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Convolutional neural networks for DESY photon science

Tuesday, 12 November 2019 18:05 (25 minutes)

We are exploiting possible applications of artificial intelligence at the German electron synchrotron (DESY) in Hamburg, in particular in the field of photon science. Our current focus is on the use of convolutional neural networks applied to 2D and 3D image analysis for life science.

We will present successful applied semantic segmentation of volumetric 3D synchrotron radiation micro-computed tomography (SR μ CT) data with a U-Net. We have trained a convolutional neural network to segment biodegradable bone implants (screws) and degeneration products from bone and background. The results obtained significantly outperform the previously used semi-automatic segmentation procedure in terms of accuracy and has successfully been applied to more than 100 rather heterogeneous datasets. Remarkably the performance of the U-Net segmentation is considerably better than the experts segmentation that has been used for training.

In addition our ongoing work tackling for instance segmentation (SR μ CT) in the context of material science and object detection and classification for cryo electron tomography will be introduced. The machine learning efforts at DESY-IT also include the development of a classification/filter method for XFEL SFX diffraction data.

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