FYP exercises - Images

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Segmentation evaluation

Load an example image and its ground-truth mask (for example one that you created yourself with LabelStudio).

- Investigate 2-3 different thresholding or other segmentation methods available in `skimage` to predict masks for your image.
- For each method, create a predicted mask, and calculate the Dice score between the prediction and ground-truth mask. Visualize the results and see if the ranking by Dice score, corresponds with your intuition.
- How could you combine the results of different segmentation methods into a single prediction? Does this give a better score, than the methods individually?

Gaussian blur

Load an example image and convert it to grayscale (or select just one channel).

- Select 5x5 patch of pixel locations somewhere in the center of the image, and inspect the pixel values at these coordinates.
- Use `sklearn.filters.gaussian` to blur the image, with different values of `sigma`. View the result, and inspect your 5x5 pixel values - do they change as you expect?
- Resize the image to 25% of its original size, and do the same blurring as you did above. Is the effect of each sigma the same as before?
- Now look at how a 5x5 patch of pixels in the corner of the image has changed - is this what you would expect?
- Investigate how you can blur the image only in the x, or only in the y-direction.
- What happens if you do not convert the image to grayscale?

Filtering, pixel classification

Load an example image, you can use the grayscale or RGB version, or filter different channels with different filters.

- Investigate edge filtering from `skimage`, here you can find some examples: `https://scikit-image.org/docs/stable/auto_examples/edges/plot_edge_filter.html`
- Select a total of 5-10 filters, consisting of blurring filters (with different sigmas) and edge filters.
- Create a dataset based on these filters, where x and y have as many rows as the total pixels in your image, an x has 5-10 dimensions based on the filtering you have done.
- Train a k-NN classifier on this dataset, and apply the classifier on a different image. Remember, you need to also filter/transform this image.
- Play around with this method, you can use for example `https://scikit-image.org/docs/stable/auto_examples/segmentation/plot_trainable_segmentation.html#sphx-glr-auto-examples-segmentation-plot-trainable-segmentation-py` for inspiration.