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Introduction of non-image PET data transformation to image-form for classification using Convolutional Neural Networks

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Recently, Convolutional Neural Networks (CNNs) [1] have achieved state-of-the-art performance in many areas including medical sciences, and are the method of choice commonly used for data recognition or classification. CNNs have proven to work most efficiently on 2-dimensional data that are in form of images.

In case of Positron Emission Tomography (PET) [2,3] studies, CNN may be applied directly to the reconstructed distribution of radioactive tracer injected to the patient's body, as for example a pattern recognition tool. Nonetheless, much PET data still exists in non-image format and therefore
opens challenging research questions on whether they can be effectively trained using CNN. Examples of such tasks are estimation of time-of-flight from signals registered in scintillators [4] or classification of coincidence events acquired by PET scanner [5].

The goal of this presentation is the introduction of scheme of non-image data transformation into 2-dimensional matrices, as a preparation stage for classification based on CNNs. The first work to apply CNN on different kinds of non-image datasets, e.g., gene expression or text information, was
proposed in [6]. Here, we will focus mainly on the problem of processing of vectors with small number of features in comparison to the number of pixels in the output images. As an example, a discussion of application of the proposed methodology to classification of PET coincidence events will provided [7].

References

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