Lab 2 - Filters cont and Introduction to augmentations

Computer Vision (10224)

Goals

- Removing noise from images.
- Implementing image augmentations.
- Implementing template matching.

Preparatory report

- Write a function which adds gaussian noise to an image, the function template is as follows:
  `def add_guassian_noise(img: np.ndarray, mean: float, sigma: float) -> np.ndarray: return noised_image`
  - Pass the parameters below to the function and observe and explain the results.:
    - mean = 0.1
    - sigma = 0.001
  - Do the same as the above with the following parameters:
    - mean = 0
    - sigma = 5

- Write a function which removes noises, and use it to clean the noisy images from above.
  You may choose any filter you deem right for the task. the function template is as follows: `def remove_noise(img: np.ndarray, filter: np.ndarray) -> np.ndarray: return clean_img`
  - Show the original image, noised_image and clean image using **matplotlib subplot**.
  - Show the absolute difference between the images and compare their histograms (using numpy).
  - Measure the MSE of the following:
    - `mse(source_img, noisy_image)`
    - `mse(source_img, denoised_image)`
  - Do this on the two noisy images you got previously.
  - Explain the obtained scores.

- Write a function which rotates an image, the function template is as follows: `def rotate_image(img: np.ndarray, angle: float) -> np.ndarray: return rotated_img`
  - The rotation function shouldn't alter the image dimensions.
  - You aren't allowed to use the cv2 image rotate function for this task but you may compare your results.
  - Review and write a short summary (up to 5 lines) of albumentations.

Guidelines

1. Code written in the assignments MUST follow the PEP-8 guidelines, we will deduct points of code not following this guideline, points will be accumulated.
2. You may use either Google Colab or Local Jupyter notebook session.
3. Use Markdown cells in-between your code cells to explain what you've done.
4. Assignments must be submitted as .html with all the required plots. Some exercises will require online reading, you may use Google and stackoverflow for inspiration, although if you use it make sure to attach the reference link.
5. Add as much comments you need to explain yourself, you wouldn't want to assume we fully understand your intuition.
6. Code should be well ordered, formatted and readable.