagnostics.
- Judge, SURF Peripall Speaking Competition Semi-Finals, Caltech, 2024.
- Instructor, Crash Course on Wearable and Ingestible Sensors for DIVE Veteran Students, Caltech, 2024

Proposal Writing Experience

Principal Investigator (PI)

- ICMB NIH T32 Training Grant proposal (Funded) - T32EB023858
- NIH Director's Early Independence Award (DP5) proposal (Pending)
- NIH Pathway to Independence Award (K99/R00) proposal (Pending)
- Merkin Institute for Translational Research Spark Grant proposal

Grant Writing Assistance

- NIH NIDCD Research Project Grant (R01) proposal (Funded) – R01DC021461
- Office of Naval Research (ONR) proposal (Funded) – N00014-21-1-2483

Patents

1. "Systems and Methods for Powering Autonomous Sweat Sensor," W. Gao, J. Min, 2023, US Patent Application No. 18/077,846.
2. "Wearable Autonomous Biomimetic Sweat Sensor for Precision Nutrition," W. Gao, M. Wang, Y. Yang, J. Min, 2022, US Patent Application No. 17/824,798.

Selected Publications

(21 papers with 8 as first/co-first author, >4800 citations, h-index 18, updated 11/2024) [Google scholar link](https://scholar.google.com/citations?user=T4pVa1UAAAAJ&hl=en)
(<https://scholar.google.com/citations?user=T4pVa1UAAAAJ&hl=en>)

† indicates equal contributions

1. Min, J.†, Ahn, H.†, Lukas, H., Ma, X., Bhansali, R., Sunwoo, S.-H., Wang, C., Xu, Y., Yao, R., Kim, G., Li, Z., Hsiai, T. K., Emami, A., Jung, H.-T., & Gao, W. (2024). Continuous biochemical profiling of the gastrointestinal tract using a multiparametric ingestible capsule. **Nature Electronics**, under second review.
2. Min, J.†, Demchyshyn, S.†, Sempionatto, J. R., Song, Y., Hailegnaw, B., Xu, C., Yang, Y., Solomon, S., Putz, C., Lehner, L., Schwarz, J. F., Schwarzinger, C., Scharber, M., Shirzaei Sani, E., Kaltenbrunner, M., & Gao, W. (2023). An autonomous wearable biosensor powered by a perovskite solar cell. **Nature Electronics**, 6, 630-641.
Featured on Journal Cover.
3. Min, J.†, Tu, J.†, Xu, C.†, Lukas, H.†, Shin, S., Yang, Y., Solomon, S. A., Mukasa, D., & Gao, W. (2023). Skin-interfaced wearable sweat sensors for precision medicine. **Chemical Reviews**, 123, 5049–5138.
Featured on Journal Cover.
4. Tu, J., Min, J., Song, Y., Xu, C., Li, J., Moore, J., Hanson, J., Hu, E., Parimon, T., Wang, T.-Y., Davoodi, E., Chou, T.-F., Chen, P., Hsu, J. J., Rossiter, H. B., Gao, W. (2023) A wireless patch for the monitoring of C-reactive protein in sweat, **Nature Biomedical Engineering**, 7, 1293–1306.
5. Min, J., Song, Y., & Gao, W. (2022). Microcracked conductors for wearable sensors. **Nature Electronics**, 5(11), 717-718.

6. Wang, M.[†], Yang, Y.[†], Min, J.[†], Song, Y., Tu, J., Mukasa, D., Ye, C., Xu, C., Heflin, N., & McCune, J. S. (2022). A wearable electrochemical biosensor for the monitoring of metabolites and nutrients. **Nature Biomedical Engineering**, 6, 1225–1235. Featured on Journal Cover.
7. Min, J.[†], Sempionatto, J. R.[†], Teymourian, H.[†], Wang, J., & Gao, W. (2021). Wearable electrochemical biosensors in North America. **Biosensors and Bioelectronics**, 172, 112750.
8. Song, Y.[†], Min, J.[†], Yu, Y., Wang, H., Yang, Y., Zhang, H., & Gao, W. (2020). Wireless battery-free wearable sweat sensor powered by human motion. **Science Advances**, 6(40), eaay9842.
9. Min, J., Yang, Y., Wu, Z., & Gao, W. (2020). Robotics in the gut. **Advanced Therapeutics**, 3(4), 1900125.

Other Publications

2024

10. Heng, W., Yin, S., Min, J., Wang, C., Han, H., Shirzaei Sani, E., Li, J., Song, Y., Rossiter, H. B., & Gao, W.* (2024). A smart mask for exhaled breath condensate harvesting and analysis. **Science**, 385, 954-961.
11. Xu, C., Song, Y., Sempionatto, J. R., Solomon, S. A., Yu, Y., Nyein, H. Y. Y., Tay, R. Y., Li, J., Heng, W., Min, J., Lao, A., Hsiai, T. K., Sumner, J. A., & Gao, W. (2024). A physicochemical-sensing electronic skin for stress response monitoring. **Nature Electronics**, <https://doi.org/10.1038/s41928-023-01116-6>.

2023

12. Ye, C., Wang, M., Min, J., Tay, R. Y., Lukas, H.; Sempionatto, J. R., Li, J., Xu, C., Gao, W. (2023). A wearable aptamer nanobiosensor for non-invasive female hormone monitoring. **Nature Nanotechnology**, <https://doi.org/10.1038/s41565-023-01513-0>
13. Song, Y., Tay, R. Y., Li, J., Xu, C., Min, J., Shirzaei Sani, E., Kim, G., Heng, W., Kim, I., Gao, W. (2023). 3D-printed epifluidic electronic skin for machine learning-powered multimodal health surveillance. **Science Advances**, 9(37), eadi6492.
14. Mukasa, D., Wang, M., Min, J., Yang, Y., Solomon, S. A., Han, H., Ye, C., Gao, W. (2023). A Computationally assisted approach for designing wearable biosensors toward non-invasive personalized molecular analysis. **Advanced Materials**, 35(35), 2212161.
15. Choi, Y., Ho, D. H., Kim, S., Choi, Y. J., Roe, D. G., Kwak, I. C., Min, J., Han, H., Gao, W., & Cho, J. H. (2023). Physically defined long-term and short-term synapses for the development of reconfigurable analog-type operators capable of performing health care tasks. **Science Advances**, 9(27), eadg5946.
16. Shirzaei Sani, E., Xu, C., Wang, C., Song, Y., Min, J., Tu, J., Solomon, S. A., Li, J., Banks, J. L., & Armstrong, D. G. (2023). A stretchable wireless wearable bioelectronic system for multiplexed monitoring and combination treatment of infected chronic wounds. **Science Advances**, 9(12), eadf7388. Highlighted in Caltech News, The Guardian, New Scientist, Materials Today, UPI, The Daily Beast, Tech Briefs, Le Monde, Business Insider, VOA News, Physics Today, The Hindu, CEP (AIChE), etc.

2022

17. Yu, Y., Li, J., Solomon, S. A., Min, J., Tu, J., Guo, W., Xu, C., Song, Y., & Gao, W. (2022). All-printed soft human-machine interface for robotic physicochemical sensing. **Science robotics**, 7(67), eabn0495. Featured on Journal Cover.

2020

18. Torrente-Rodríguez, R. M., Lukas, H., Tu, J., Min, J., Yang, Y., Xu, C., Rossiter, H. B., & Gao, W. (2020). SARS-CoV-2 RapidPlex: a graphene-based multiplexed telemedicine platform for rapid and low-cost COVID-19 diagnosis and monitoring. **Matter**, 3(6), 1981-1998.

Featured on Journal Cover.

19. Torrente-Rodríguez, R. M., Tu, J., Yang, Y., Min, J., Wang, M., Song, Y., Yu, Y., Xu, C., Ye, C., & IsHak, W. W. (2020). Investigation of cortisol dynamics in human sweat using a graphene-based wireless mHealth system. **Matter**, 2(4), 921-937.
20. Yang, Y., Song, Y., Bo, X., Min, J., Pak, O. S., Zhu, L., Wang, M., Tu, J., Kogan, A., & Zhang, H. (2020). A laser-engraved wearable sensor for sensitive detection of uric acid and tyrosine in sweat. **Nature biotechnology**, 38(2), 217-224.
21. Yu, Y., Nassar, J., Xu, C., Min, J., Yang, Y., Dai, A., Doshi, R., Huang, A., Song, Y., & Gehlhar, R. (2020). Biofuel-powered soft electronic skin with multiplexed and wireless sensing for human-machine interfaces. **Science robotics**, 5(41), eaaz7946.

2019

22. Song, Y., Min, J., & Gao, W. (2019). Wearable and implantable electronics: moving toward precision therapy. **ACS nano**, 13(11), 12280-12286.