COMPUTER VISION

Intro to Image Processing & OpenCV

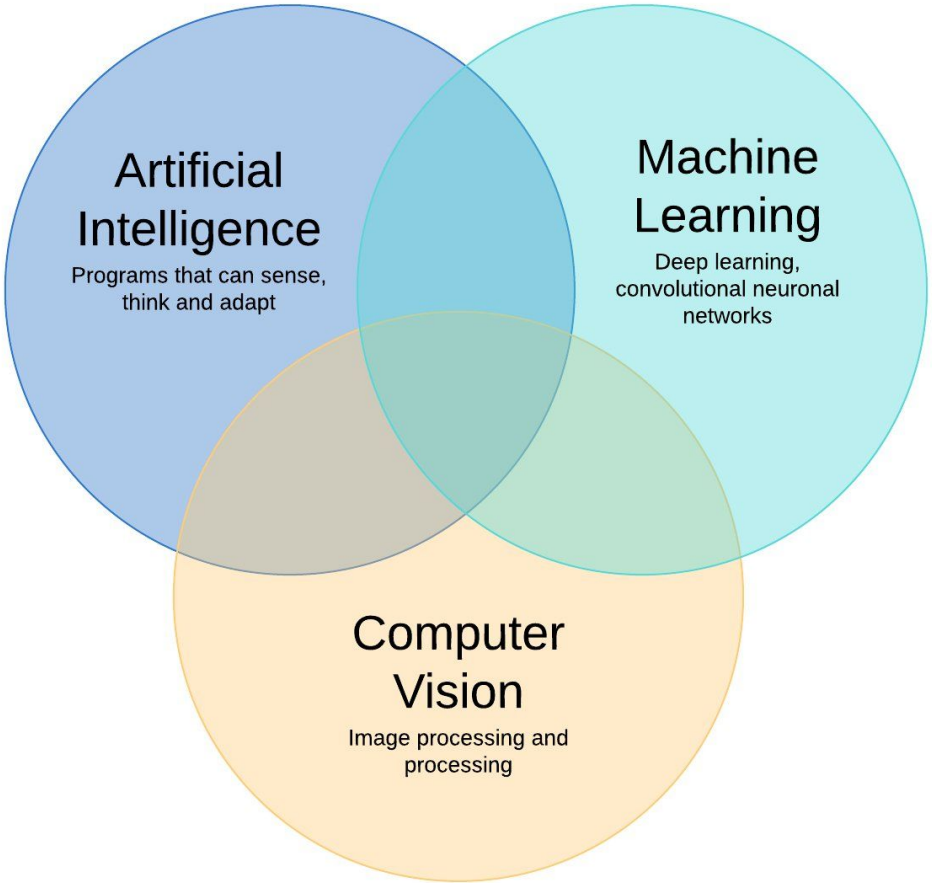
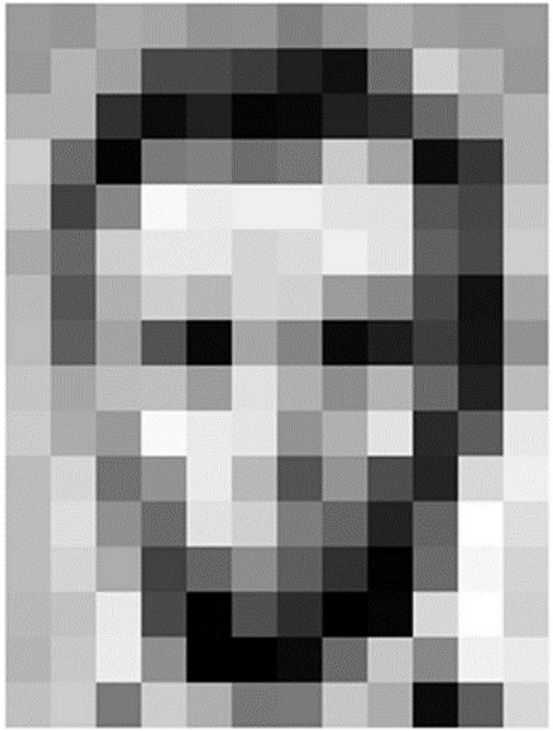
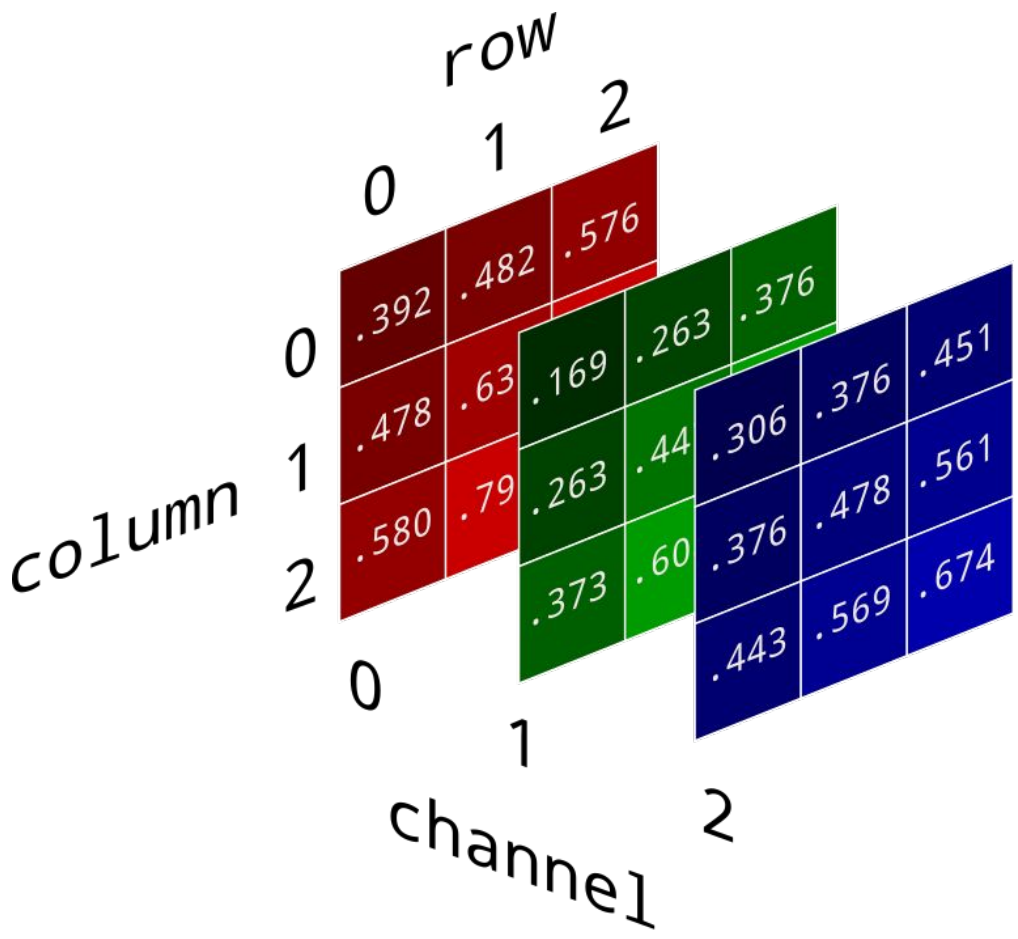

Artificial Intelligence
Programs that can sense, think and adapt
Machine Learning
Deep learning, convolutional neuronal networks
Computer Vision
Image processing and processing

Image as a Matrix



157	153	174	168	150	152	129	151	172	161	155	156
155	182	163	74	75	62	33	17	110	210	180	154
180	180	50	14	34	6	10	33	48	106	159	181
206	109	5	124	131	111	120	204	166	15	56	180
194	68	137	251	237	239	239	228	227	87	71	201
172	105	207	233	233	214	220	239	228	98	74	206
188	88	179	209	185	215	211	158	139	75	20	169
189	97	165	84	10	168	134	11	31	62	22	148
199	168	191	193	158	227	178	143	182	106	36	190
205	174	155	252	236	231	149	178	228	43	95	234
190	216	116	149	236	187	86	150	79	38	218	241
190	224	147	108	227	210	127	102	36	101	255	224
190	214	173	66	103	143	96	50	2	109	249	215
187	196	235	75	1	81	47	0	6	217	255	211
183	202	237	145	0	0	12	108	200	138	243	236
195	206	123	207	177	121	123	200	175	13	96	218

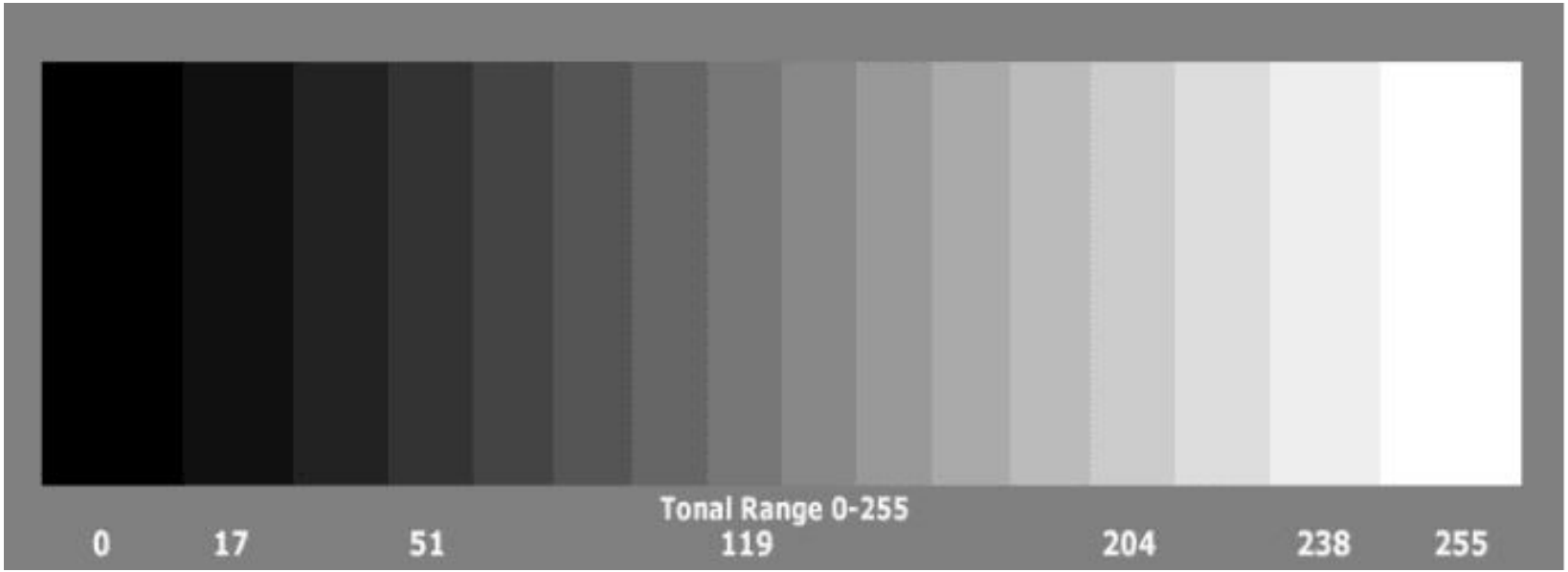
157	153	174	168	150	152	129	151	172	161	155	156
155	182	163	74	75	62	33	17	110	210	180	154
180	180	50	14	34	6	10	33	48	106	159	181
206	109	5	124	131	111	120	204	166	15	56	180
194	68	137	251	237	239	239	228	227	87	71	201
172	105	207	233	233	214	220	239	228	98	74	206
188	88	179	209	185	215	211	158	139	75	20	169
189	97	165	84	10	168	134	11	31	62	22	148
199	168	191	193	158	227	178	143	182	106	36	190
205	174	155	252	236	231	149	178	228	43	95	234
190	216	116	149	236	187	86	150	79	38	218	241
190	224	147	108	227	210	127	102	36	101	255	224
190	214	173	66	103	143	96	50	2	109	249	215
187	196	235	75	1	81	47	0	6	217	255	211
183	202	237	145	0	0	12	108	200	138	243	236
195	206	123	207	177	121	123	200	175	13	96	218


row
0
1
2
column
0
1
2
.392
.482
.576
.478
.63
.580
.79
.169
.263
.376
.263
.44
.373
.60
.306
.376
.451
.376
.478
.561
.443
.569
.674
0
1
2
channel

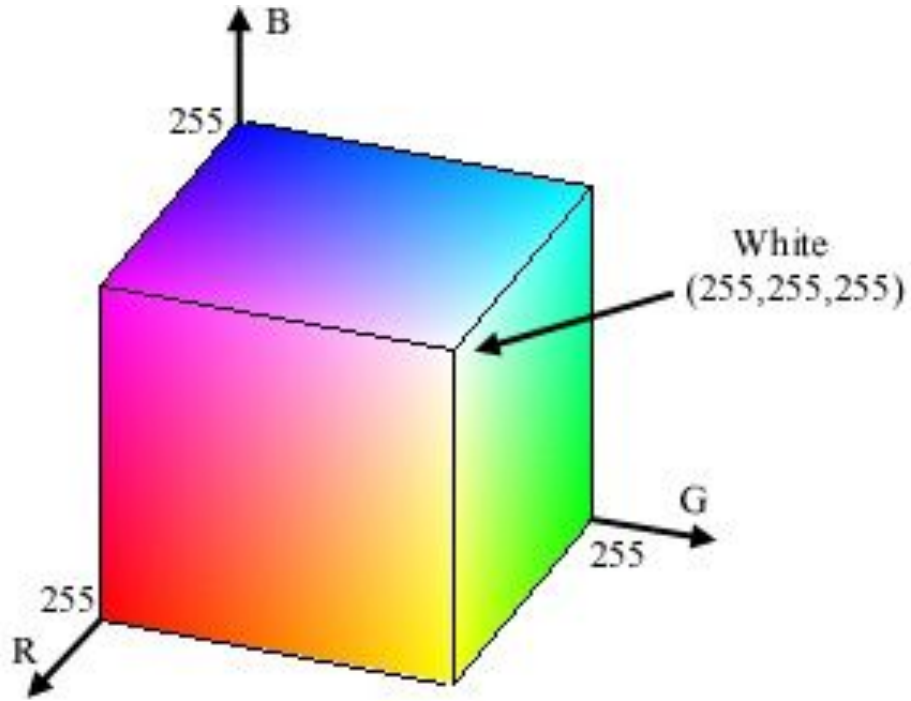
Color Spaces

- Color spaces define how colors are represented using numerical values.
- They provide a standardized way to express and interpret colors in a digital format.
- Each color space has its own set of coordinates or parameters to represent colors.

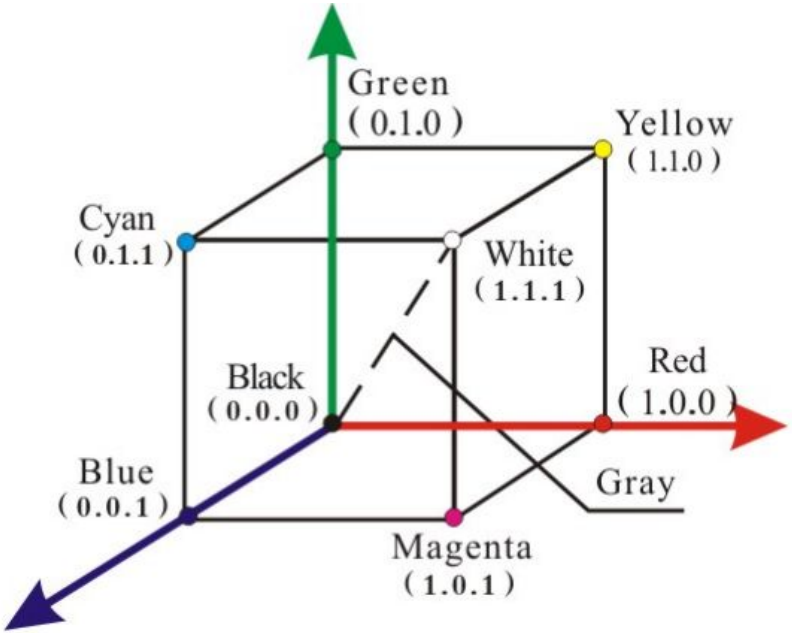
Grayscale Color Space



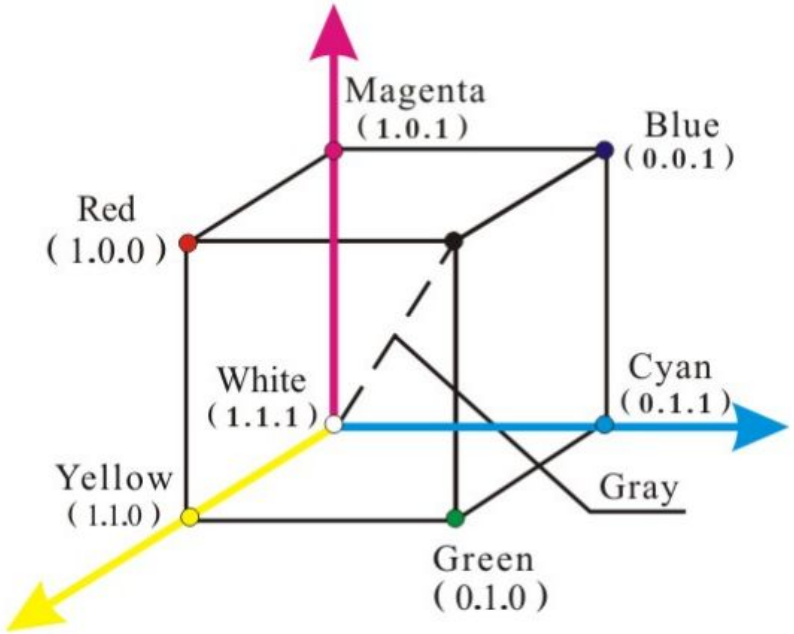
RGB Color Space



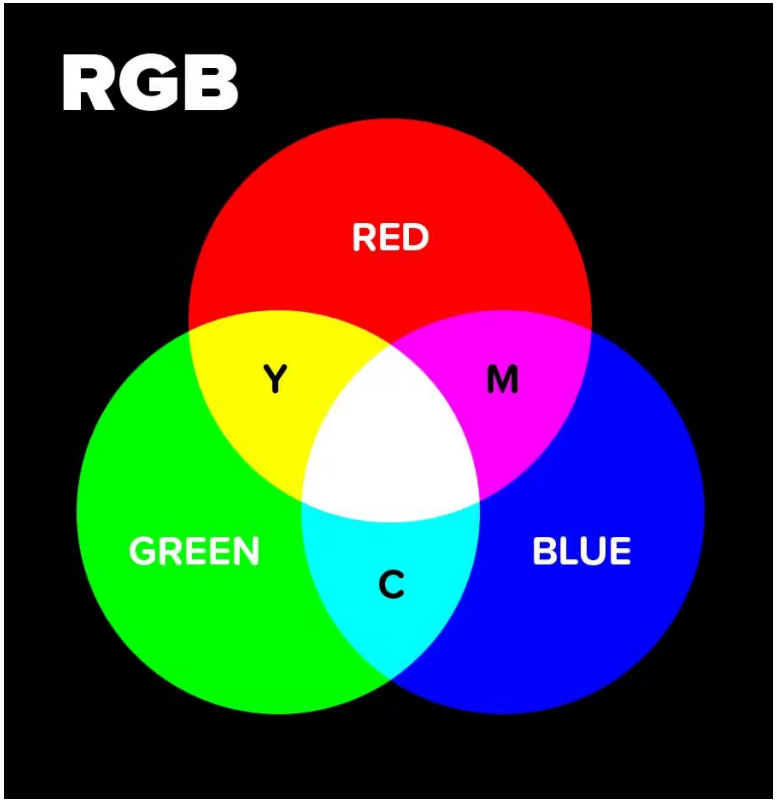
CMY Color Space

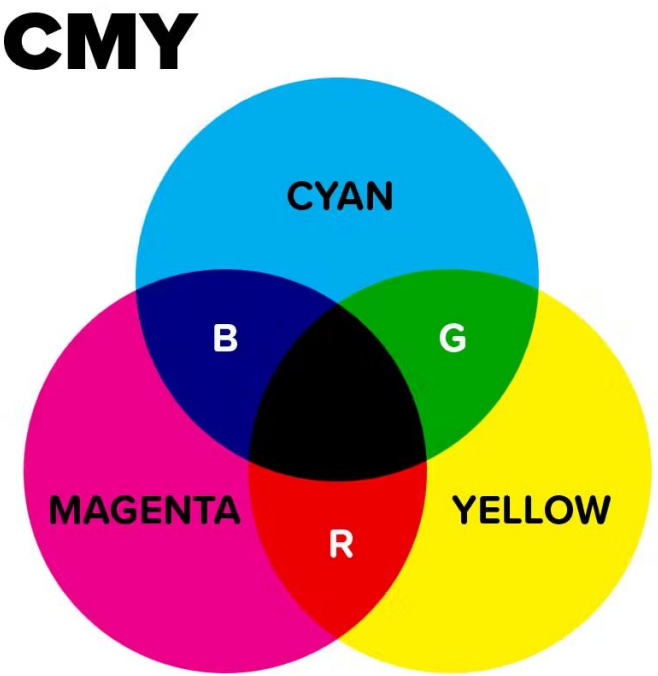


RGB



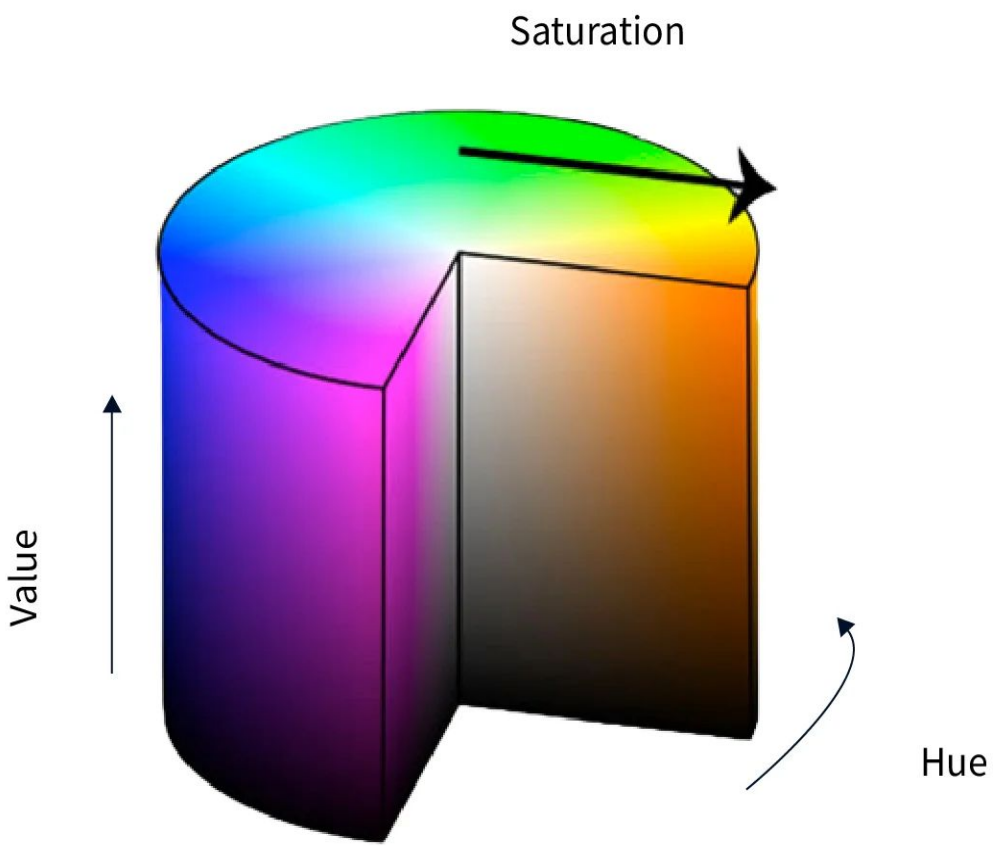
CMY


RGB
RED
Y
M
GREEN
C
BLUE


CMY
CYAN
B
G
MAGENTA
R
YELLOW

HSV Color Space

- **Hue -** Type of color expressed as angle around a color wheel**.**
- **Saturation -** Measures the purity, intensity or vividness of a color.
- **Value -** Represents the brightness or lightness of a color.



NumPy

- NumPy is a powerful open-source library in Python for numerical computing. It provides support for large, multi-dimensional arrays and matrices, along with a collection of mathematical functions to operate on these arrays efficiently.
- Provides functions to create large arrays and perform array manipulation operations like reshaping, slicing and indexing efficiently.
- Performs operations on entire arrays parlelley instead of individual elements leading to faster execution.
- Includes a wide range of mathematical and statistical functions, such as trigonometric, logarithmic, and statistical operations.
- Works seamlessly with other python libraries like OpenCV, SciPy, pandas and scikit-learn.

OpenCV

- Open Source Computer Vision Library is a powerful open-source computer vision and machine learning software library. It is designed to provide a common infrastructure for developing computer vision applications.
- Offers a vast array of functions for image and video analysis, object detection, and machine learning.
- Supports real-time computer vision applications by leveraging optimized algorithms and parallel processing capabilities.
- Supports programming languages like Python, C++, and Java.
- OpenCV seamlessly integrates with machine learning frameworks like Pytorch and TensorFlow, allowing developers to incorporate machine learning models into their computer vision applications.

Common Image Operations

- Reading and Displaying Image
- Changing Color Space
- Brightening and Darkening
- Rotation
- Interpolation
- Resizing
- Cropping
- Perspective Transform
- Thresholding
- Edge and Contour Detection
- Face and Text Detection

Additional Resources

- Bootcamp GitHub Repo
- FreeCodeCamp OpenCV Course (Available on YT)
- Official Certification Course by OpenCV
- NumPy Tutorial on YT
- NumPy Docs
- OpenCV Docs