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강연제목: 다기능 의료 영상 구현을 위한 새로운 생물학적 동역학 모델

Multi-functional Medical Imaging Based on a Biologically Inspired Novel Kinetic Model

Abstract

Dynamic [18F]fluorodeoxyglucose (FDG) PET has the potential to provide detailed insight into glucose metabolism in vivo, yet existing kinetic models often lack physiological interpretability and robustness. We propose a novel dynamic [18F]FDG PET model that explicitly quantifies glucose transporter (GLUT) and hexokinase activities, the key drivers of cellular metabolism. By integrating these molecular mechanisms, the model enhances estimation of kinetic parameters (K_1^* , k_2^* , k_3^*) and metabolic rate (MR) derived from irreversible two-tissue compartment analysis. Voxel-wise fitting to human brain data yielded high-resolution maps of GLUT, hexokinase, and derived rate parameters, clearly delineating brain structures and revealing region-specific metabolic patterns. This physiologically grounded framework improves the reliability and interpretability of dynamic FDG PET, potentially advancing quantitative imaging of neurological disorders and metabolic research.

Brief Biosketch

조송현 박사는 KAIST 의과학대학원의 연구조교수로 재직 중이다. 한양대학교를 졸업한 후 동 대학원에서 전자 및 컴퓨터 공학 박사학위를 받았다. LG 전자 CTO 부문에서 책임연구원으로 근무하며 자율주행 및 주행보조시스템을 위한 딥러닝 기반 컴퓨터 비전 기술을 개발했다. 현재는 이러한 산업계 AI 경험을 바탕으로 AI 기술을 바이오메디컬 이미징 시스템으로 확장하는 연구에 집중하고 있다. 대한의용생체공학회 및 Brain & Brain PET 학회 등에서 활발히 활동하고 있다.

Song Hyun Jo is a Research Assistant Professor at the Graduate School of Medical Science and Engineering, KAIST. He received his Ph.D. in electrical and computer engineering from Hanyang University. At LG Electronics CTO Division, he served as a Principal Research Engineer, developing deep learning-based computer vision technologies for autonomous driving and advanced driver assistance systems. Building on his industrial AI experience, his current research focuses on extending AI technologies to biomedical imaging systems. He actively participates in the Korean Society of Medical and Biological Engineering and Brain & Brain PET conferences.