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Soft Electronics for Mobile Health and Human-Centered Robotics

ABSTRACT:

Internet of things (IoT), robotics, big data and artificial intelligence (AI) hold the key to Industry 4.0. To stay relevant in the AI age, humans must collaborate or even merge with electronics, machines and robots to realize internet of health (IoH), augmented reality (AR), as well as augmented human capabilities. However, bio-tissues are soft, curvilinear and dynamic whereas conventional electronics and machines are hard, planar, and rigid. Over the past two decades, soft electronics blossom as a result of new materials, novel structural designs, and digital manufacturing processes. This talk will discuss our research on the design, fabrication, conformability, and functionality of soft bio-integrated and bio-mimetic electronics based on inorganic functional materials such as metals, silicon, carbon nanotubes (CNT), and graphene. In particular, epidermal electronics, a.k.a. electronic tattoos (e-tattoos) represent a class of noninvasive stretchable circuits, sensors, and stimulators that are ultrathin, ultrasoft and skin-conformable. My group has invented a dry and freeform “cut-solder-paste” method for the rapid prototyping of multimodal, wireless, or very large area e-tattoos that are also high-performance and long-term wearable. The e-tattoos can be applied for physiological sensing and prosthesis/robot control. Recently, we have also engineered e-skins based on electrically conductive porous nanocomposite. The hybrid piezoresistive and piezocapacitive response has enabled high pressure sensitivity of the e-skin over wide pressure ranges. A perspective on future opportunities and challenges in this field will be offered at the end of the talk.

BIOGRAPHY:

Dr. Nanshu Lu is currently Temple Foundation Endowed Associate Professor at the University of Texas at Austin. She received her B.Eng. from Tsinghua University, Beijing, Ph.D. from Harvard University, and then Beckman Postdoctoral Fellowship at UIUC. Her research concerns the mechanics, materials, manufacture, and human or robot integration of soft electronics. She has been named 35 innovators under 35 by MIT Technology Review. She has received US NSF CAREER Award, US ONR and AFOSR Young Investigator Awards, 3M non-tenured faculty award, and iCANX/ACS Nano Inaugural Rising Star Lectureship. She has been selected as one of the five great innovators on campus and five world-changing women at UT-Austin. She is named a highly cited researcher by Web of Science. For more information, please visit Prof. Lu’s research group webpage at <https://lu.ae.utexas.edu/>.



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