이름: 김홍준 / HongJune Kim
직위: 박사후 연구원 / post-doc fellow
소속: 건국대학교병원 임상의학연구소 /
Konkuk university medical center Clinical research Institute
기타소속:

강연제목: 신경영상 기술과 설명 가능한 인공지능을 활용한 인공신경망 기반 운동 제어 뇌-컴퓨터 인터페이스 개발 (Development of the deep neural network-based brain-computer interface by the explainable AI and the neuroimaging techniques)

Abstract: With the development of deep neural networks (DNNs), the brain-computer interface (BCI) employs them to improve decoding movement from neural signals (Yeom et al., 2020). Although DNNs require sufficient datasets as they become more profound and complex, most BCI research still trains them with a subject-wise dataset. For the current issue, some research has tried to utilize the grouped dataset comprised multiple subjects. However, the neural signal characteristics within- and between subjects limited BCI performance and caused generalization failure. Here, we introduce a method utilizing the grouped dataset by simultaneously considering the between- and within-subject neural data features identified by explainable AI (XAI)-based neuroimaging technique. We have extracted the general features that the DNN utilized for decoding continuous hand movement from the magnetoencephalogram (MEG) datasets through XAI (Kim et al., 2023; Yeo et al., 2024). Then, we proposed a transfer learning strategy, IV-TL (Kim et al., 2024). This strategy transferred the between-subject features, hidden within DNNs for grouped dataset, toward the individuals. Simultaneously, the IV-TL weighted the within-subject features calculated from the individual subject's variability matrix. This method could improve the decoding accuracy to 8.76%. Our research demonstrated a possible method to generalize the individual datasets into a big one to train large-scale DNNs.

Brief Biosketch

김홍준 박사는 2023 년 서울대학교 뇌인지과학과 박사과정을 졸업한 후, 현재 건국대학교 병원 임상의학연구소의 NICA 연구소에서 선임급 연구원으로 있습니다. 현재, 사지 운동을 제어하는 Brain-computer interface 개발과 인공지능 기반 신경 영상 기술을 연구하고 있으며, 2023 년 대한 뇌기능맵핑학회(KHBM)에서 젊은 연구자상을 수상한 바 있습니다.