

Artificial Intelligence for Pancreatic Cancer Detection: A Comprehensive Survey of Deep Learning, Multi-Modal Fusion, and Explainable AI Techniques

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Abstract:

Pancreatic cancer is stated as one of the deadliest forms of cancer in the world. Pancreatic cancer is detected at a very advanced stage, and the percentage of survival is low for pancreatic cancer. One of the major issues faced while detecting pancreatic cancer is the detection of the cancer from the images. In recent times, due to the development of Artificial Intelligence (AI) technologies like Machine Learning (ML) and Deep Learning (DL), the detection and classification of pancreatic cancer from various images such as computed tomography scans and positron emission tomography scans are becoming more efficient. This study critically evaluates 31 recent research studies on the application of AI in pancreatic cancer detection using traditional ML algorithms, CNNs, transformer models, semi-supervised models, hybrid models of metaheuristic optimization techniques, and XAI algorithms. This review also critically evaluates the latest research trends in the field of AI in the diagnosis of pancreatic cancer. The objectives of this review are to present a taxonomy on the latest research trends in AI in the diagnosis of pancreatic cancer and to identify the major challenges to be resolved in the diagnosis of pancreatic cancer using AI models. Furthermore, the study presents a comparative analysis of current AI methodologies and highlights future research directions for clinically deployable pancreatic cancer diagnostic systems.

Keywords:

Pancreatic cancer, deep learning, machine learning, convolutional neural networks, Swin Transformer, multi-modal fusion, medical image analysis, explainable AI.