

Convolutional neural networks in classification of multi-photon coincidences in J-PET scanner

Sunday, 10 October 2021 15:40 (20 minutes)

Paweł Konieczka, on behalf of the J-PET collaboration

Convolutional Neural Networks are excellent at analyzing images by learning abstract representations. CNN has been an overwhelming strategy in computer vision tasks and has achieved expert-level performances in various fields. There has been a surge of interest in the potential of CNN among radiology researchers and several studies have already been published in areas such as classification [1] and image reconstruction [2].

First general methodology to transform a non-image data into an image for CNN architectures has been presented in [3]. Nevertheless, this method cannot be applied to large data sets, where number of features is very small, because of computational complexity of PCA. The introduction of scheme of non-image data transformation into 2-dimensional matrices will be proposed [4].

The goal of this poster is to present results of multi-photon coincidences classification in J-PET scanner using CNNs. Bayesian optimization of two convolutional network architectures (DeepInsight [3], YOLOv1 [5]) will be presented.

References:

- [1] Yasaka, Koichiro, et al. Deep learning with convolutional neural network for differentiation of liver masses at dynamic contrast-enhanced CT: a preliminary study. *Radiology*, 2018, 286.3: 887-896.
- [2] Liu, Fang, et al. Deep learning MR imaging-based attenuation correction for PET/MR imaging. *Radiology*, 2018, 286.2: 676-684.
- [3] Sharma, Alok, et al. DeepInsight: A methodology to transform a non-image data to an image for convolution neural network architecture. *Scientific reports*, 2019, 9.1: 1-7.
- [4] Raczyński, Lech, Introduction of non-image PET data transformation to image-form approach for classification using Convolutional Neural Networks. 1st Symposium on Theranostics, 2021.
- [5] Redmon, Joseph, et al. You only look once: Unified, real-time object detection. In: *Proceedings of the IEEE conference on computer vision and pattern recognition*. 2016. p. 779-788.

E-mail: pawel.konieczka@ncbj.gov.pl

Primary author: KONIECZKA, Paweł (NCBJ)

Presenter: KONIECZKA, Paweł (NCBJ)

Session Classification: Poster Session