

Deep Learning for Assisted Spine Clinical Surgery

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Spinal pains are mostly caused by joints that have worn out over time or degenerated due to disease. Spinal fusion is used to join together the vertebrae on either side of a joint, making the two bones to grow together into one and stopping the motion causing pain. Pedicle screws and rods are often required in the spinal fusion. Here, we need to develop the pre-surgical clinical diagnosis and simulation software platform to reduce the risk of pedicle screw misplacement. So, we have accomplished two tasks: (1) the vertebrae precise segmentation and labeling from the CT image slices for the 3D visualization or virtual spinal surgery simulation software and (2) the computer-assisted individual drill guide template generated for minimally invasive pedicle screw placement trajectory. We will introduce three related research works. Firstly, we develop a 3D modeling and manipulation software platform for precisely clinical diagnosis and simulation. Secondly, we propose a deep learning method for spine segmentation and recognition. Finally, we need to synthesize as many lumbar spine CT Images as possible for the deep learning in the training process to improve the accuracy of vertebrae segmentation based on the Generative Adversarial Networks (GAN) and AutoEncoder methods.