Artificial Intelligence and Neuroscience: A Review

Pushparani M. K[1], Preetham S[2], Ankith Y Kunder[3], Vaishnavi Udupa[4], PS Haiqa[5]

Associate Professor, DEPT. of CSD[1]

UG Scholar, DEPT. of CSD[2,3,4,5]

Alvas Institute of Engineering & Technology, Mijar, Karnataka, India

drpushparani@aiet.org.in[1], preethams1737@gmail.com[2], ankithkunder16@gmail.com[3],

vaishnaviudupa20@gmail.com[4], haiqasheik1@gmail.com[5]

Abstract: *The intersection of Artificial Intelligence (AI) and neuroscience represents one of the most exciting frontiers in modern science and technology. As neuroscience generates ever-larger datasets from neuroimaging, electrophysiology, and genomics, AI provides the computational tools to analyze, interpret, and model these complex datasets. In return, neuroscience offers biological principles that inspire the development of novel AI architectures, such as neural networks and neuromorphic systems. This review explores the bidirectional relationship between AI and neuroscience, covering recent breakthroughs, core methodologies, applications in clinical and cognitive neuroscience, and the ethical and technical challenges that must be addressed. We discuss the promise of brain-computer interfaces (BCIs), explainable AI, and cognitive augmentation Innovative technologies such as Artificial Intelligence (AI), deep learning, Machine learning and optogenetics have been considered key components in the contribution to the acceleration of numerous discoveries in life sciences, particularly in the field of neuroscience. With the inherent progress of AI in particular, it is no surprise that 'neuroscience', a complex study of the nervous system could benefit from the endless capabilities that AI has to offer with its magnification of the human mind. Although our minds are capable of extraordinary endeavours, there is a limit as to how much information we may mentally be able to process. Alongside the advancements of AI systems, we may be able to drive neuroscience forward and unlock the secrets of the human brain with one of its applications being the ability to identify neurological problems and detect neurotransmitters. This review therefore discusses the fruitful relationship between AI and neuroscience and its applications to furthering our knowledge in this field. while proposing a roadmap for future interdisciplinary research.*

Keywords: Artificial Intelligence, Neuroscience, Brain- Computer Interfaces, Deep Learning, Neuroimaging, Reinforcement Learning, Cognitive Neuroscience, Neuromorphic Computing, Explainable AI, Neural Decoding, Personalized Medicine