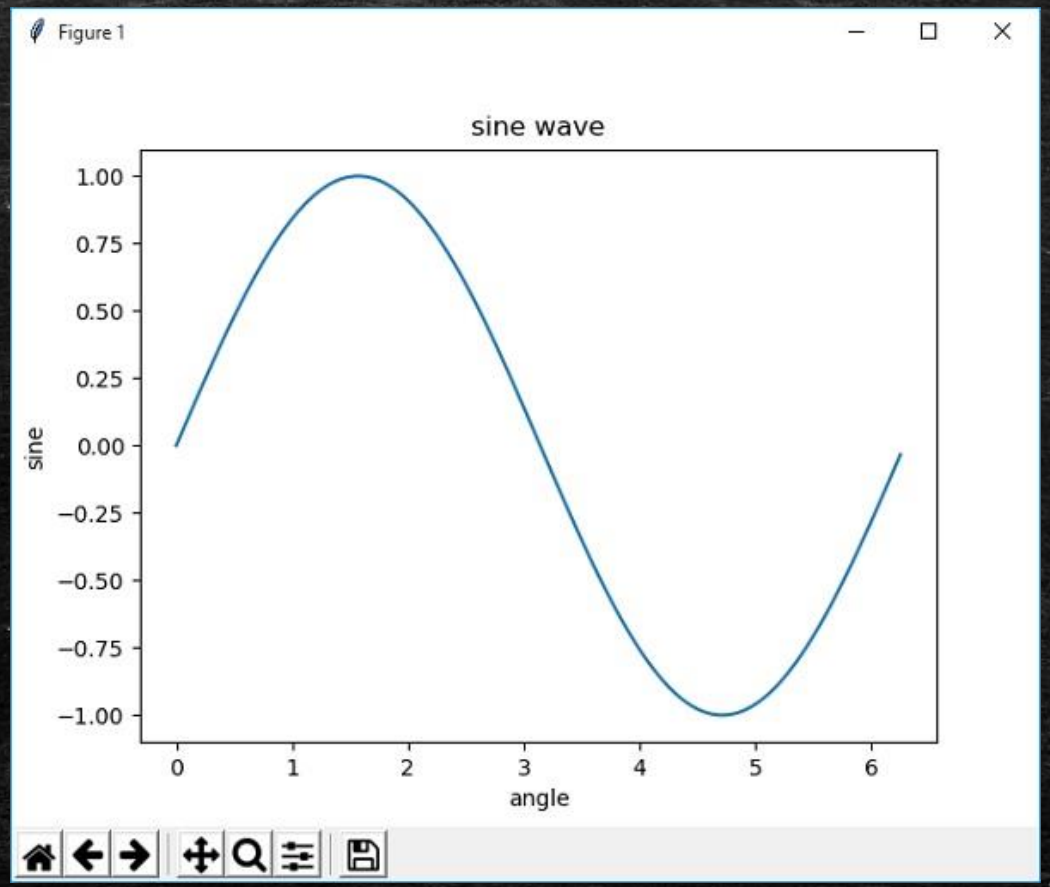
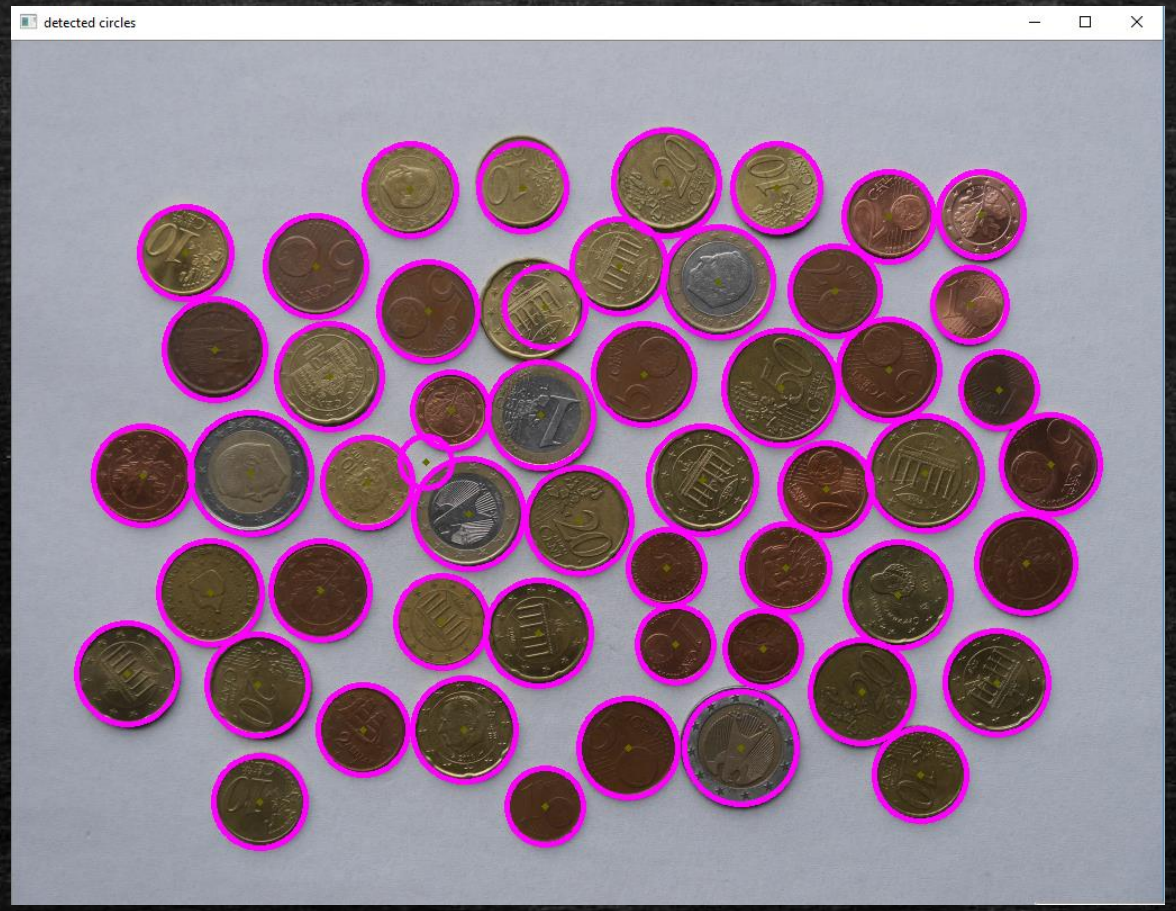
Plotting

1. Matplotlib.pyplot is a popular plotting tool in Python which can be used to plot data as a chart or as a histogram



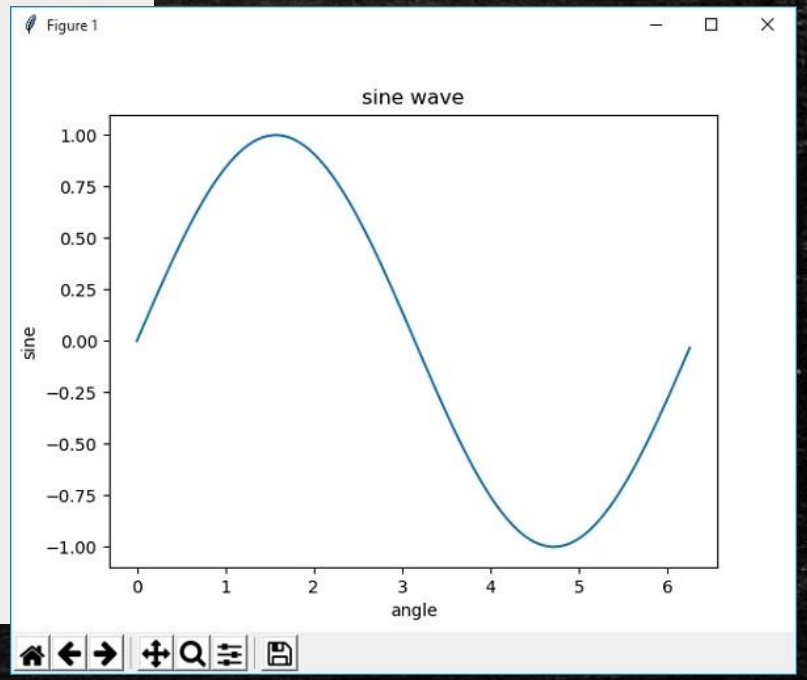
2) OpenCV together with Matplotlib is popular to mark parts of an image for the user e.g. detect circles



Use 1: to plot charts

```
from matplotlib import pyplot as plt
import numpy as np
import math #needed for definition of pi

x = np.arange(0, math.pi*2, 0.05)
y = np.sin(x)
plt.plot(x,y)
plt.xlabel("angle")
plt.ylabel("sine")
plt.title('sine wave’)
plt.show()
```



Use 1: to plot bar charts

```
plt.bar(x,y)
plt.xlabel("Months")
plt.ylabel("mm")
plt.title('Rainfall’)
plt.show()
```

Try to create a plot with the following data (rainfall in Malta in the months of the year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mm	95	63	37	26	9	5	0	6	67	77	109	108

Use 1 cont: to plot histograms

```
plt.hist(values,num);
%values is an array, num is the number of bins


plt.xlabel("x axis label")
plt.ylabel("y axis label")
```

Try to create a histogram with the following marks obtained by students in a math exam.
0, 23, 39, 46, 48, 50, 50,52, 54, 53, 61, 62, 64, 68, 70, 71, 75, 82, 90, 91, 100

Make sure the marks are divided into 10 bins: 0-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70,71-80,81-90, 91-100

Use 2: mark parts of an image

For drawing a rectangle cv2.rectangle() function is used.

This function accepts five input parameters:

- Image object on which to draw
- Coordinates of the vertex at the top left (x, y)
- Coordinates of the lower right vertex (x, y)
- Stroke color in BGR (not RGB, to be noted)
- Stroke thickness (in pixels)

Example code

```
import numpy as np
import cv2
my_img = np.zeros((400, 400, 3), dtype = "uint8")
# creating a rectangle:
cv2.rectangle(my_img, (30, 30), (300, 200), (0, 20, 200), 10)
cv2.imshow('Window', my_img) # allows us to see image
cv2.waitKey(0) # until closed forcefully
cv2.destroyAllWindows()
```

Use 2: mark parts of an image (circles)

```
cv2.circle(image, center=(y,x), radius=10, color=(255,0,0) , thickness=3 )
```

Try this…

Questions?