

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

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

Research Mentor Yonglin Chen (MedE), Graduate Student
at Caltech Hyehyun Kim (MSE), Visiting Graduate Student
(6 female Hyunah Ahn (ChemE), Visiting Graduate Student
students) 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

Professional Activities

Reviewer of international Journal: Biosensors and Bioelectronics, ACS Photonics, ACS Applied Nano Materials, Scientific Reports, Analytical Chemistry, Talanta, IEEE Consumer Electronics Magazine, Electrochemistry Communications, ACS Applied Materials & Interfaces, ACS Applied Nano Materials, IEEE Open Journal of Engineering in Medicine and Biology, IEEE International Conference on Flexible and Printable Sensors and Systems, Sensors & Diagnostics.

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, >4100 citations, h-index 18, updated 09/2024) [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. (2023). Continuous biochemical profiling of the gastrointestinal tract using a multiparametric ingestible capsule. **Nature Electronics**, under 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., Schwarzingler, 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.