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University of Oregon; Fall 2024

Physics 410/510 Image Analysis: Homework 1

Due date: (i) Be ready to comment on the reading in Thursday's class. (ii) Problem 1, due Wednesday, October 2 by **11:59 pm**. You'll see a place to submit a **PDF** in "Assignments" on Canvas.

Note: This is a very short assignment!

Readings:

- *On coding:* Always try to write clear, readable code! Imagine that you're looking back on what you wrote years later: Would it make sense? Could you build on it? Read this article, which has good advice, and be ready to comment or ask questions in class. G. Wilson *et al.*, "Best Practices for Scientific Computing," *PLOS Biology*. **12**, e1001745 (2014). https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1001745

Image Files: Images you'll need for the assignment are in the "Images" folder in \Files on Canvas.

1 Puzzles. (6 pts.) An exercise involving loading images, exploring some idiosyncrasies of languages and libraries. There are two different versions; just do one!

VERSION 1: If you're using **Python:**

(a) load the images "AuLait_gray.png" and "AuLait_gray.tif" as arrays using the popular `matplotlib` library:

```
import numpy as np
import matplotlib.pyplot as plt
Image_A_png = plt.imread('AuLait _gray.png')
Image_A_tif = plt.imread('AuLait_gray.tif')
```

Display each of the arrays, using for example:

```
plt.imshow(Image_A_png, 'gray');
```

Do they look the same?

Print the maximum and minimum values of each of the arrays. Are they the same?

Explain what the difference is between the two arrays. (*Hint:* are they the same type?)

(b) Save the first image array as a TIFF using the matplotlib library's `imsave`:

```
plt.imsave('AuLait_png_out.tif', Image_A_png, format='TIFF')
```

and using scikit-image's `imsave`:

```
from skimage import io
io.imsave('AuLait_png_out_sk.tif', Image_A_png)
```

Open these images in a standard image viewer. Do they look like they should? If you load these images into Python using `io.imread`, what are their dimensions (shapes)?.

VERSION 2: If you're using **MATLAB:**

(a) load the image "AuLait _gray.png":

```
Image_A = imread('AuLait_gray.png');
figure; imshow(Image_A, []);
Image_B = Image_A*6.2;
Image_C = Image_B/6.2;
figure; imshow(Image_C, []);
```

??!! Why is `Image_C` not the same as `Image_A`, since multiplying and dividing by 6.2 should give us the same thing we started with? Try this instead:

```
Image_D = double(Image_A)*6.2;
Image_E = Image_D/6.2;
figure; imshow(Image_E, []);
```

Why does this work? Explain, briefly.

(b) Save "Image_E" as a PNG file using `imwrite`:

```
imwrite(Image_E, 'image_E.png');
```

Load this into an image viewer. Does it look like it should? Try:

```
imwrite(uint8(Image_E), 'image_E_uint8.png');
```

Why does this work? Explain, briefly.

Lesson: Be careful!