Introduction To Python Programming

Introduction to Python programming Course Outline

- Intro to Computer Science
- Environment Setup (Anaconda)
- Command Line
- Conda & pip package managers
- Jupyter Notebook
- Input & Output
- Variables
- Data types
  - Numbers & Math
  - Boolean & Comparison and Logic
  - Strings
  - Lists
  - Tuples
  - Sets
  - Dictionaries
- File Handling
- If Conditions
- For Loops
- Built-in functions & Operators (zip, enumerate, range, ...)
- List Comprehensions
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- Modules & Packages

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Intro to Computer Science

- How Computers Work
- Decimal & Binary numbering systems
- How computer stores Words (ASCII)
- How computer stores Images
- How computer stores Videos
- How computer stores Audio
- Technology Tree
- Why python

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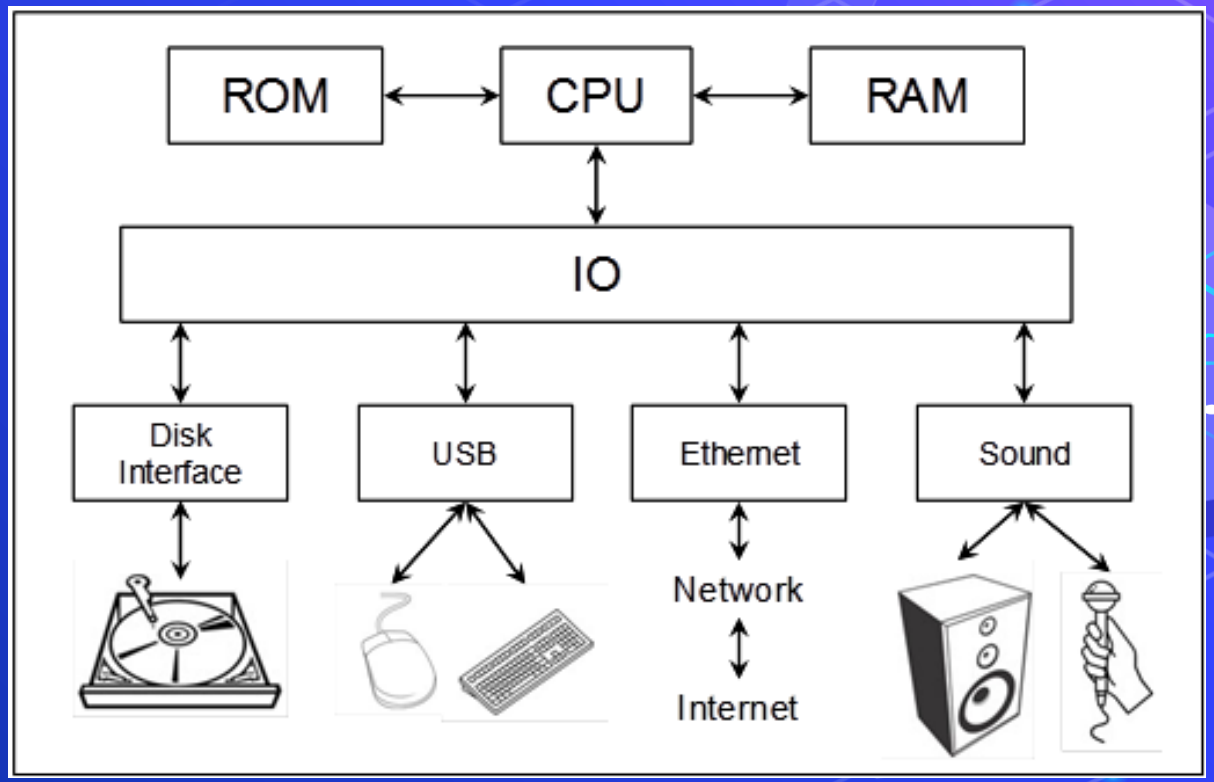
How Computers Work



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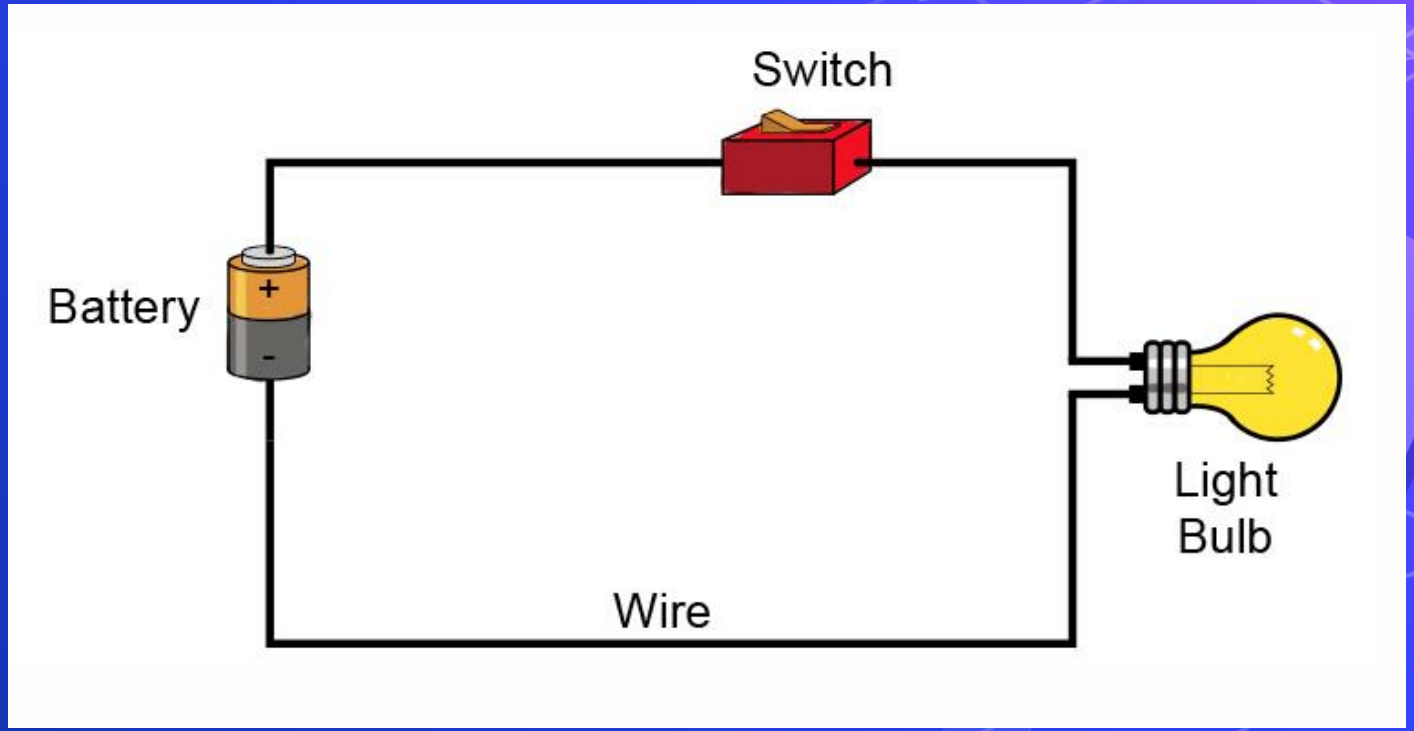
Decimal & Binary numbering systems



Decimal & Binary numbering systems

Decimal

100's 10's 1's

154

1 x 100 = 100
5 x 10 = 50
4 x 1 = 4
154

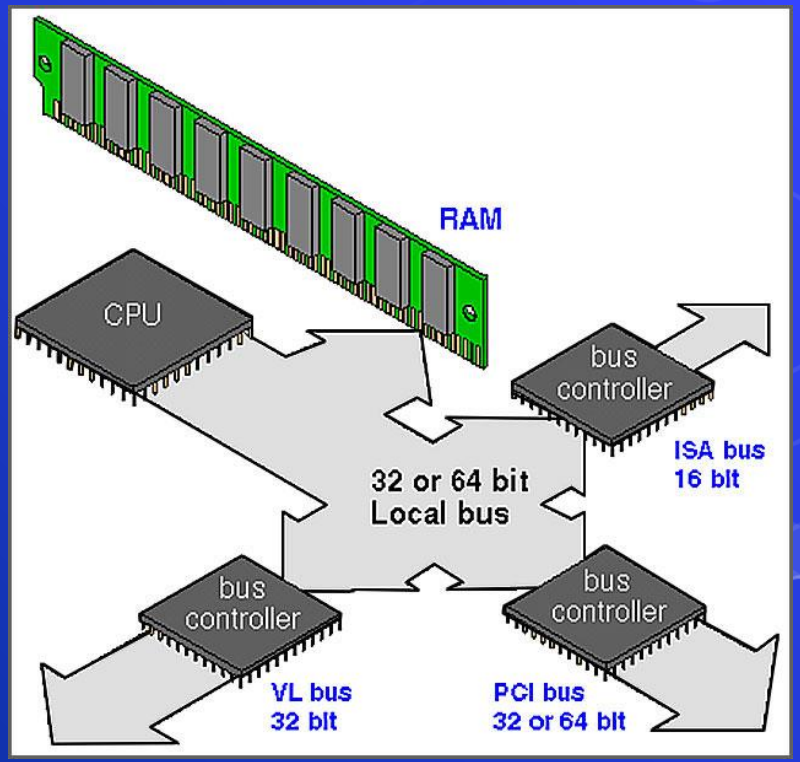
Binary

128's 64's 32's 16's 8's 4's 2's 1's

1001 1010

1 x 128 = 128
1 x 16 = 16
1 x 8 = 8
1 x 2 = 2
154

Decimal & Binary numbering systems



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How computer stores Words (ASCII)

ASCII BINARY ALPHABET			
A	1000001	N	1001110
B	1000010	O	1001111
C	1000011	P	1010000
D	1000100	Q	1010001
E	1000101	R	1010010
F	1000110	S	1010011
G	1000111	T	1010100
H	1001000	U	1010101
I	1001001	V	1010110
J	1001010	W	1010111
K	1001011	X	1010111
L	1001100	Y	1011001
M	1001101	Z	1011010

Full Table
http://www.asciitable.com/

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How computer stores Images

What We See

08 02 22 97 38 15 00 40 00 75 04 05 07 78 52 12 50 77 91 08 08 02 22 97
49 49 99 40 17 81 18 57 60 87 17 40 98 43 69 48 04 56 62 00 49 49 99 40
81 49 31 73 55 79 14 29 93 71 40 67 53 88 30 03 49 13 36 65 81 49 31 73
52 70 95 23 04 60 11 42 69 24 68 56 01 32 56 71 37 02 36 91 52 70 95 23
22 31 16 71 51 67 63 89 41 92 36 54 22 40 40 28 66 33 13 80 22 31 16 71
24 47 32 60 99 03 45 02 44 75 33 53 78 36 84 20 35 17 12 50 24 47 32 60
32 98 81 28 64 23 67 10 26 38 40 67 59 54 70 66 18 38 64 70 32 98 81 28
67 26 20 68 02 62 12 20 95 63 94 39 63 08 40 91 66 49 94 21 67 26 20 68
24 55 58 05 66 73 99 26 97 17 78 78 96 83 14 88 34 89 63 72 24 55 58 05
21 36 23 09 75 00 76 44 20 45 35 14 00 61 33 97 34 31 33 95 21 36 23 09
78 17 53 28 22 75 31 67 15 94 03 80 04 62 16 14 09 53 56 92 78 17 53 28
16 39 05 42 96 35 31 47 55 58 88 24 00 17 54 24 36 29 85 57 16 39 05 42
86 56 00 48 35 71 89 07 05 44 44 37 44 60 21 58 51 54 17 58 86 56 00 48
19 80 81 68 05 94 47 69 28 73 92 13 86 52 17 77 04 89 55 40 19 80 81 68
04 52 08 83 97 35 99 16 07 97 57 32 16 26 26 79 33 27 98 66 04 52 08 83
88 36 68 87 57 62 20 72 03 46 33 67 46 55 12 32 63 93 53 69 88 36 68 87
04 42 16 73 38 25 39 11 24 94 72 18 08 46 29 32 40 62 76 36 04 42 16 73
20 69 36 41 72 30 23 88 34 62 99 69 82 67 59 85 74 04 36 16 20 69 36 41
20 73 35 29 78 31 90 01 74 31 49 71 48 86 81 16 23 57 05 54 20 73 35 29
01 70 54 71 83 51 54 69 16 92 33 48 61 43 52 01 89 19 67 48 01 70 54 71

What Computers See

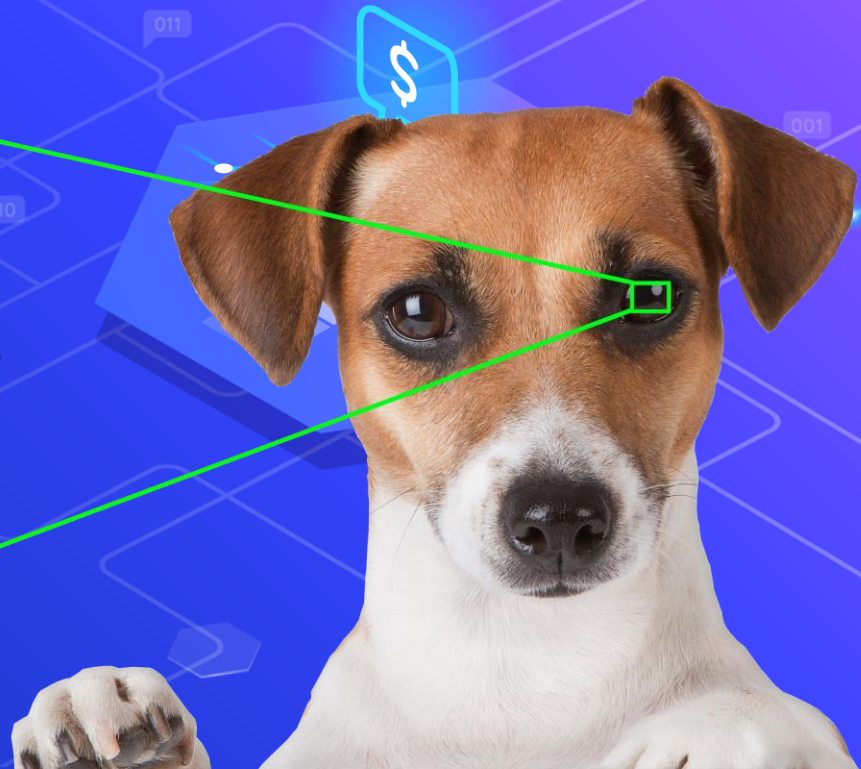
How computer stores Images

Pixels

Every pixel is one color

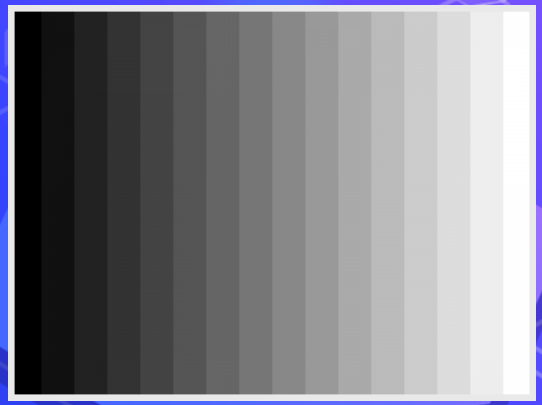
Height

Width



How computer stores Images

Grayscale Digital Images



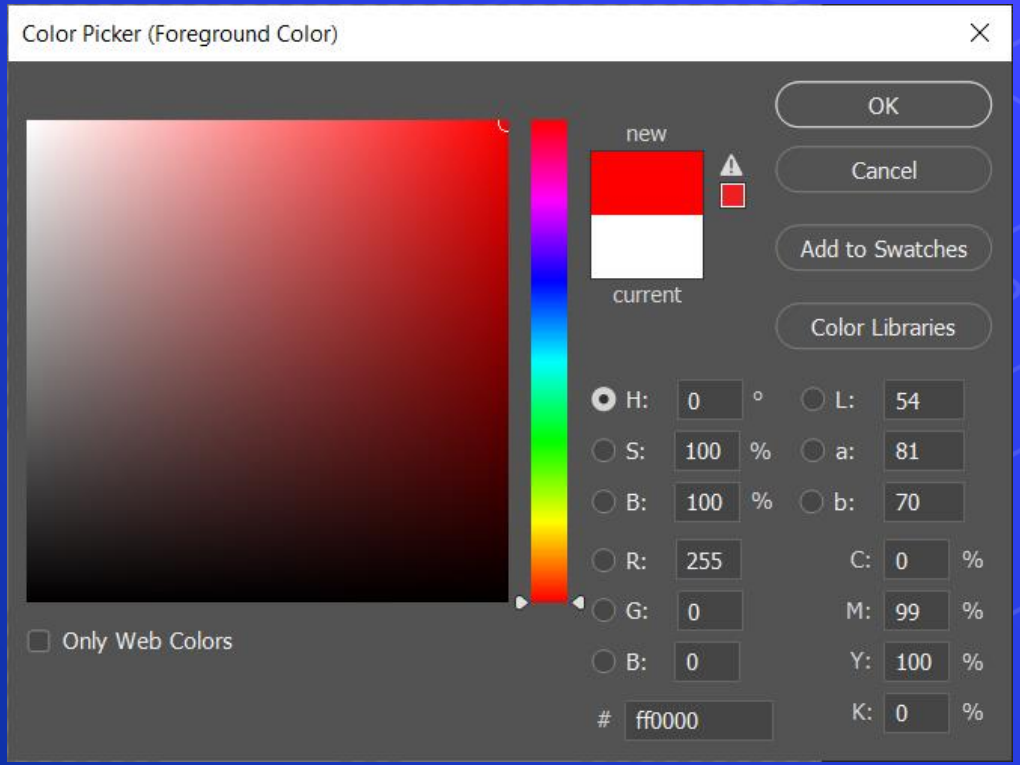
We can generate a grayscale image by using Pixels each pixel has a single value between 0 (White) and 255 (Black) and values in between are gray variations.

How computer stores Images

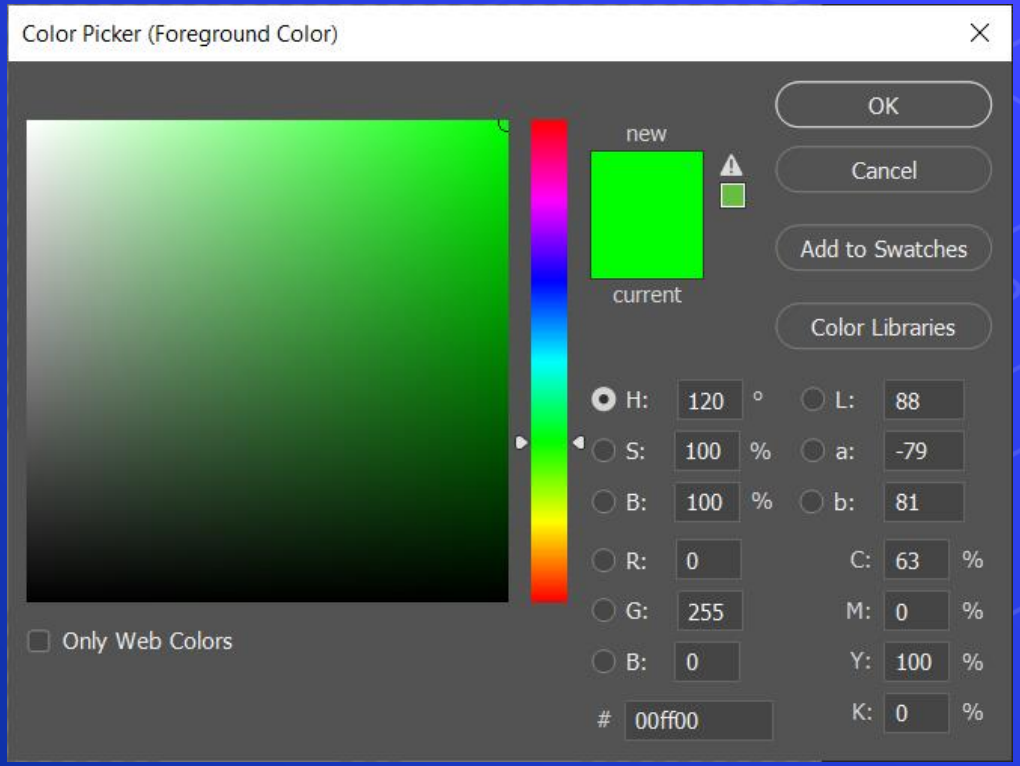
RGB Digital Images

We can generate an RGB image by using Pixels each pixel has 3 values for each color (red, green, blue) each color has value between 0 (Dark) and 255 (Light) and values in between are color variations .

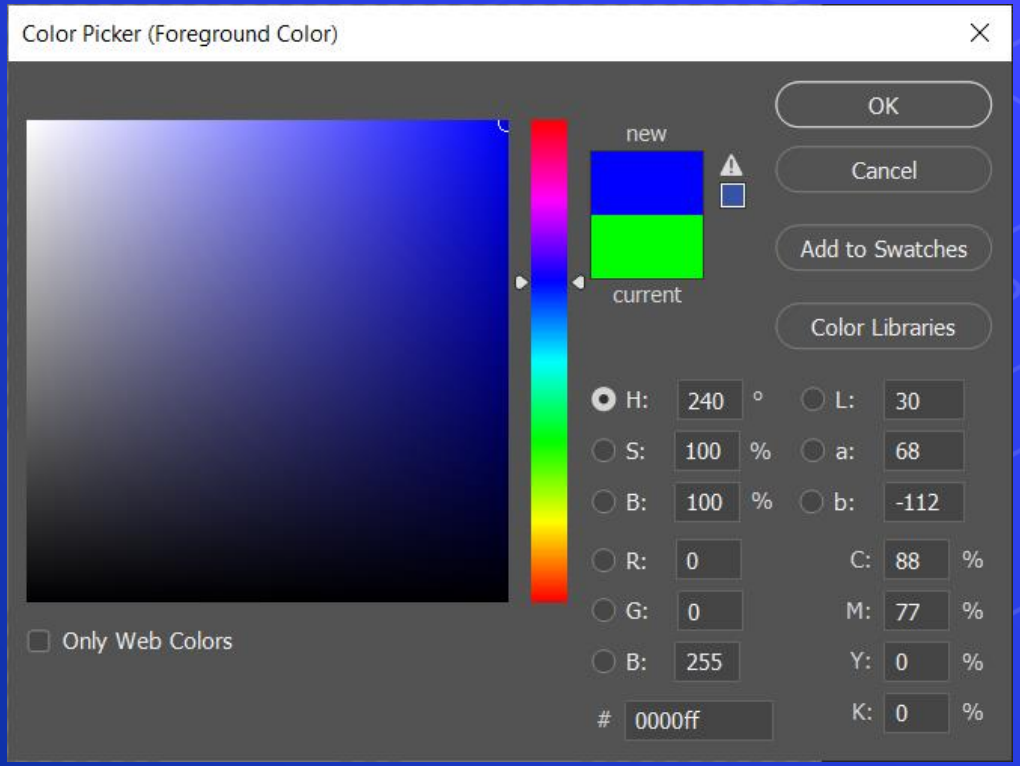
How computer stores Images (Red)



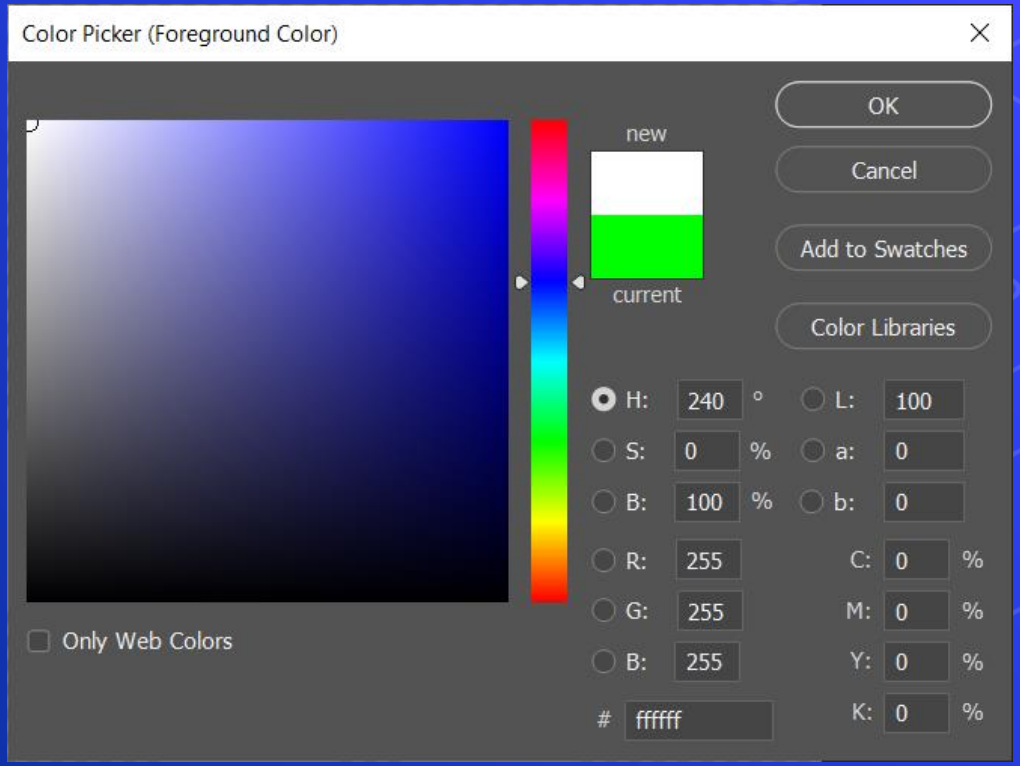
How computer stores Images (Green)



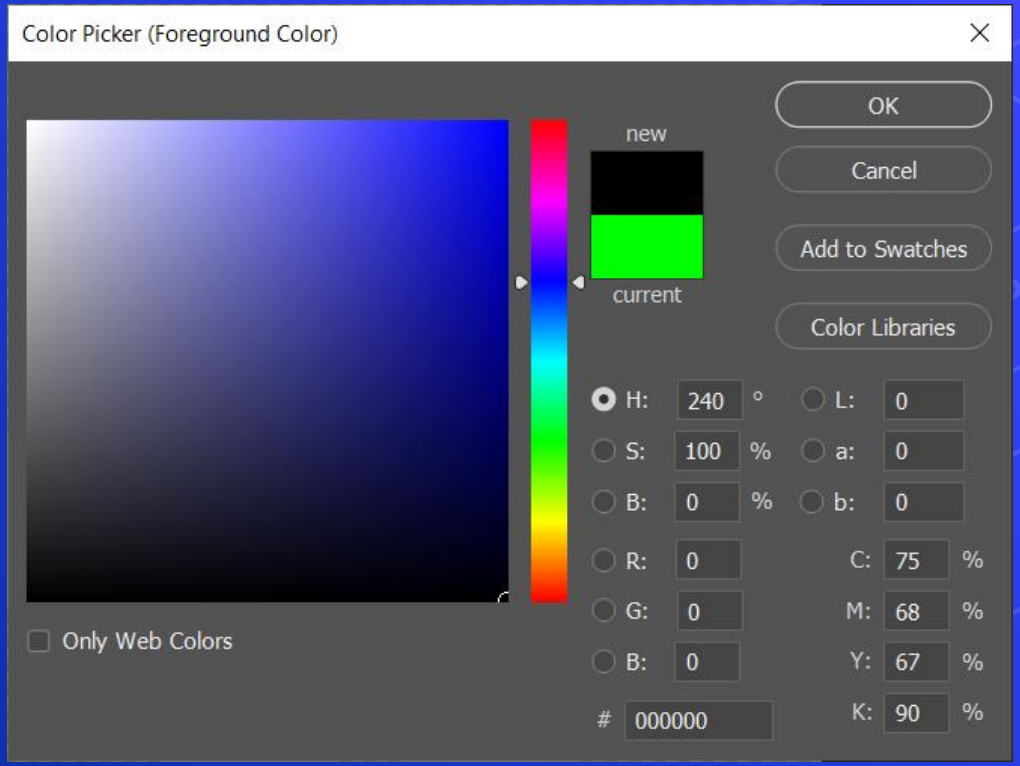
How computer stores Images (Blue)



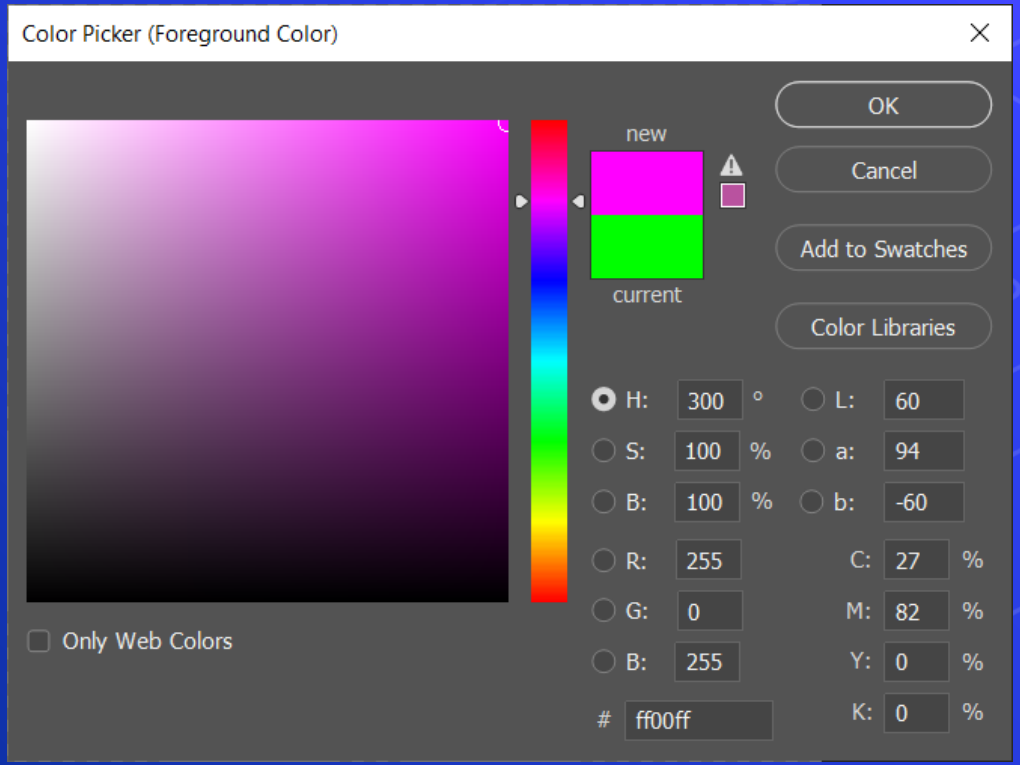
How computer stores Images (White)



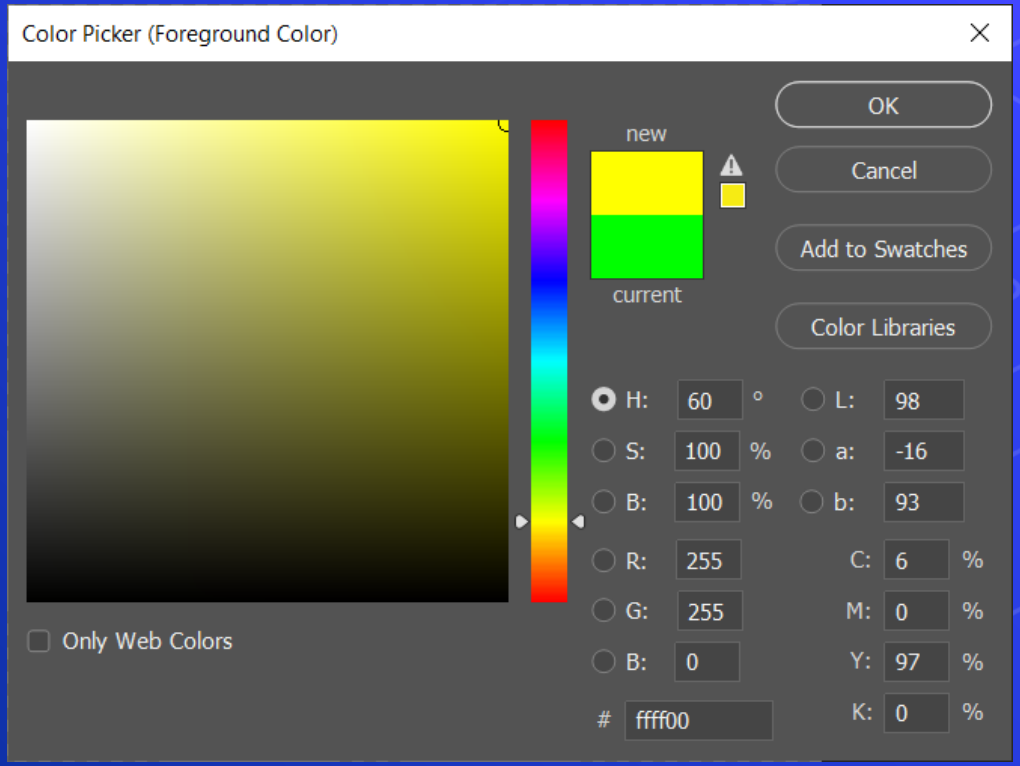
How computer stores Images (Black)



How computer stores Images (Pink)



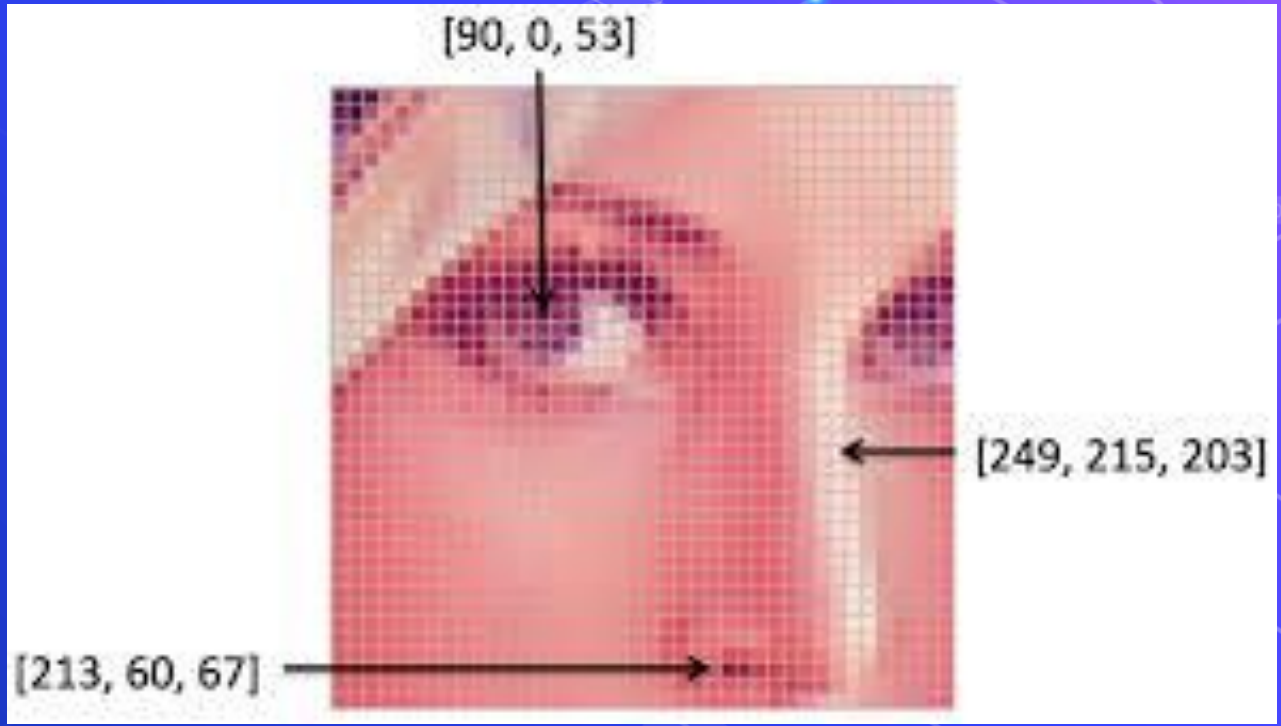
How computer stores Images (Yellow)



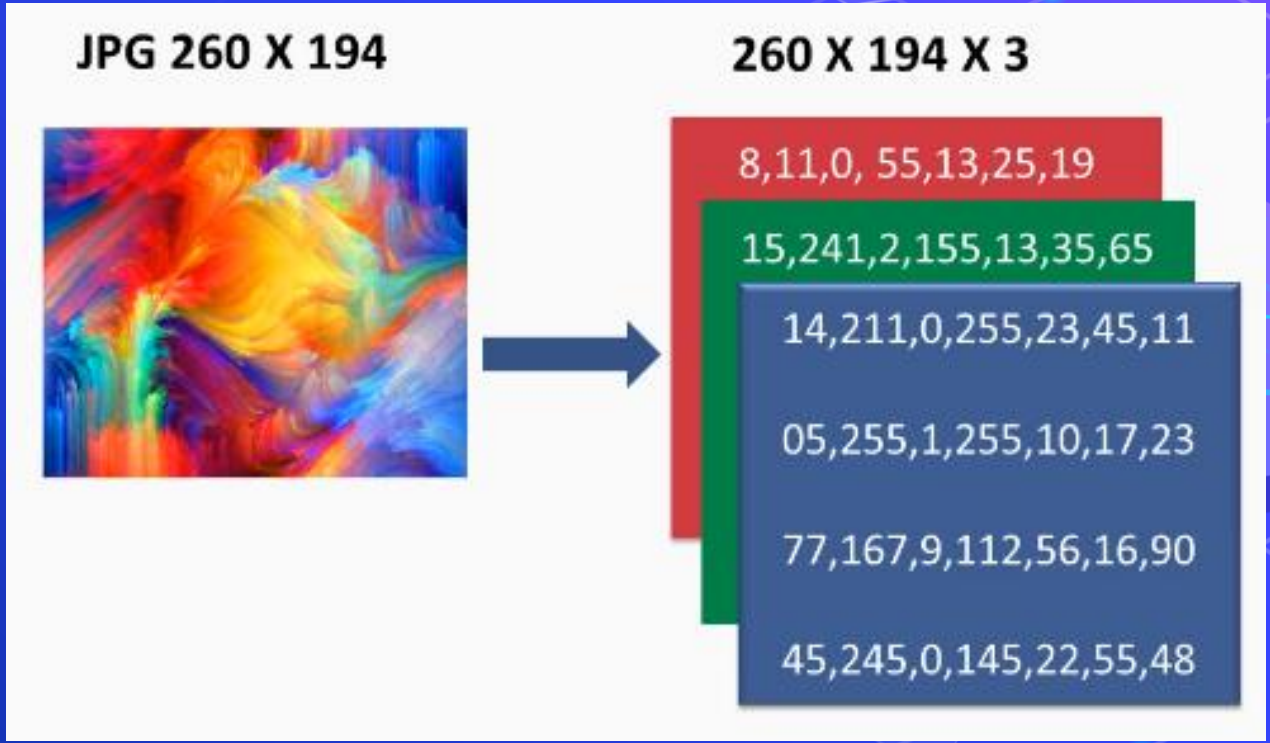
How computer stores Images

Resolution: 100x100

Width : 100 pixels
Height: 100 pixels



How computer stores Images



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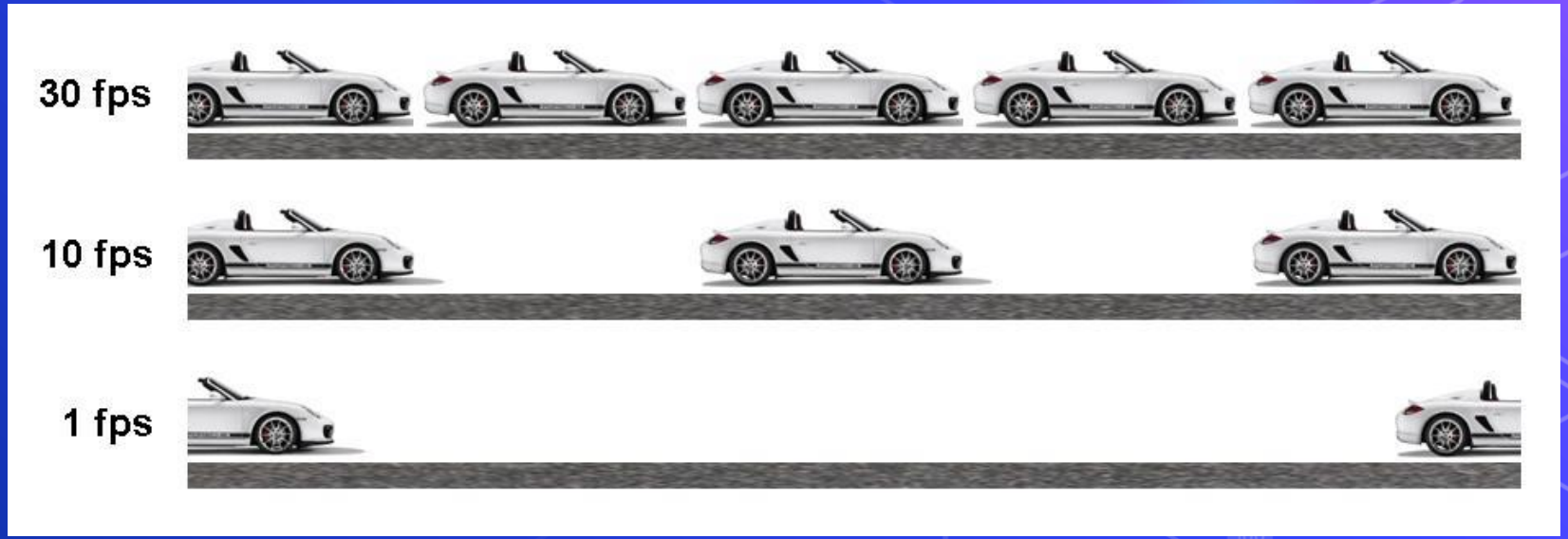
How computer stores Videos



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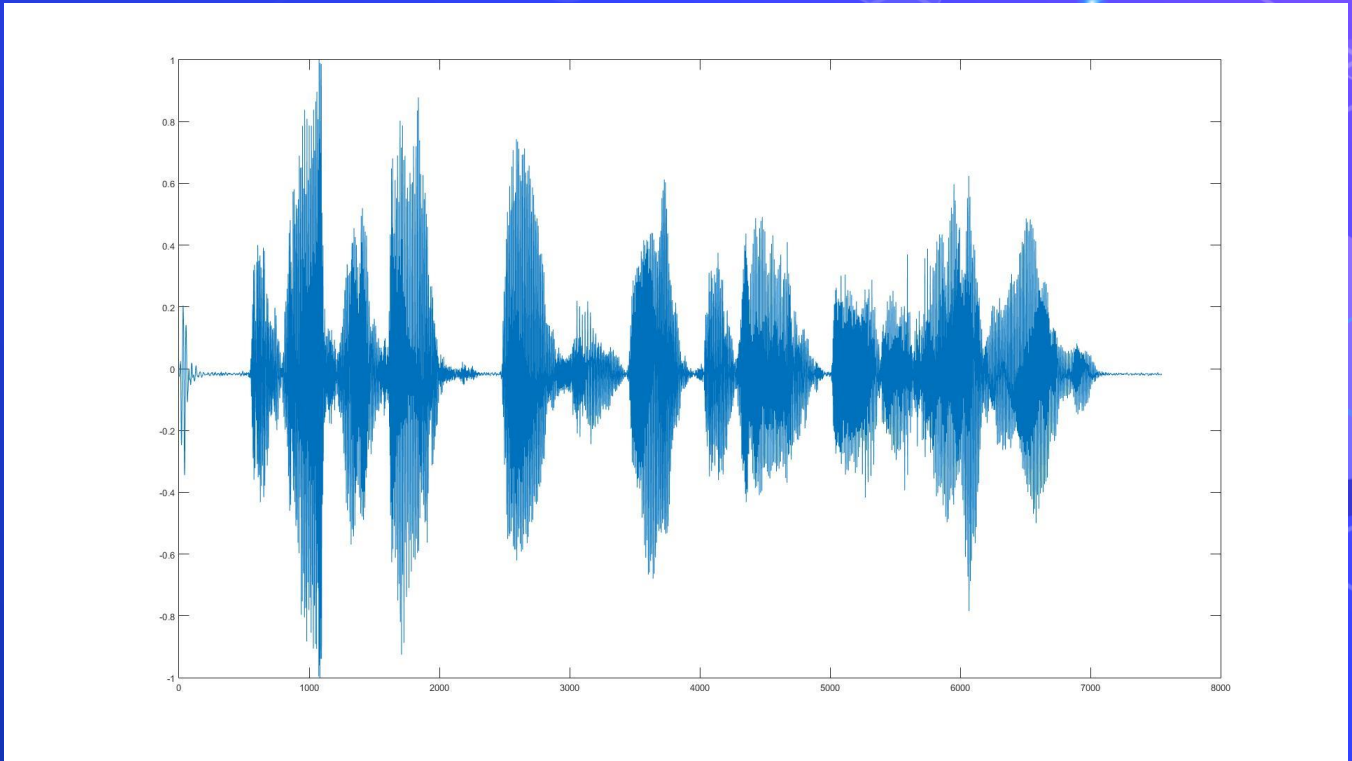
How computer stores Audio



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Programming ?!

Just writing code for executing some sequential instructions to perform various tasks.

Computers are **FAST** but **DUMB**, they need to know what to do.

Technology Tree

- Embedded Systems
- Operating Systems
- Desktop Applications
- Web Applications
- Mobile Applications
- Database Systems
- Networking & Server administration
- Internet of Things
- Game Development
- AR / VR
- Compression
- Encryption
- Security & Ethical Hacking
- Machine & Deep Learning
- Data Science
- Computer Vision
- Speech Processing
- Natural Language Processing
- Autonomous
- Blockchain
- Big Data
- Computer Graphics
- Compiler Design
- ...

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Why Python ?!

>_ Easy to Learn, Read, Maintain.

>_ Very Big Community so you will find a lot of Libraries to use.

Python 2 vs 3 ?!

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ANACONDA

Awesome Python Distribution.

Free and open-source distribution of the Python and R programming languages for scientific computing (data science, machine learning applications) . Anaconda distribution includes data-science packages suitable for Windows, Linux, and macOS.

https://www.anaconda.com

Visual Studio Code

Awesome Code Editor.

https://code.visualstudio.com

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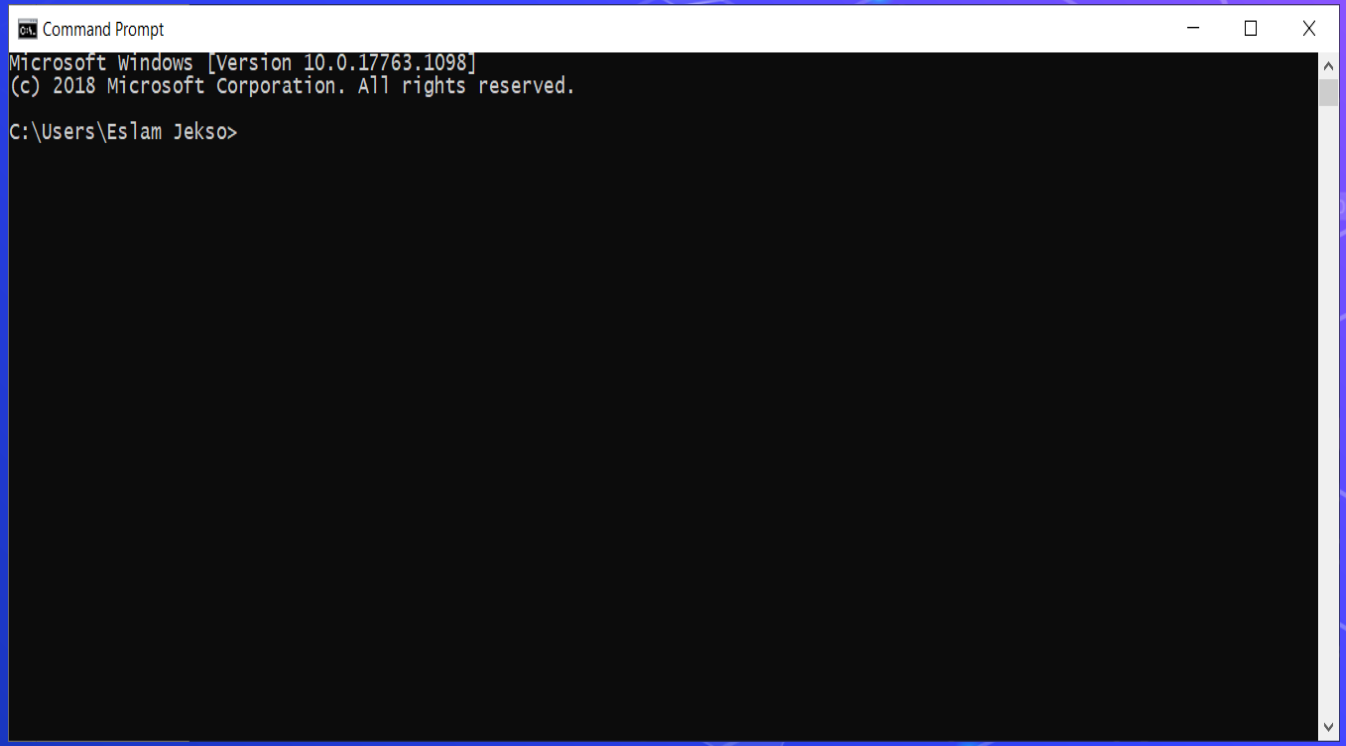
Command Line

- >_ cd
- >_ dir
- >_ copy
- >_ del
- >_ move
- …



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conda & *pip* package managers

https://anaconda.org/

```
conda install --package name--
```

https://pypi.org/

```
pip install --package name--
```

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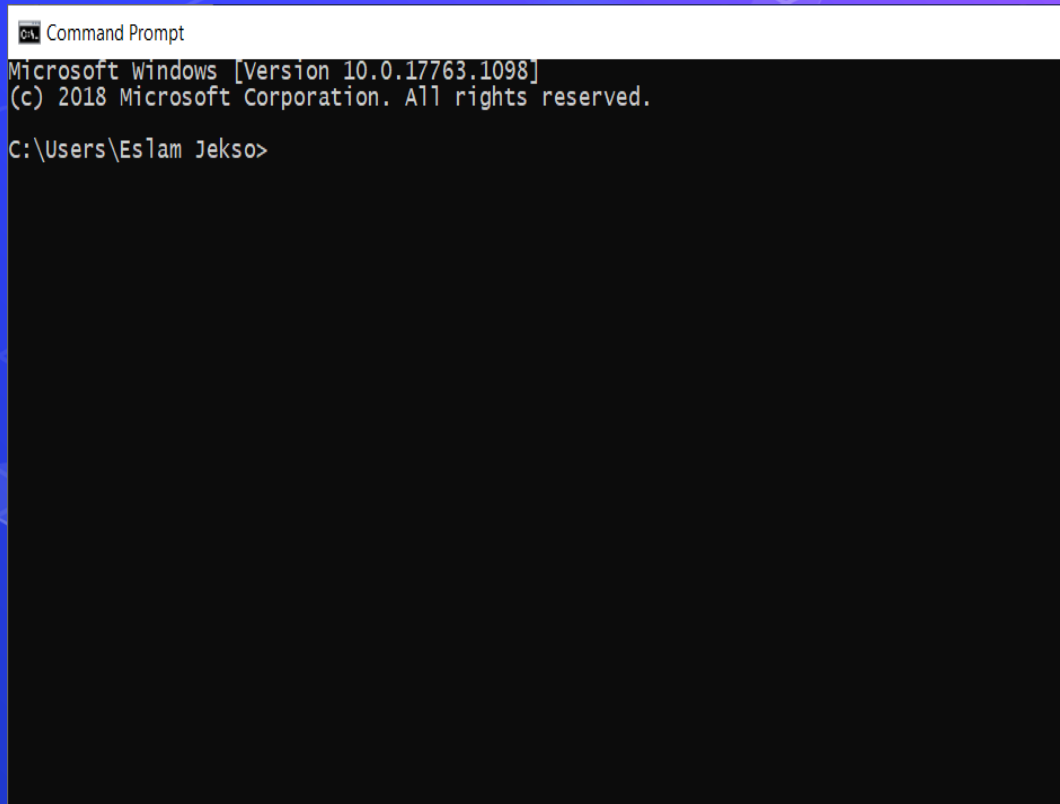
Run Python Script via Command Line

1- Make a .py file

2- Write code & Save it

3- Open cmd

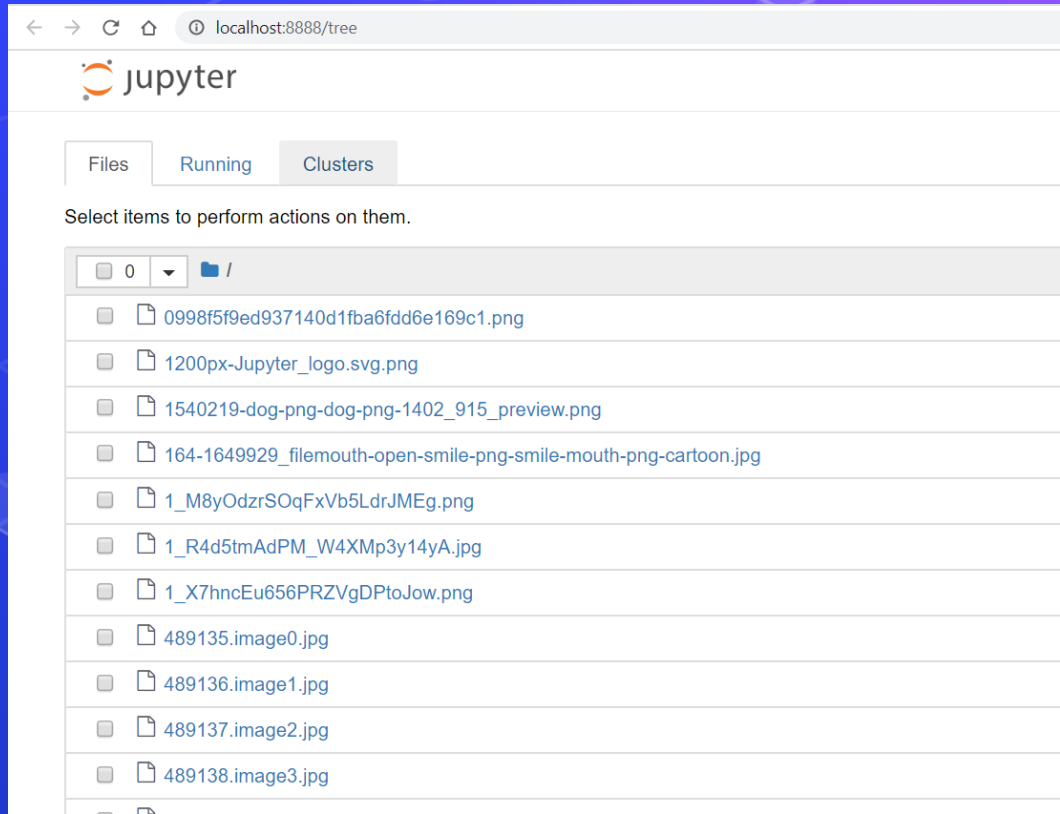
4- *>_ python file.py*



Run Python via Jupyter Notebook

1- Open *cmd in a folder*

2- `>_ jupyter notebook`



Jupyter Notebook

- Create new .ipynb file
- Naming the notebook
- Menu buttons (Run, Insert, Delete cells, etc...)
- Move Cell up or down
- Copy, Paste and Cut Cells
- Merge Cells
- Saving the notebook for checkpoints
- Code and Markdown Cells
- Export .py file
- Kernel
- Use command line in Jupyter using '!' operator

Jupyter Notebook (Shortcuts)

- **Ctrl + Enter** --- > Execute Cell
- **Shift + Enter** --- > Execute Cell then go to the next cell
- **Alt + Enter** --- > Execute Cell then insert new cell below
- **A and B** --- > Insert Cell Above or Below
- **Shift + Up or Down** --- > Select Cells Above or Below
- **C and V and X** --- > Copy, Paste and Cut Cells inside Notebook
- **Ctrl + C or V or X** --- > Copy, Paste and Cut Cells outside Notebook
- **Double D** --- > Delete Cells
- **Shift + M** --- > Merge Cells
- **Y and M** --- > Make Cell type Code or Markdown
- **S** --- > Save Notebook

https://www.audiolabs-erlangen.de/resources/MIR/FMP/B/B_Jupyter.html

Questions ?!

Thanks!

>_ Live long and prosper