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The Application of Convolutional Neural Networks (CNN) in the Detection and Segmentation of Brain Tumors in medical imaging

Computed Tomography (SPECT), Positron Emission Tomography (PET) and Computed Tomography (CT) plays a crucial role in the non-invasive detection of brain tumors, offering detailed images that are essential for effective treatment planning. However, the interpretation of these images is traditionally time-intensive and requires significant expertise. This presentation introduces how CNNs, a subset of deep learning algorithms adept at analyzing visual data, are being leveraged to automate the detection and segmentation of brain tumors, presenting a significant advancement in diagnostic methodologies. The presentation delves into the architecture of CNNs, including their convolutional, pooling, and fully connected layers, and elucidates how these networks extract and learn from the complex patterns in medical imaging data to distinguish between healthy tissue and tumorous areas. Highlighting recent studies and advancements, the seminar demonstrates CNNs' capability to significantly improve diagnostic accuracy and speed, thereby enhancing patient outcomes. Additionally, the presentation addresses the challenges faced in applying CNNs to medical imaging, such as data limitations and computational demands, and discusses strategies like data augmentation and transfer learning to overcome these hurdles. By examining optimization techniques and the critical role of image processing methods, the presentation illustrates the ongoing progress and potential of CNNs in transforming neuro-oncology and radiology into more automated and patient-focused fields.

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