Concepts and Applications of Convolutional Neural Networks (CNN) for Radiology Image Analysis for Better Treatment Planning

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With the advent of artificial intelligence, the perspective of radiology diagnostics is being changed in terms of automatization towards quick and effective treatment planning. Deep learning techniques, a typical artificial intelligence technology, have become prevalent in medical images analysis in this decade. Convolutional Neural Networks (CNN) are prominent deep learning models that have been extensively used in many aspects of radiology image analysis, including almost all kinds of modalities like X-Ray, CT, MRI etc. to improve the precision and accuracy of computer-aided diagnosis. It is designed to learn spatial hierarchies of features through backpropagation over multiple layers, such as convolution, pooling, and fully connected layers to interpret complex but latent information underlying in the images. The objective of this tutorial cum hands-on session will be to explain the basics of different building blocks of various kinds of CNNs with illustrations through different use cases, so that it will be useful to understand their power and potential. The hands-on will deliver the coding skills required to implement CNN architecture for chest X-Ray and brain hemorrhage classification in CT scans followed by brain tumor contouring using the U-Net model, another kind of convolutional architecture for image segmentation. Eventually the candidates is expected to be skilled in implementing CNN for various other kinds of translational health sciences problems like gene network inference, proteomics analysis etc.