

ECSE Faculty Candidate Seminar

11:30 AM to 12:30 PM

Tuesday, March 8, 2022

In-person: White 411 and Virtual

Zoom Webinar ID: 940 7438 8634

Passcode: 357363

Next Generation Bioelectronic Medicine: Wireless Microelectronic Systems

Abstract: The ability to understand living systems in the body and attain therapeutic effects at target organs promises to transform therapies for complex diseases and conditions that cannot be treated adequately with drug-based therapies alone. The last decade has seen rapid advances in implantable medical devices (implants), ranging from new materials to increased implant sophistication and beyond. Despite these advances, existing implant technologies are heavily reliant on wires and batteries, creating problems for chronic use, while emerging wireless implant systems lack the size scalability necessary to minimize tissue damage and hence enable chronic use of the implant. My research focuses on addressing the challenges related to miniaturization to realize safe, chronic, scalable wireless microelectronic systems based on ultra-miniature implants with complex sensory and actuation functions for future bioelectronic medicine; these systems can seamlessly interface with the human body and operate at both shallow and deep tissue depths.

In this talk, I will present the first minimally invasive wireless system to monitor deep-tissue oxygenation. Spanning from the development of oxygen sensor implant enabled by custom integrated circuit and microsystems technologies to a wireless power/data transmission strategy, I will discuss the design of each fundamental component and show how we integrate these components to build the complete system. System-level in vivo and ex vivo demonstrations in this work highlight the enormous capabilities of wireless implant systems. I will also present our work in the extreme miniaturization of ultrasonic implants, and a new class of electro-optic sensors that will enable large-scale, high-density wireless neural interfaces. I will conclude by discussing research directions that I would like to pursue in the future.



Soner Sonmezoglu
University of California, Berkeley

Bio: Soner Sonmezoglu is currently a postdoctoral researcher in the EECS Department at the University of California, Berkeley, in Professor Michel M. Maharbiz's Group. He received his Ph.D. degree in Electrical and Computer Engineering from the University of California, Davis under the supervision of Professor David A. Horsley in 2017. He received a B.S. degree with a minor in Solid-State Physics and an M.S. degree from Middle East Technical University, Turkey in 2010 and 2012, respectively. His research interests are primarily in integrated devices and systems for wireless biomedical applications. Soner's work has been published in top-tier Nature, OSA, and IEEE journals and conference proceedings. He is a recipient of numerous awards, including the UC Davis Graduate Division Fellowship and the Graduate Fellowship provided by the Scientific and Technical Research Council of Turkey.

This is to certify that _____ attended this seminar. Certified by _____.
Certificates of attendance and other evidence of CPD activity should be retained by the attendee for auditing purposes.



CASE SCHOOL
OF ENGINEERING

CASE WESTERN RESERVE
UNIVERSITY