German International University of Applied Sciences
Informatics and Computer Science

Introduction to Media Informatics, Spring 2025

Assignment 1

In this assignment, you are given a file containing an image, but not in the form you're used to.

The image is saved as a CSV file representing a NumPy array of grayscale values, where each value represents a pixel's brightness level.

Your mission is to investigate this secret image using Python, figure out what it represents, analyze the structure, and then creatively transform it.

The assignemnt is designed to challenge your understanding of raster images, pixel data, and image manipulation.

Phase 1: Load and Reveal the Image

- Open the file **(secret_image.csv)**.
- Figure out how to read the pixel data into Python using NumPy.
- After displaying the grayscale version, you must visualize the image using at least two different colormaps (hot, cool, viridis).

(Colormaps are color filters that map pixel values to colors, helping to reveal hidden patterns.)

- Save and include all resulting visualizations in your submission.

Phase 2: Pattern Detection and Analysis

- Count how many black pixels exist in the image.
- Extract and print the coordinates of all black pixels.
- Determine the bounding box (min and max x and y values) that contains all the black pixels.
- **Analyze the pattern:** check if there are dark spots (black pixels) at some positions and report whether there is a recognizable structure. (**hint:** look for symmetry or facial features).

Phase 3: Modify the Image

- Convert the grayscale image into an RGB image.
- Change the color of the detected "eyes" to red.
- Add a blue border around the image.
- Flip the mouth upside down by creating a "sad face".
- Save and Display the modified image.

Phase 4: Apply a Noise Reduction Filter

- Apply a **mean (average) filter** to the final modified image in order to reduce the soft background noise while keeping the structure of the main pattern.
- Compare the filtered image with the original (noisy) version by displaying both side by side.
- Save and include both the **noisy** and the **denoised** images in your submission.

Phase 5: Please answer the following questions **at the end of your google colab notebook**:

- How many black pixels were found?
- What are the coordinates of the black pixels?
- What is the bounding box?
- What features did you detect in the image?

This is a team Assignment. Each team (consisting of two students Only) must submit one shared submission only

Submission:

1. **Deliverables:**
    - Google Colab link
    - **.py** code file
    - Report
    - Output images saved

*All deliverables must be uploaded to a **Google Drive folder**. Please ensure the sharing settings are set to **"Anyone with the link can view."** Include the Google Drive link in your submission*.

2. **Submission form:**
    https://forms.gle/AEp6ZGmC3UXgr1F58

Deadline

The **deadline** is **Tuesday 22 April, 2025**.

Good luck