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Abstract:

Computed tomography is a form of imaging commonly used for diagnostic purposes and is more commonly used for surgery preparation. The ability to accurately segment a CT image is a commodity as it allows for physicians to clearly assess the steps needed to carry out a procedure. Convolutional Neural Networks (CNNs) are trainable deep-learning models that have been increasingly used to automatically segment CT images, with the goal of eliminating the need for manual segmentation. CNNs use a complex network that is modeled after human thought processes, thus the “neural network” moniker. Through many convolutional layers, CNNs downscale and upscale images to identify and extract notable image features through training. MS-D Net has emerged as a high-performing CNN, using mixed-scaling to reduce the amount of down and upscaling needed to extract key features from medical images. The goal of this research project is to properly assess the performance of MS-D Net on segmenting publicly available clinical CT datasets, with a special emphasis on bony structures within the head. A high performing MS-D Net architecture can then be used to assist in the development of further imaging modalities within the Applied Nanotechnology Lab at UNC Chapel Hill.

Fig. 4 (left): A visual representation of a convolution. The kernel, on the right, is a 2x2 matrix that parses the input image on the left. It acts like an operator, filtering the inputs into corresponding **tensors** in the output.