Detection of signs of damage that suggest cell proliferation on PET scans

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Abstract

Due to the fact that the amount of PET and CT scans is low, traditional supervised learning algorithms are not, or only with great difficulties are applicable to detect and map tissue lumping.

One of the possibilities to tackle this problem can be to use the technology called 'transfer learning'. When using this technology, we use segmentators that have previously been trained on data that are similar, but slightly different compared to the available small dataset's elements. These segmentators are then trained using the available data to reach the desired outcome.

Another approach is to generate a synthetic train dataset, then use the artificially generated data to train a segmentator. For this approach we decided to use a certain - Pix2Pix[1] - type of deep learning networks, which would let us extract the background and foreground pixels' texture, so that we could generate the artificial data.

For the available dataset we configured the previously prepared Pix2Pix algorithm. Initially we tried to train the algorithm to generate recordings that are similar to the original data, from random noise that's format is the same as of the original dataset's elements'. Since this approach hadn't been satisfactory, we decided to annotate the original data. Firstly, we used the color white to mark the significant area to the Pix2Pix, while using black for rest of the image. Afterwards we segmented the data in more detail manually, using an image editor program. Since the manual annotation has proven time-consuming, to load the files, and to save them in the desired format we've written scripts to speed up the procedure. After the successful annotation, we altered the Pix2Pix algorithm in accordance with the more detailed annotation method. The results of these actions have proven to be better, however there were a good amount of images on which there were inexplicable burnouts, so we continued to try other different methodologies. We separated the body, the lungs, the lung lobes, the interlobular section, and - on the images on which they were observable - the tumors as well. Because the results were not satisfactory yet again, we reduced the amount of classes to the whole body, the two lung lobes, and the tumors.

Keywords: generated data, segmentation

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References

[1] *Pix2Pix*. URL: `https://phillipi.github.io/pix2pix/`.