

# INFX574 lab 1

Your name:

Deadline: Wed, Apr 4, 11:59pm

## Introduction

Please submit the completed lab by end of the day (April 4th, 2018). You should submit a) your code (notebooks or whatever you are using) and b) the lab in a final output form (html or pdf).

Note: you may want to do some of it on paper instead of computer. You are welcome to do it but please include the result as an image into your final file.

Working together is fun and useful but you have to submit your own work. Discussing the solutions and problems with your classmates is all right but do not copy-paste their solution! Please list all your collaborators below:

- 1.
2. ...

## 1 2D Transformation Matrices

Your task is to play with this and other similar transformation matrices and show how they alter the image. The image is stored in a data file. Note also that this image has several lines that are not connected, so you have to call 'plot' separately for each group.

1. Ensure that you can repeat the class example with the flipped-1 matrix

$$A = \begin{pmatrix} 0 & 0 \\ 0 & 1 \\ 0.5 & 0.5 \end{pmatrix}$$

and the rotation matrix

$$R(\alpha) = \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix}$$

Plot the image rotated by a)  $+45^\circ$ , b)  $-225^\circ$ , c) an angle of your choice.

2. Create a new simple object of your choice. The object should be asymmetric. Print this matrix.
3. Show the object (rotation 0) and a few rotated images of that object. Ensure you keep the correct aspect ratio for the axes!
4. Load in the Crazy Hat's image data from the file *crazy\_hat.tsv*. Print the data.

It contains three variables: *x* and *y* are coordinates, and *group* is the line group: points belonging of the same group should be connected, groups belonging to different groups should not be connected. (Hence you have to repeat the plotting, `plt.plot`, for each group inside of the same image).

5. Plot Crazy Hat, and a few rotated images of it. Ensure the correct lines are connected.

Extra task (not graded):

6. Previously we only discussed rotation. Now create the flip-X-matrix  $F^x$  that flips the image around x-axis. Demonstrate how it works.
7. Construct matrix “stretchy” that stretches the image along y-axis by a given amount. Show how it works.
8. Combine rotations, flips and stretches to modify the Crazy Hat image in a more creative way.