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강연제목: 차세대 신경 보철을 위한 저전력 유연 인공 신경 /
Low-power soft artificial nerves for next-generation neuroprosthetics

Abstract: In modern society, as aging and industrialization accelerate, brain and neural disorders such as motor neuron degeneration and spinal cord injury are increasing. They are having a significant impact on patients' lives and society. To help patients recreate lost function, neuroprosthetics have been developed to replace damaged nerves and restore the function the patient has missed. Current neuroprosthetic devices have significantly advanced the field of neurorehabilitation, but their rigid digital components and computing systems hinder patients from using them during daily activities for a long time. Therefore, it is necessary to develop more soft, biomimetic, and power-efficient systems for demonstrating low-power, long-term wearable/implantable, and user-friendly neuroprosthetics. In this talk, we present our research on the development of low-power soft artificial nerves for next-generation neuroprosthetics. In particular, we introduce stretchable efferent nerves based on organic stretchable synaptic transistors that precisely emulate the functions of neuromuscular junctions and muscle actuation mechanisms, enabling biomimetic actuation of artificial muscles. In addition, we applied the soft artificial nerves as low-power stretchable neuromorphic implants with real-time closed-loop proprioceptive feedback to restore coordinated and smooth motions in the legs of mice with motor disorders. Our study will provide the potential of soft neuromorphic devices as low-power future neurorehabilitation devices.

Brief Biosketch

이영준 교수는 포항공과대학교 신소재공학과에서 박사학위를 받았고 (2018), 서울대학교에서 박사 후 연구원과(2018~2019), 삼성종합기술원에서 책임연구원으로(2019~2021) 근무하며 유연/신축성 고분자 전자 재료와 생체전자소자를 연구하였다. 이후 미국 스탠포드대학교에서 박사 후 연구원으로 근무하였고(2021~2024), 현재 KAIST 뇌인지과학과에서 조교수로 근무하며 소프트 전자 재료 기반 뇌-기계 인터페이스, 저전력 뉴로모픽 신경 보철, 유연/신축성 생체 전자소자를 연구하고 있다.

Yeongjun Lee is an assistant professor in Brain and Cognitive Sciences at KAIST. He received his Ph.D. in Materials Science and Engineering (MSE) from POSTECH, South Korea (2018). He worked at Seoul National University as a postdoctoral researcher (2018-2019) and at Samsung Advanced Institute of Technology as a staff researcher (2019-2021). After that, he joined Stanford University, USA, as a postdoctoral researcher (2021-2024). His research interests include soft materials and devices for brain-machine interfaces, stretchable/wearable electronics, and low-power neuromorphic applications.