Who?

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**Research Interests**
Computer Vision, Machine Learning, Artificial Intelligence, etc.
Background

Spine Segmentation
Spinal diseases greatly limit body mobility, block nervous system, and deteriorate quality of life worldwide, especially to old people. However, clinical diagnosis of these spinal diseases still relies on laborious workloads and suffers from high interobserver variations, because experienced radiologists make decisions based on their level of expertise and always get different radiological grading results even according to the same grading criterion. Mis-grading and inaccuracy clearly affect the decision of optimal therapeutic planning. Automated semantic segmentation of neural foramen, intervertebral discs, and vertebrae could help doctors to diagnosis spinal diseases and also plays an important role in surgery navigation.
Background

Spine Structure

The image is from [1].
Background

**Deep Learning & Spine Segmentation**
Deep learning has boosted the development of computer vision, especially in image processing. In the field of medical image segmentation, many researcher proposed well-designed convolutional neural networks (CNN) to achieve accurate and automatic segmentation. For spine segmentation, there are also many works for this.
Spine-GAN

Fig. 1. Spine-GAN directly localizes all target structures while classifying target structures with crucial radiological diagnoses (i.e., normal and abnormal) with pixel-level precision (i.e., each pixel has the possibility of errors, even including the background). The goal of the segmentation network is to infer the segmentation network to produce higher correct predictions, which efficiently promotes both sensitivity and convergence performance.

Fig. 2. The segmentation network aims at generating pixel-level segmentation and radiological classification of multiple spine structures. The AACE module does not only preserve fine-grained information but also recovers spatial dimensional detail. The Local-UTM learns spatial pathological correlations between surrounding abnormal spinal structures.

The image is from [3].
The image is from [4].
U-Net

Fig. 3. HeLa cells on glass recorded with DIC (differential interference contrast) microscopy. (a) raw image. (b) overlay with ground truth segmentation. Different colors indicate different instances of the HeLa cells. (c) generated segmentation mask (white: foreground, black: background). (d) map with a pixel-wise loss weight to force the network to learn the border pixels.

The image is from [4].
U-Net
Reference
