

MACHINE INTELLIGENCE (2025)

Prof. Andres Perez-Uribe

Practical work prepared by Simon Walther

COLAB

This practical work has been tested on Google Colab, we highly advise you to do it on Colab too.

Upload the data zip (without unzipping them) to your Google Drive to make the data available to your notebooks on Colab.

REPORT

Please, provide a PDF report (do not submit notebooks) with your answers to the questions in the notebooks.

You can find below a summary of the questions.

DCGAN

QUESTIONS 1.1

? What makes this practical work experiment a self-supervised one?

QUESTIONS 1.2

? Please look at the generator architecture.

How many time do we multiply by two the size of the input and what are the layers responsible for this?

? What is the use of the Reshape layer in this code?

QUESTIONS 1.3

? Please look at the discriminator architecture, notices that it's a CNN classifier (between fake and real images).

If you where to classify RGB images of multiple animal classes (cats, dogs and ducks for example),
what would you need to change?

DCGAN - OUTPUTS

QUESTIONS 1.4

? Can you rely only on the loss of the generator and discriminator to choose the best model?

If no, provide a counter-example.

? In the third experiment we significantly reduced the number of parameters of the discriminator compared to the other experiments. Did it helped the generator to produce better images? Why?

? Compare experiments 1 and 6. Remember, They use the same number of filters but have a different architecture.

? In experiment 5, we decrease the number of paramers of the generator. What was the impact?

PIX2PIX COLORIZATION

QUESTIONS 2.1

? We want to colorize grayscale images. Is there only one valid colorized output?

QUESTIONS 2.2

? Pix2Pix is a Conditional Adversarial Network, in the practical work with DCGAN we were using noise as input. What is different in the input we have here?

? How does our colorization task relates to a problem where we would want to take photos as inputs and make them look like paintings? Please provide another task that would be related to these problems.

QUESTIONS 2.3

? Why do you think the model predictions look like this? In which way a Pix2Pix GAN would be useful to improve the results?

QUESTIONS 2.4

? What is the advantage to use L*A*B* color space instead of RGB in our case?

QUESTIONS 2.5

? What does it mean to have an input shape of (None, None, 1)?

? Look at the architecture plot.

What are the connections between some layers of the downsampling and upsampling parts?

? Why do we have only two outputs channels? What is the model output?

QUESTIONS 2.6

? In the training process, do the discriminator compare pairs of target and predicted images?

? Let's consider that the generator model is better than the one trained here. Is it probable for the generator to produce an image that is the same as one from the targets set (with the real colors)? Why so?

? Look at the training code, what is the value we expect the discriminator to give us when the image is fake and the one when the image is real.

? Provide three colorized images with the model that you find interesting (e.g. well colorized, artistic, disastrous result, ...).

? Provide an image you have in grayscale (convert one in grayscale if you don't have any) and apply the model on your image.