MASTER'S THESIS

Building a machine learning model to support medical diagnoses

Abstract

Machine learning is increasingly used to solve tasks in many different fields. Thanks to technological progress and increasing computing power of computers, deep learning used in processing large data sets is currently particularly popular. Deep learning algorithms have an important application in the field of medicine because they achieve very good results in problems related to image processing such as classification, segmentation, object detection.

In this work, deep learning techniques - convolutional neural networks and transfer learning - were used in the task of classifying X-ray images to detect pneumonia in a patient. The results obtained on a small data set (2,560 images) were compared using a convolutional network built from scratch and five publicly available models, trained on the ImageNet set, used as extractors of features in transfer learning. 95.70% accuracy was obtained for the convolutional neural network, which is the best of the results for models built from scratch in all studies on the selected data set. To compare all the models trained in this work, a sensitivity measure was used, because it best represents the ability of a given algorithm to detect a disease. The highest sensitivity value, 95%, was achieved for a simple neural network serving as a classifier for data obtained as a result of the extraction of features from a set of X-ray images using the MobileNet model.

The use of transfer learning allows to significantly simplify the process of adjusting the architecture and model parameters to the task being solved, and often allows to obtain better results in less time than in the case of models built from scratch.