Quantum-Optimized AI for PET Scan Analysis: Early Cancer Detection through Machine Learning

Introduction

Cancer remains a leading global cause of mortality, with early detection being critical for effective treatment. Positron Emission Tomography (PET) scans play a vital role in oncology by identifying and monitoring malignant tumors through functional imaging of metabolic activity. AI-driven analysis, particularly using deep learning techniques like convolutional neural networks (CNNs), has enhanced cancer detection and classification. However, classical AI methods face challenges in processing speed, accuracy, and sensitivity to early-stage tumors due to subtle imaging differences. Quantum computing offers a promising solution by efficiently handling vast datasets, potentially overcoming these limitations. This paper explores the integration of quantum-optimized AI to improve PET scan analysis, enabling earlier and more precise cancer detection.