Transfer learning from ImageNet

The objective of this lab is to **fine-tune** a state-of-the art neural network pre-trained on ImageNet on a target task using on-line **data augmentation**.

You can choose the Cats vs. Dogs binary classification task:

- Cats vs dogs https://www.kaggle.com/datasets/tongpython/cat-and-dog

or one of the simplest classification datasets available from Pytorch (https://pytorch.org/vision/main/datasets.html), such as Cifar10 or Oxford Flower102 dataset.

1. What is the accuracy when using the pre-trained network as feature extraction (all base layers frozen) and training only the added top layer (warm up)?
2. What is the accuracy after fine-tuning the transferred layers?
3. How does the accuracy change if we fine-tune only part of the layers?
4. How does the performance change with and without a warm up stage?
5. How does the validation performance change without data augmentation?

For each experiment, plot the validation and training loss and accuracy as a function of the number of training epochs.

Suggestions:

- A common sanity check is to select a small sample of 10-50 images and make sure that you are able to overfit (i.e., reach 100% accuracy). Try it before running the experiments!
- Choose a lightweight network