



Siddharth Krishnan

Assistant Professor of Electrical Engineering, and by courtesy, of Bioengineering and of Materials Science and Engineering

Bio

BIO

Siddharth is an Assistant Professor of Electrical Engineering and a Terman Faculty Fellow at Stanford University. Prior to this, he was a K99-funded Research Scientist in the groups of Prof. Daniel Anderson and Prof. Robert Langer at the Koch Institute for Integrative Cancer Research at MIT and at Boston Children's Hospital. He received BS and MS degrees from Washington University in St. Louis, and his PhD from the University of Illinois at Urbana-Champaign from Prof. John Rogers' group. His work has focused on the development of bioelectronic devices for sensing and therapeutics. He has published over 20 scientific papers, is an inventor several granted and pending patents and is co-founded of Rhaeos Inc., a company focused on translating his graduate work on wireless wearable diagnostic tools for neurological surgery. His work has been recognized through several awards, including a postdoctoral fellowship from the Juvenile Diabetes Research Foundation, the 2019 Illinois Innovation Prize, a graduate student medal from the Materials Research Society and being named on MIT Technology Review's Global Innovators Under 35 list.

ACADEMIC APPOINTMENTS

- Assistant Professor, Electrical Engineering
- Assistant Professor (By courtesy), Bioengineering
- Assistant Professor (By courtesy), Materials Science and Engineering
- Member, Bio-X
- Faculty Fellow, Sarafan ChEM-H
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Member, Stanford Diabetes Research Center, (2025- present)

HONORS AND AWARDS

- Terman Faculty Fellow, Stanford University
- K99/R00 Pathway to Independence Award, NIH-NIBIB
- Early Career Distinguished Presenter, Materials Research Society
- Global Innovators Under 35 (TR35), MIT Technology Review
- Illinois Innovation Prize, University of Illinois at Urbana-Champaign
- JDRF Postdoctoral Fellowship, Breakthrough T1D (Formerly JDRF)
- Chakrapani innovation award for outstanding PhD thesis, University of Illinois at Urbana-Champaign

PROFESSIONAL EDUCATION

- Postdoctoral Training, MIT
- PhD, University of Illinois at Urbana-Champaign
- MS, Washington University in St. Louis
- BS, Washington University in St. Louis

LINKS

- Lab Website: <https://krishnanlab.stanford.edu/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The Krishnan Lab develops bioelectronic devices, tools and systems for closed loop disease management. Our work is divided into the following broad areas:

1. Biohybrid electronics for therapy and sensing: we combine living cells as functional parts of implantable devices, leveraging their ability to produce complex biologic therapeutics in a constitutive or triggerable manner, and their ability to sense their complex dynamic environment. These efforts are focused on developed functional cures for diseases like Type I Diabetes and other conditions requiring the regular infusion of proteins, peptides or antibody drugs.
2. Digital drug release systems for particulate forms of biologic drugs: Many complex protein and peptide drugs are not stable in solution, thereby frustrating the ability to delivery them through pumps and autoinjectors. This need is particularly acute for drugs that need to be administered as emergency rescue therapies, such as glucagon in the context of type 1 Diabetes. We develop implantable, miniaturized microelectromechanical devices that can store particulate (powders, pills) forms of these drugs and release them in a close loop manner based on wireless inputs from sensors.
3. Wearable sensors: Wearables to detect biophysical (temperature, flow, cardiac activity) and biochemical markers of health are gaining importance for closed-loop disease management and personalized medicine. We design hardware for on-chip molecular profiling based on sampling biofluids in noninvasive or minimally invasive formats.
4. New wireless power architectures for implantable bioelectronics: We develop high-power, high-efficiency strongly coupled power harvesting system to power battery-free implant systems.

Teaching

COURSES

2025-26

- Bioelectronics: EE 120, EE 220, MATSCI 220 (Spr)
- Integrated Circuit Fabrication Processes: EE 212 (Aut)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Leen Abdul Razzak, Michelle Hedlund, Nathan Jensen, Emma Kranich, Jason Saunders

Postdoctoral Faculty Sponsor

Sunghoon Rho, Kecheng Wang

Doctoral Dissertation Advisor (AC)

Alice Gao, Huy Tran

Master's Program Advisor

Alan Mendoza Alderete, Mitch Peterson, Elinor Tandberg

Doctoral (Program)

Atharv Naik

Publications

PUBLICATIONS

- **Wireless battery-free oxygenation devices enable extended immunosuppression-free islet transplantation in minimally invasive sites** *DEVICE*
Krishnan, S. R., Bochenek, M. A., Pan, J., Pendyala, S., Chan, S., Liu, C., Prokop, E., Hoglebe, N., Rios, P. D., Lopez, D., Potdar, S., Gumustop, D., Her, et al
2026; 4 (5)
- **Emergency delivery of particulate drugs by active ejection using in vivo wireless devices.** *Nature biomedical engineering*
Krishnan, S. R., O'Keeffe, L., Rudra, A., Gumustop, D., Khatib, N., Liu, C., Yang, J., Wang, A., Bochenek, M. A., Lu, Y. C., Bose, S., Reed, K., Langer, et al
2026; 10 (1): 144-160
- **Materials approaches for next-generation encapsulated cell therapies.** *MRS communications*
Krishnan, S. R., Langer, R., Anderson, D. G.
2025; 15 (1): 21-33
- **A wireless, battery-free device enables oxygen generation and immune protection of therapeutic xenotransplants in vivo.** *Proceedings of the National Academy of Sciences of the United States of America*
Krishnan, S. R., Liu, C., Bochenek, M. A., Bose, S., Khatib, N., Walters, B., O'Keeffe, L., Facklam, A., Langer, R., Anderson, D. G.
2023; 120 (40): e2311707120
- **Continuous, noninvasive wireless monitoring of flow of cerebrospinal fluid through shunts in patients with hydrocephalus** *NPJ DIGITAL MEDICINE*
Krishnan, S. R., Arafa, H. M., Kwon, K., Deng, Y., Su, C., Reeder, J. T., Freudman, J., Stankiewicz, I., Chen, H., Loza, R., Mims, M., Mims, M., Lee, et al
2020; 3 (1): 29
- **Epidermal electronics for noninvasive, wireless, quantitative assessment of ventricular shunt function in patients with hydrocephalus** *SCIENCE TRANSLATIONAL MEDICINE*
Krishnan, S. R., Ray, T. R., Ayer, A. B., Ma, Y., Gutruf, P., Lee, K., Lee, J., Wei, C., Feng, X., Ng, B., Abecassis, Z. A., Murthy, N., Stankiewicz, et al
2018; 10 (465)
- **The road ahead for applications of mechanics in drug delivery by** *MECHANICS RESEARCH COMMUNICATIONS*
Sarmadi, M., Krishnan, S. R., Ramadi, K. B., Langer, R.
2022; 125
- **An on-skin platform for wireless monitoring of flow rate, cumulative loss and temperature of sweat in real time** *NATURE ELECTRONICS*
Kwon, K., Kim, J., Deng, Y., Krishnan, S. R., Choi, J., Jang, H., Lee, K., Su, C., Yoo, I., Wu, Y., Lipschultz, L., Kim, J., Chung, et al
2021; 4 (4): 302-312
- **Battery-free, fully implantable optofluidic cuff system for wireless optogenetic and pharmacological neuromodulation of peripheral nerves.** *Science advances*
Zhang, Y., Mickle, A. D., Gutruf, P., McIlvried, L. A., Guo, H., Wu, Y., Golden, J. P., Xue, Y., Grajales-Reyes, J. G., Wang, X., Krishnan, S., Xie, Y., Peng, et al
2019; 5 (7): eaaw5296
- **Fully implantable optoelectronic systems for battery-free, multimodal operation in neuroscience research** *NATURE ELECTRONICS*
Gutruf, P., Krishnamurthi, V., Vazquez-Guardado, A., Xie, Z., Banks, A., Su, C., Xu, Y., Haney, C. R., Waters, E. A., Kandela, I., Krishnan, S. R., Ray, T., Leshock, et al
2018; 1 (12): 652-660

- **Wireless, Battery-Free Epidermal Electronics for Continuous, Quantitative, Multimodal Thermal Characterization of Skin.** *Small (Weinheim an der Bergstrasse, Germany)*
Krishnan, S. R., Su, C. J., Xie, Z., Patel, M., Madhvapathy, S. R., Xu, Y., Freudman, J., Ng, B., Heo, S. Y., Wang, H., Ray, T. R., Leshock, J., Stankiewicz, et al
2018; 14 (47): e1803192
- **Epidermal Electronic Systems for Measuring the Thermal Properties of Human Skin at Depths of up to Several Millimeters** *ADVANCED FUNCTIONAL MATERIALS*
Madhvapathy, S. R., Ma, Y., Patel, M., Krishnan, S., Wei, C., Li, Y., Xu, S., Feng, X., Huang, Y., Rogers, J. A.
2018; 28 (34)
- **Multimodal epidermal devices for hydration monitoring** *MICROSYSTEMS & NANOENGINEERING*
Krishnan, S., Shi, Y., Webb, R., Ma, Y., Bastien, P., Crawford, K. E., Wang, A., Feng, X., Manco, M., Kurniawan, J., Tir, E., Huang, Y., Baloch, et al
2017; 3: 17014
- **Epidermal devices for noninvasive, precise, and continuous mapping of macrovascular and microvascular blood flow** *SCIENCE ADVANCES*
Webb, R., Ma, Y., Krishnan, S., Li, Y., Yoon, S., Guo, X., Feng, X., Shi, Y., Seidel, M., Cho, N., Kurniawan, J., Ahad, J., Sheth, et al
2015; 1 (9): e1500701