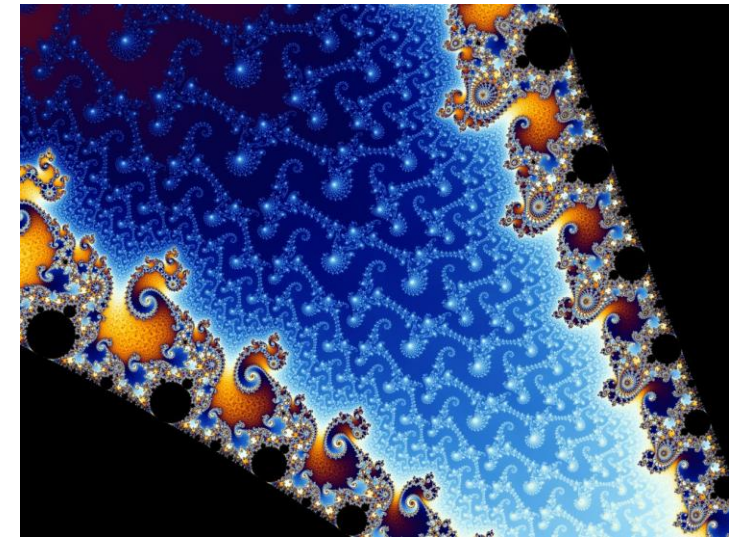
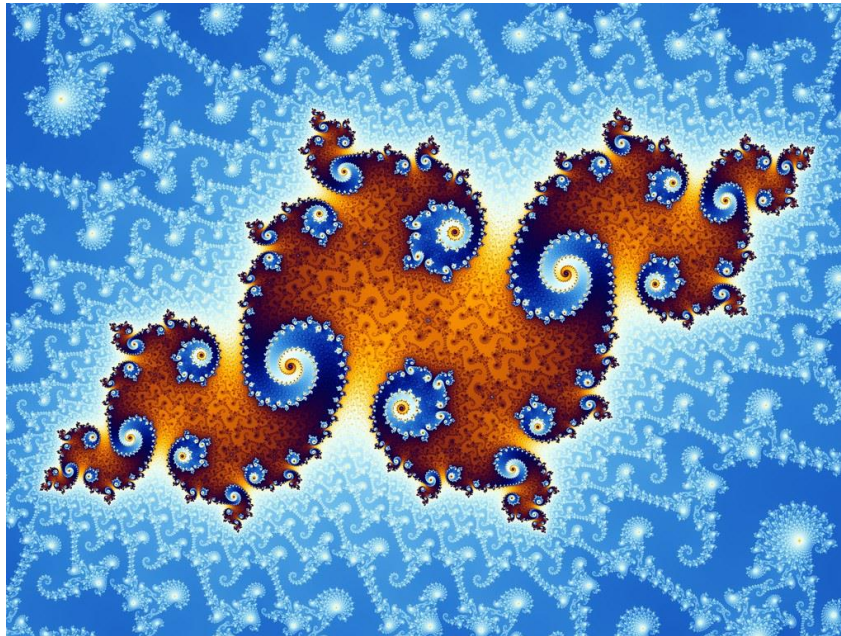
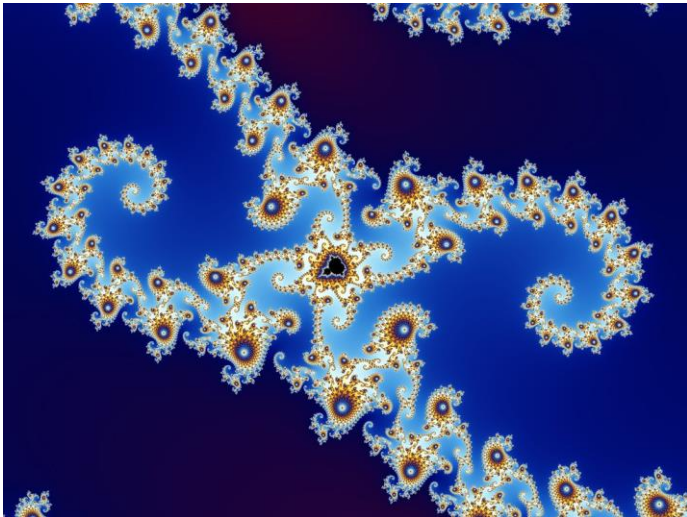


# Python crash course

Cool stuff you will learn / be able to programme

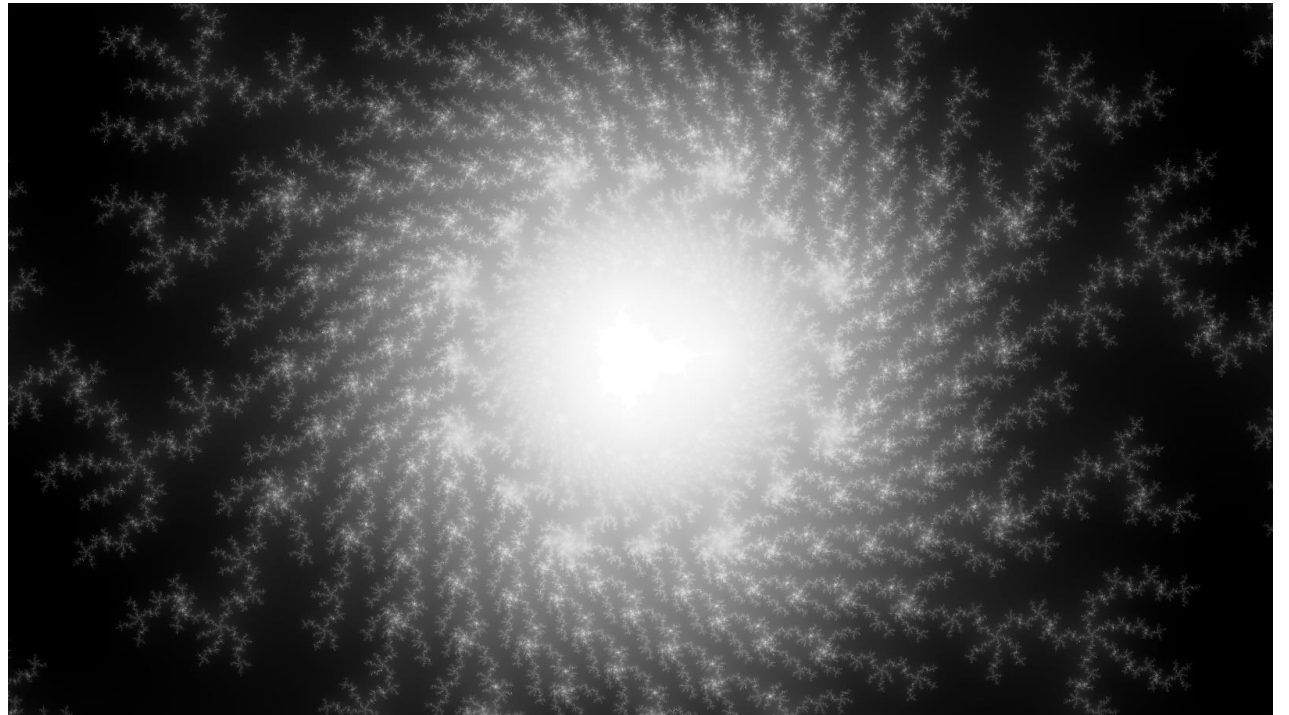
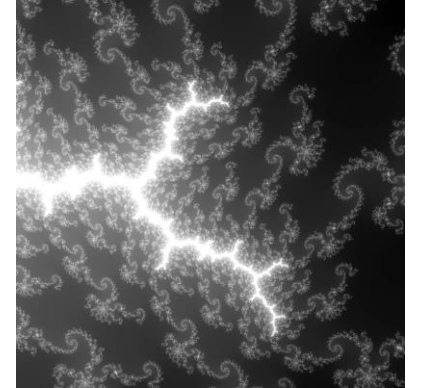
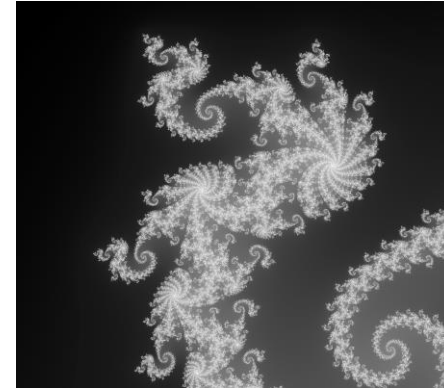
# Mandelbrot set – create art in python

- One equation:  $z_{n+1} = z_n^2 + c$
- 10 lines of code
- [https://en.wikipedia.org/wiki/Mandelbrot\\_set](https://en.wikipedia.org/wiki/Mandelbrot_set)



# Mandelbrot set – create art in python

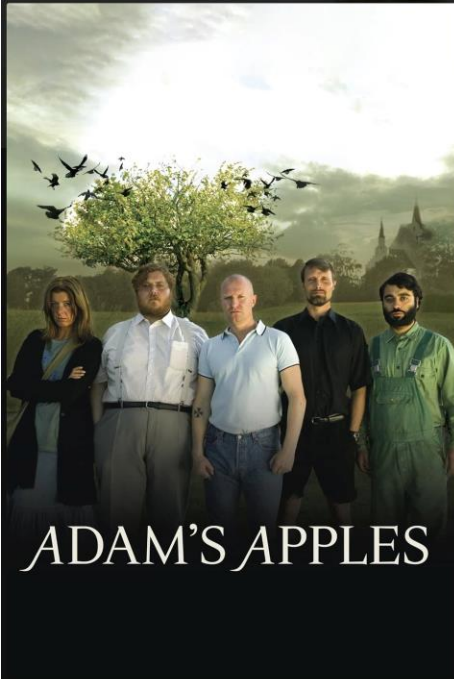
```
def iterations_in_mandelbrot_set(c, z, max_iter):  
    for i in range(max_iter):  
        z = z**2 + c  
        if abs(z) > 2:  
            return i  
    return max_iter
```





# Web scraping

- Scraping IMDb, Wikipedia etc. to get images, descriptions, actors ... from movie file names.
- Can recommend this movie



**Adam's Apples**  
Adams æbler  
2005 1h 31m R ★ 7.7 70 Ends at 22:26

Video 576i MPEG2VIDEO SDR  
Audio Ger - Dolby Digital - 5.1 - Default  
Subtitles English - SUBRIP - External







When it rains, it pours

A neo-nazi sentenced to community service at a church clashes with the blindly devotional priest.

Tags: alcoholic, apple, church, cynic, dark comedy, faith, god, lie, neo-nazism, parish, pastor, religion, religious humour, satire, suppressed past  
IMDb, TheMovieDb, Trakt

Genres Comedy, Crime, Drama  
Director Anders Thomas Jensen  
Writer Anders Thomas Jensen  
Studio M&M Productions

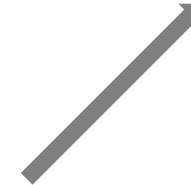
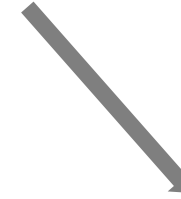
Cast & Crew

 Mads Mikkelsen as Ivan	 Ulrich Thomsen as Adam	 Paprika Steen as Sarah	 Ole Thestrup as Dr. Kolberg	 Nikolaj Lie Kaas as Holger	 Nicolas Bro as Gunnar
---	---	---	--	---	--

# Image processing

- Make for the human eye invisible things visible
- Some stones moved slightly due to a person walking over them
- With simple image processing, the difference can be made visible
- Source:  
<https://youtu.be/NSS6yAMZF78>
- Really cool, relaxing video!
- Check it out.
- Seriously!

Video screenshots



# Machine learning - train your own neural network

- Train an AI bot which becomes better than you in your favorite board game!
- Can recommend this board game
- Play my python implementation right now: <https://github.com/StraightCurlyCurves/azul>



```
Bag:
X X X X X

Factories:
0: 2
1:
2:
3:
4:
5: 4 2 2 4
6: 3 5 2 4
7: 3 3 4 4

Temp out of game tiles:
5 4 4 2 2 5 2 2 5 5 3 3 2 3
4 5 1 4 1 1 1

Alice:
Pattern lines: 5 X X X X _
Wall:
0:
1: _ 4 X _ X _
2: _ 2 2 X X _
3: _ 4 4 4 _ _
4: _ 1 1 1 _ _ X _

Bob:
Pattern lines: 2 X _ X X X
Wall:
0:
1: _ 1 _ _ X _
2: _ 3 _ X _ X _
3: _ 5 5 _ _ X _
4: _ 1 1 1 1 _ _

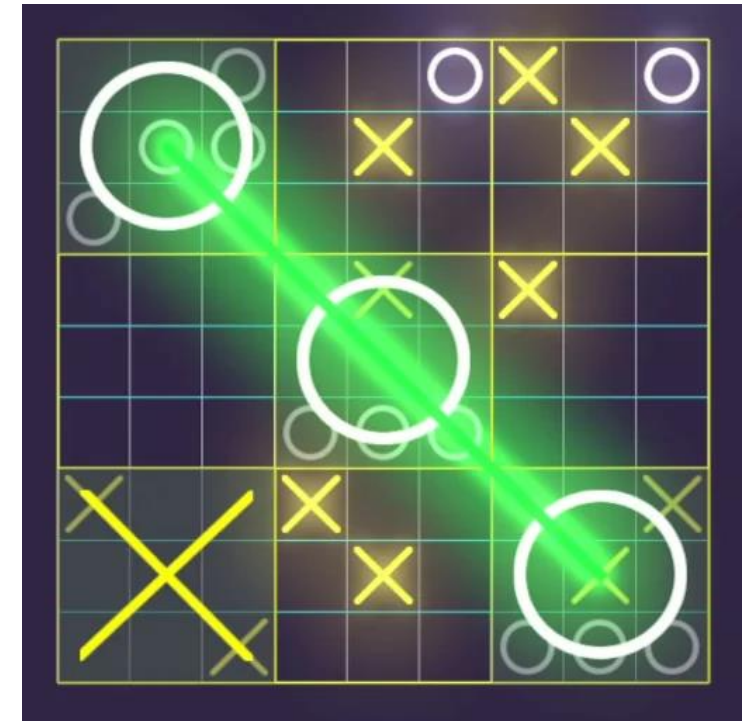
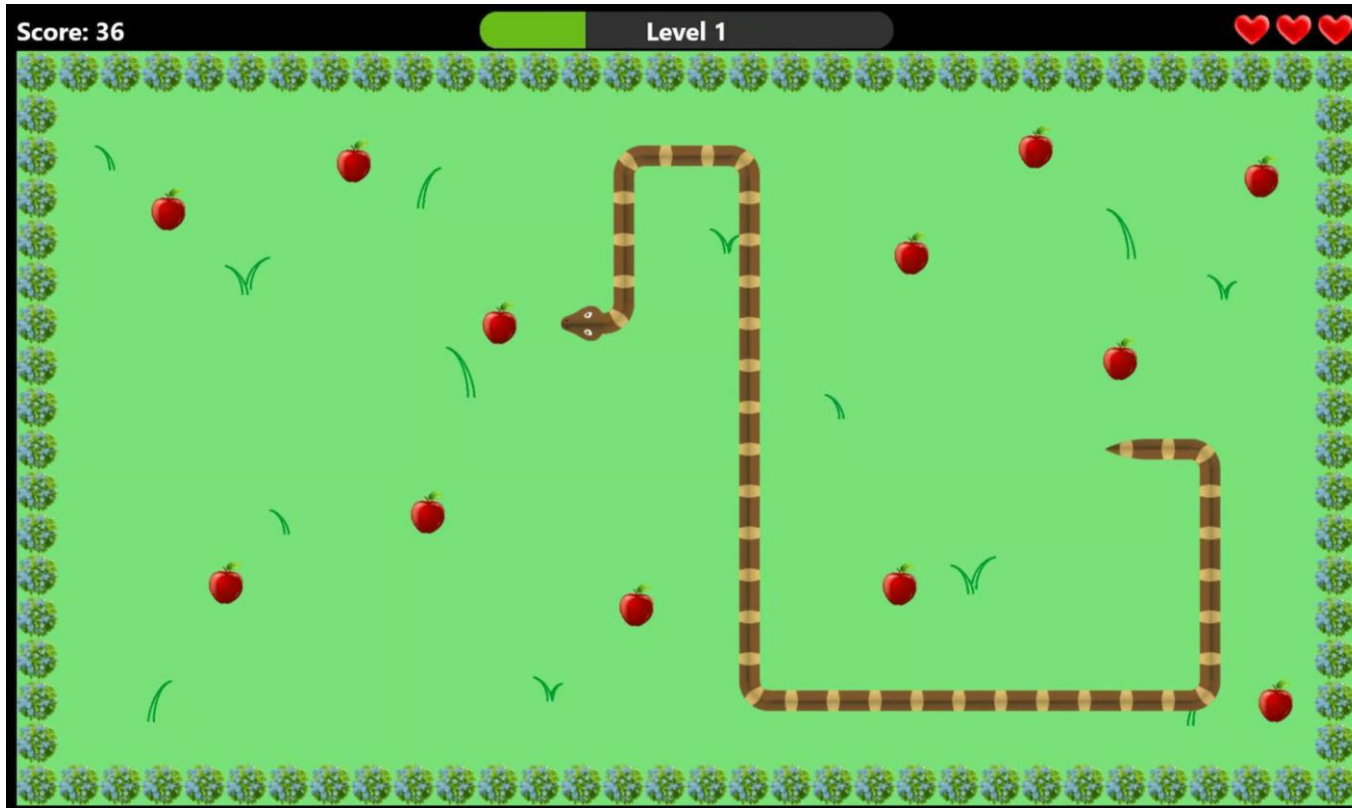
Mallory:
Pattern lines: _ X X X _ X
Wall:
0:
1: _ 2 2 X X _ X X
2: _ 3 3 3 X _ _ _
3: _ 2 2 X _ _ _
4: _ 3 3 _ _ _ _

Floor line: Score: 0
5 _ _ _ _ _
1 1 2 2 2 3 3




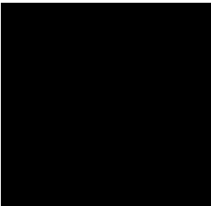
Factory ID: 
```



# Programme a game like Snake or Tic Tac Toe



# Steganography – hiding an image within an image

8-bit image				16-bit image			
		Decimal	Binary		Decimal	Binary	
Pixel of public image		R: 255	1111 1111	MSB		R: 65280	1111 1111 0000 0000
		G: 0	0000 0000			G: 0	0000 0000 0000 0000
		B: 255	1111 1111			B: 65280	1111 1111 0000 0000
Pixel of private image		R: 0	0000 0000	LSB		R: 0	0000 0000 0000 0000
		G: 255	1111 1111			G: 255	0000 0000 1111 1111
		B: 255	1111 1111			B: 255	0000 0000 1111 1111

Vincent van Gogh is hidden in Mona Lisa!




What we see:

R: 254  
G: 1  
B: 255

For a human eye  
indistinguishable

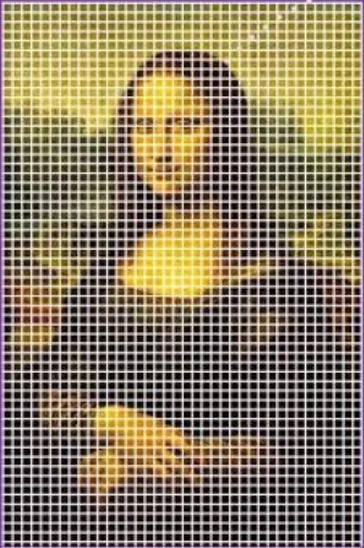
Add both pictures together

	R: 65280	1111 1111 0000 0000
	G: 255	0000 0000 1111 1111
	B: 65535	1111 1111 1111 1111



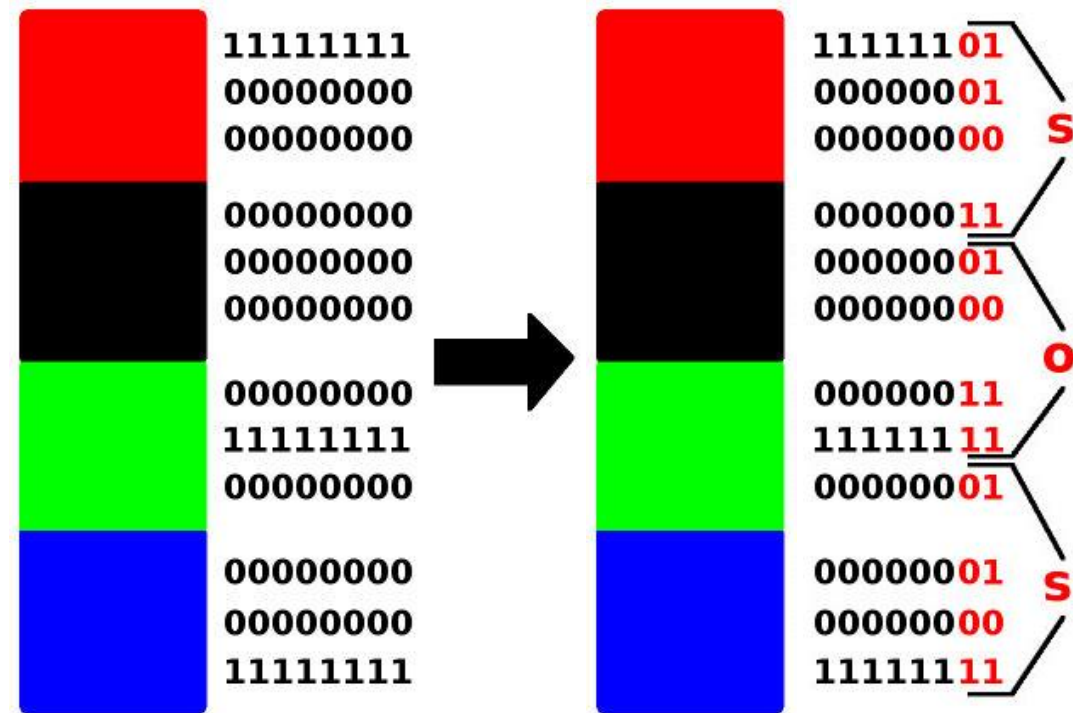
# Steganography – hiding text in an image

**Digital Steganography**  
LSB IN IMAGES

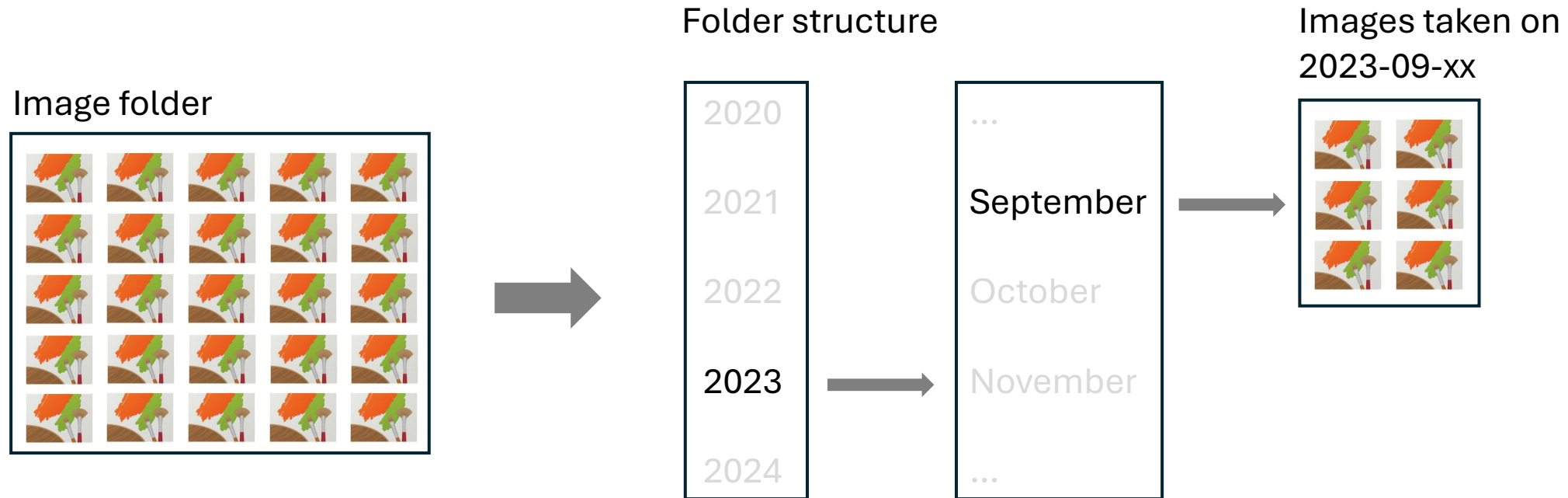


144	141	81
10010000	10001101	01010001
145	140	81
1001000 <b>1</b>	1000110 <b>0</b>	0101000 <b>1</b>
146	142	81
100100 <b>10</b>	100011 <b>10</b>	010100 <b>01</b>

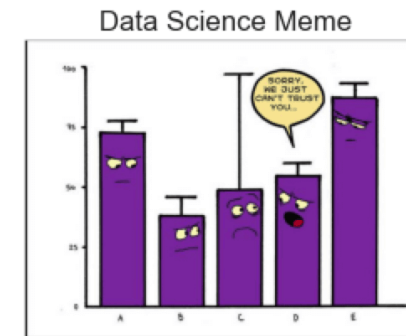
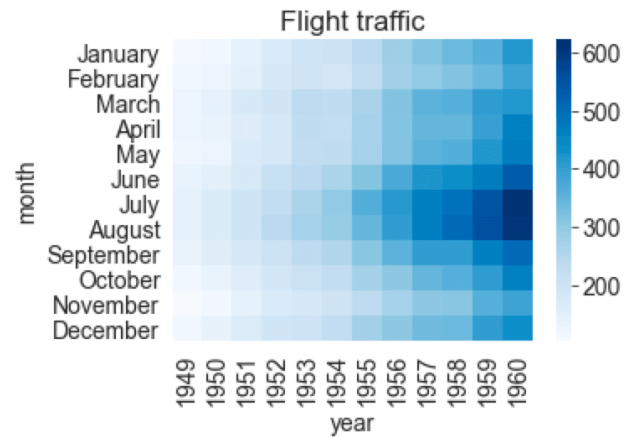
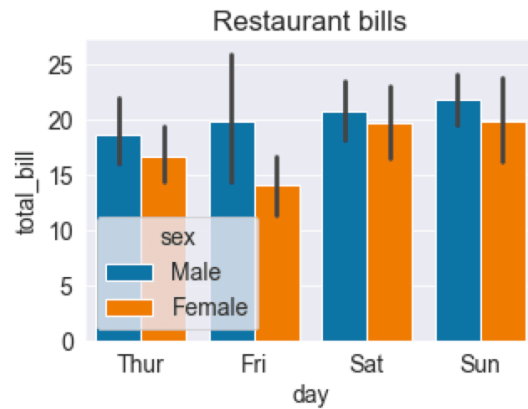
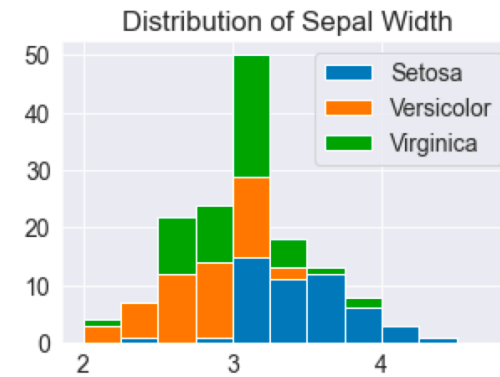
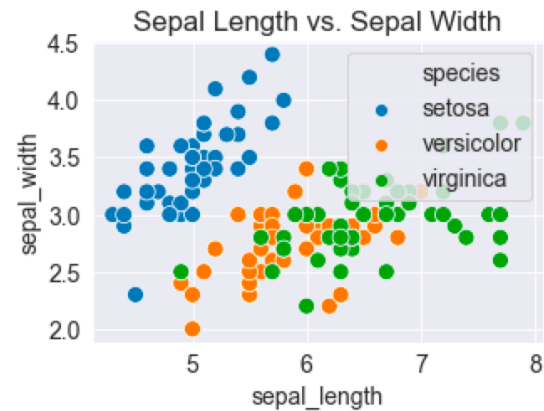
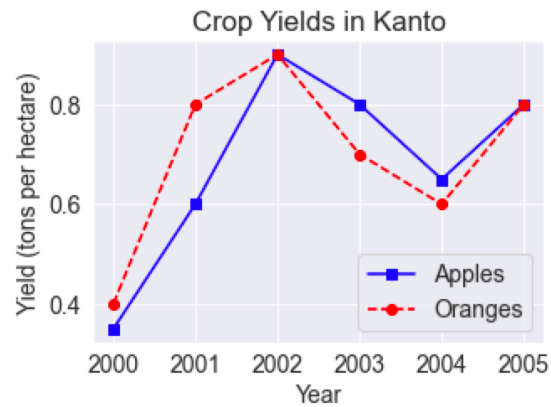
Hidden message: 101001...



# File Management



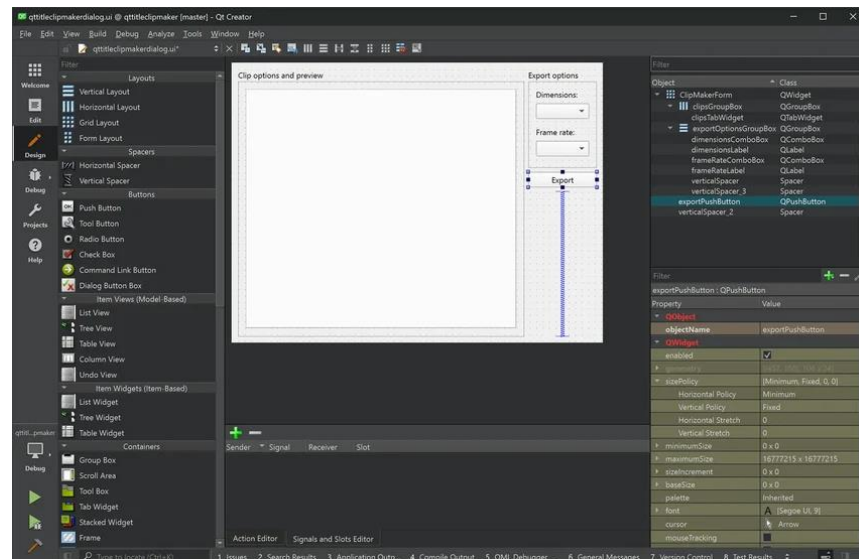
# Data analysis





# Graphical user interface (GUI)

- Design and programme graphical user interfaces with the Qt framework



PySide6 or PyQt6