

Miniaturized Biomedical Devices for Navigation, Sensing and Stimulation

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Location: EEB 248

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Abstract: Medical electronic devices are an integral part of the healthcare system today and are used in a variety of applications around us. The design of such devices has several stringent requirements, the key being miniaturization, low-power operation, and wireless functionality. In this talk, I will present CMOS-based miniaturized, low-power and wireless biomedical devices in three broad domains: (a) in-vivo navigation and tracking, (b) in-vivo sensing of biomarkers and physiological signals, and (c) in-vivo stimulation and drug delivery. For the first part, I will talk about ingestible and implantable devices that can be used to achieve sub-mm tracking accuracy in 3D and in real time inside the human body, which is very useful for localizing devices in the GI tract, during precision surgeries and minimally invasive procedures. In the second part, I will present the design of a novel on-chip 3D magnetic sensor that is highly miniaturized and low-power, thus making it suitable for many biomedical applications. In the last part, I will briefly talk about my recent work on a wearable device for multi-modal sensing from sweat, followed by ongoing work on devices for stimulation and drug-delivery. I will end the talk with a glimpse of my future research direction.



Biography: Saransh Sharma received the B.Tech. degree in Electronics and Electrical Communication Engineering from IIT Kharagpur, India, in 2017 and the M.S. and Ph.D. degree in Electrical Engineering from Caltech, Pasadena, CA, USA, in 2018 and 2023 respectively. He is currently a post-doctoral scholar at MIT, Cambridge, MA, USA. His research is on integrated circuits and systems design, with special emphasis on low-power biomedical applications. He was a recipient of the Demetriades-Tsafka-Kokkalis award for best PhD thesis at Caltech in biotechnology and related fields, the Jakob van Zyl Predoctoral Research award at Caltech, Lewis Winner Award for Outstanding Paper at ISSCC 2024, Charles Lee Powell Fellowship at Caltech, and Excellence in Mentorship award at Caltech for mentoring undergraduate and graduate research students.