

Deep Learning

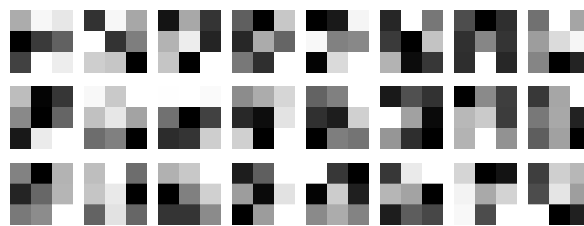
- Sheet 4-

Exercise 1 (4 Points) Complement the functions in `convextractor.py` to extract kernels and activations for specific instance, and upload it to gradescope.

Exercise 2 (2 Points) Create two JPEG files in which you visualize properties of the network given in `model.keras`.

1. In the first, show the weights of the kernels for each convolutional layer.

Create a separate vertical block for each convolutional layer. It should have one row for each input channel and one column for each output channel. The figure at position (i, j) should visualize the weights of the kernel that connects channel i and j. This would be the visualization for the first layer:



2. In the second figure, visualize the behavior of each channel on the test instance given in `image.npy`. That is, create a vertical array of figures, one for each convolutional layer. For each convolutional layer, visualize the convolution output for each output channel; use 8 columns and multiple lines if the output channel is large than that. This is an example for the convolutions produced by the first layer:



Exercise 3 (2 Points) In this exercise we try to find the smallest convolutional networks that will detect whether there is a rectangle in an image (binary classification problem). We create two versions:

1. In one version, there are only some noise pixels and, maybe, a rectangle at some position.
2. In the second version, some images contain a triangle (maybe in addition to a rectangle), which can lead to a confusion in the learner.

Implement the two functions in `solution.py` that generate the Keras architectures for each of the two cases and upload the file to gradescope. Your architecture will be run for 50 epochs using Adam with learning rate 10^{-3} ; the loss is binary cross entropy (computed from logits, not probabilities). Your score will be based on the prediction accuracy on the test data (more is better) and the number of trainable parameters in your model (less is better).

You can use the data in `images_without_triangles_train.h5` and `images_with_triangles_train.h5` for “practicing”. These files have the fields “images” and “labels”.