# Invited Talk: U-Net

## Convolutional Networks for Biomedical Image Segmentation

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In the last years, deep convolutional networks have outperformed the state of the art in many visual recognition tasks. A central challenge for its wide adoption in the bio-medical imaging field is the limited amount of annotated training images. In this talk, I will present our u-net for biomedical image segmentation. The architecture consists of an analysis path and a synthesis path with additional shortcut-connections. The network is trained end-to-end from scratch with only approximately 30 annotated images per application. The surprisingly simple strategy to train a network with such a low number of samples is a data augmentation with elastic deformations. Furthermore, the u-net can segment arbitrarily large images with a seamless tiling strategy. For 3D images we have developed a training strategy to learn a full 3D segmentation from a few annotated slices per volume. This can be used in a semi-automated setup to create a dense segmentation from the sparse annotations on the same volume, or in a fully-automated setup, where sparse annotations speed up the training data generation significantly.



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