

# Introduction to Image and Video Processing

## Lab1: Color spaces, quantization, geometric transformations

Spring 2022

### 1 Color Spaces

1. Read an RGB color image and display its R, G and B component.
2. Create a BGR image based on the RGB one, show and discuss your results.

### 2 Sampling

1. Sample an image uniformly, every  $m$  horizontal and vertical pixels. Set  $m$  for 2 cases: downsampling and upsampling. Display the sampled image using NN and bilinear interpolation, using built-in functions.

### 3 Quantization

1. Uniform quantization: Choose an image, apply uniform quantization to its color components or 2, 16 and 128 quantization levels and display your results. Calculate and display the error image in each case. Calculate the Mean Squared Error for each case.
2. Dithering: Apply a small amount of random noise to your image and then repeat the above. What do you observe?
3. K-means: Apply K-means clustering to your color levels and quantize your image values to the cluster value levels. Use  $K = 3, K = 10$  clusters.

### 4 Geometric transformations

1. Choose an image and apply translation followed by rotation in two ways: (a) Calculate the translation + rotation matrices  $A_T$ ,  $A_R$  respectively and apply them successively. (b) Calculate the translation + rotation matrix  $A$  and apply it directly. Use NN and bilinear interpolation. What do you observe?
2. Create a resizing function for scaling (zooming, shrinking) and apply it to an image using NN and bilinear interpolation. What do you observe in your results for a low and high resizing factor  $s$ ?