Image preprocessing

Weronika Hryniewska

Po co robi się pre-processing?

- Ujednolicić zdjęcia
- Usprawnić trenowanie sieci
- Usunąć artefakty
- Usunąć szum
- Zauważyć niekompletne dane

Preprocessing etykiet

- Label Encoder
- One Hot Encoding

SAFETY-LEVEL (TEXT)	SAFETY-LEVEL (NUMERICAL)
None	0
Low	1
Medium	2
High	3
Very-High	4

BRIDGE-TYPE (TEXT)	BRIDGE-TYPE (NUMERICAL)
Arch	0
Beam	1
Truss	2
Cantilever	3
Tied Arch	4
Suspension	5
Cable	6

BRIDGE-TYPE (TEXT)	BRIDGE-TYPE (Arch)	BRIDGE-TYPE (Beam)	BRIDGE-TYPE (Truss)	BRIDGE-TYPE (Cantilever)	BRIDGE-TYPE (Tied Arch)	BRIDGE-TYPE (Suspension)	BRIDGE-TYPE (Cable)
Arch	1	0	0	0	0	0	0
Beam	0	1	0	0	0	0	0
Truss	0	0	1	0	0	0	0
Cantilever	0	0	0	1	0	0	0
Tied Arch	0	0	0	0	1	0	0
Suspension	0	0	0	0	0	1	0
Cable	0	0	0	0	0	0	1

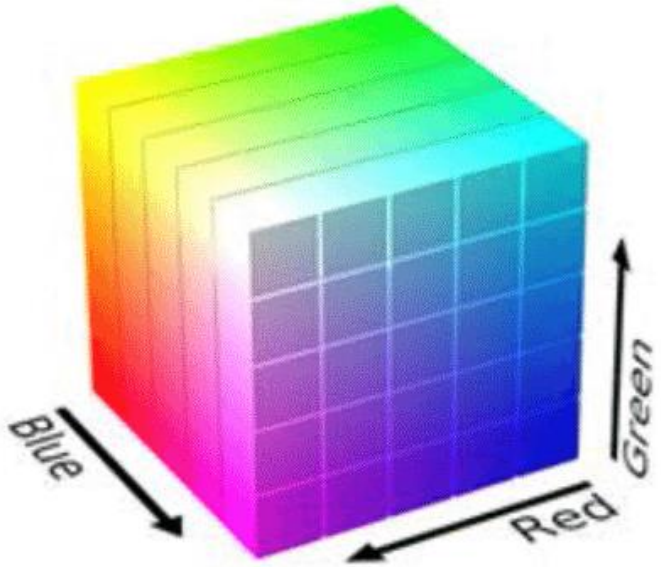
https://towardsdatascience.com/categorical-encoding-using-label-encoding-and-one-hot-encoder-911ef77fb5bd

Typowe operacje

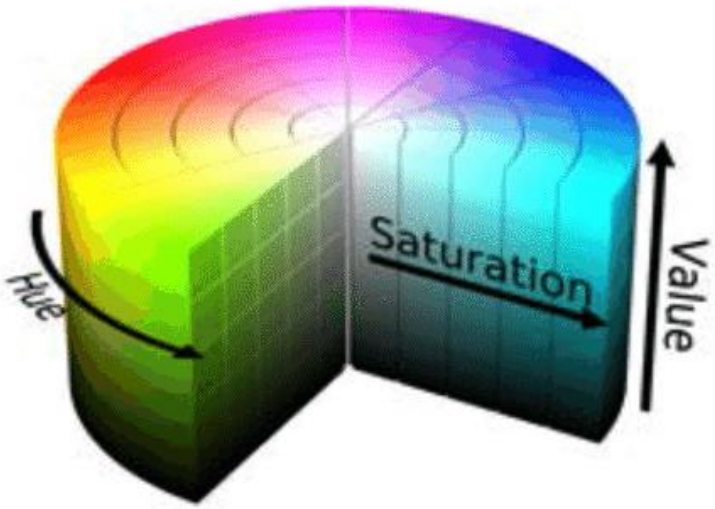
- Zmień rozmiar
- Przytnij

- Zmień przestrzeń kolorów
- Przeskaluj intensywność pikseli

RGB



HSV



www.researchgate.net/figure/RGB-left-and-HSV-right-color-spaces_fig1_310474598

Original

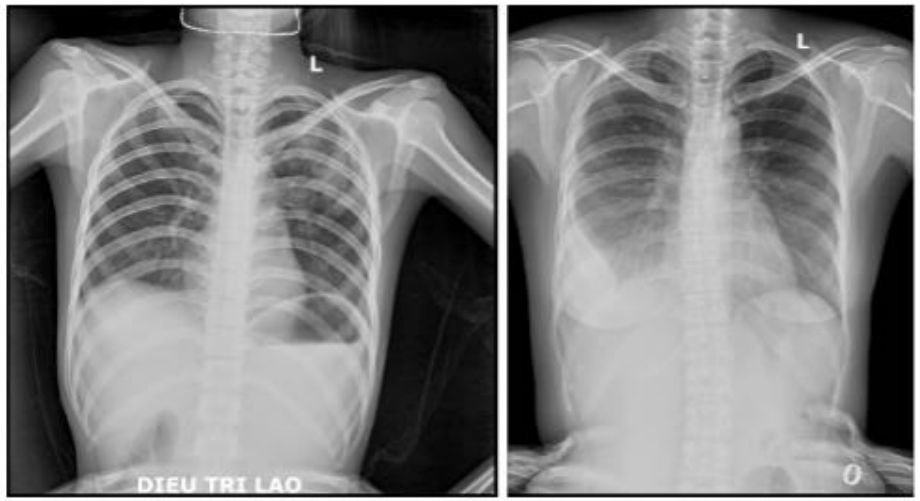
Reduced spatial resolution

Reduced color resolution

www.oreilly.com/library/view/strengthening-deep-neural/9781492044949/ch04.html

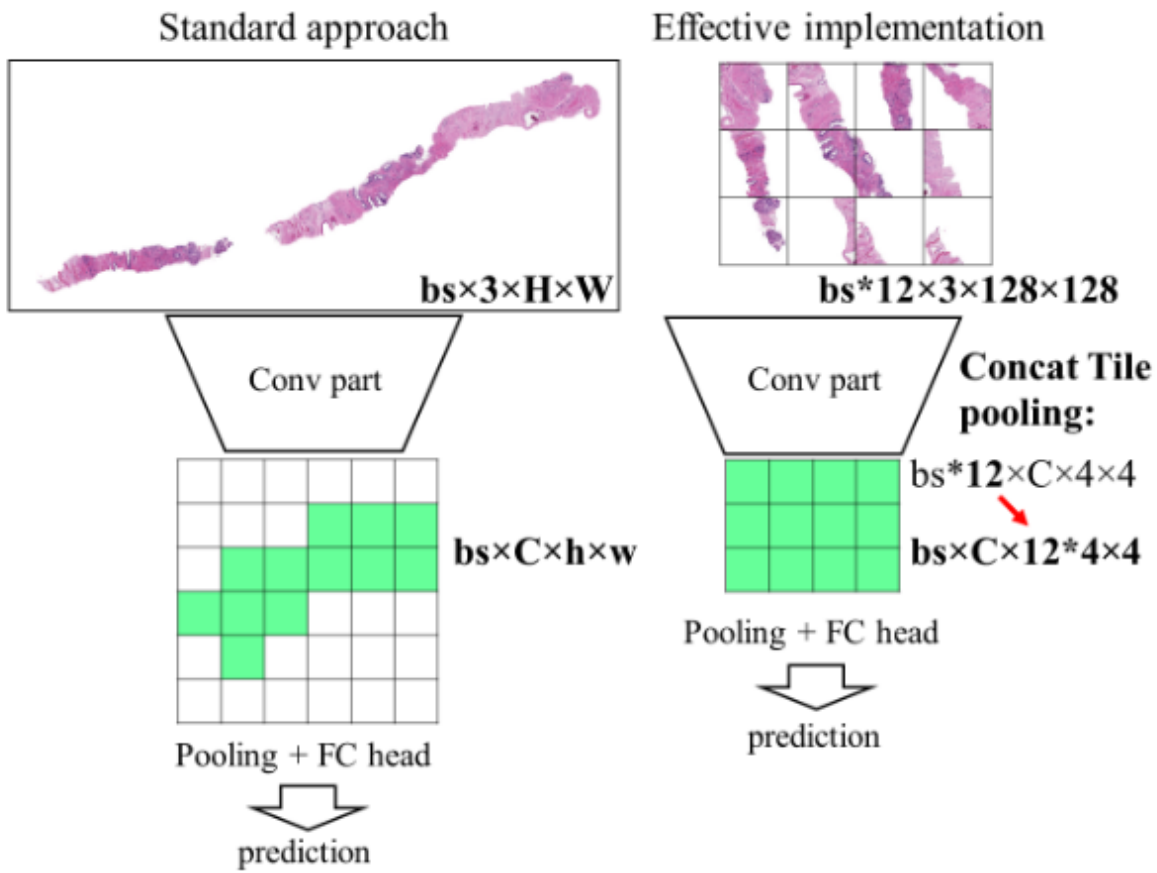
Typowe operacje dla obrazów medycznych

- Usunięcie artefaktów
- Usunięcie napisów
- Podział na kafelki



https://www.kaggle.com/c/vinbigdata-chest-xray-abnormalities-detection/

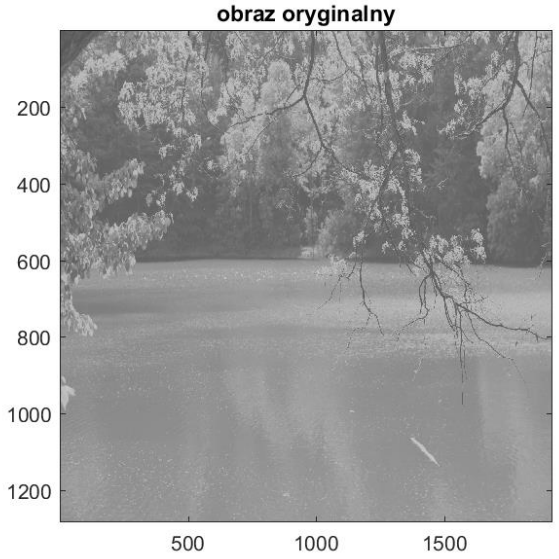
Podział na kafelki

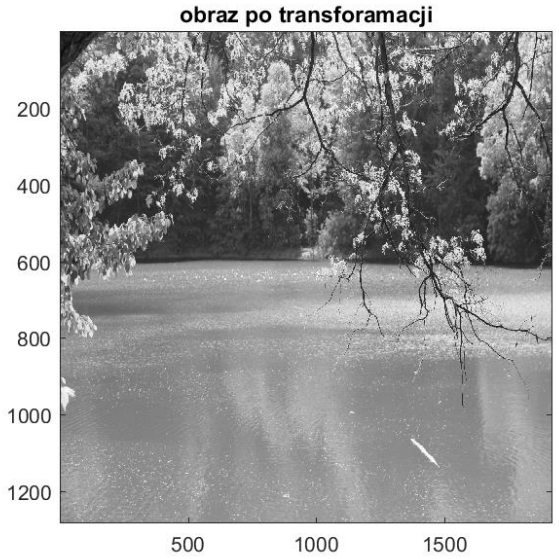


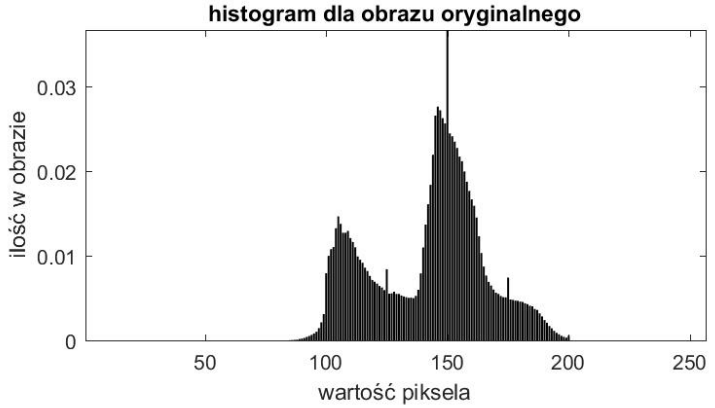
www.kaggle.com/c/prostate-cancer-grade-assessment/discussion/146855

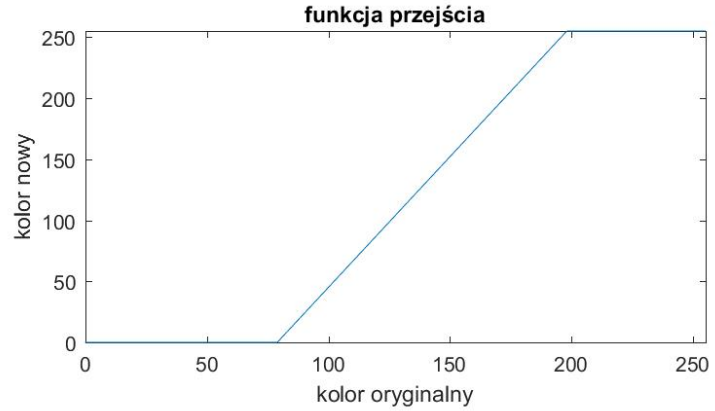
Mniej typowe operacje wykonywane w preprocessingu

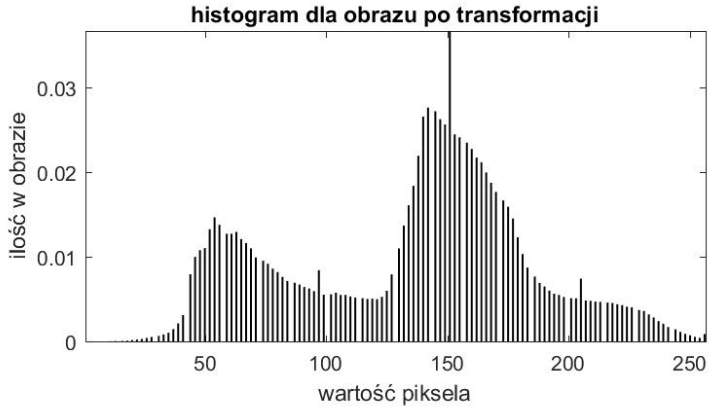
- Rozciąganie histogramu
- Wyrównywanie histogramu
- Zwiększanie kontrastu
- Usuwanie szumu
- Operacje morfologiczne
- Segmentacja – jako przygotowanie do np. klasyfikacji
- Rekonstrukcja obrazu
- Wykrywanie konturów
- Transformata falkowa
- Transformata Fouriera
- Filtr Gabor
- Adaptive Median Filter
- Weighted Median Filter
- Mean Filter or Average Filter
- Weiner Filter





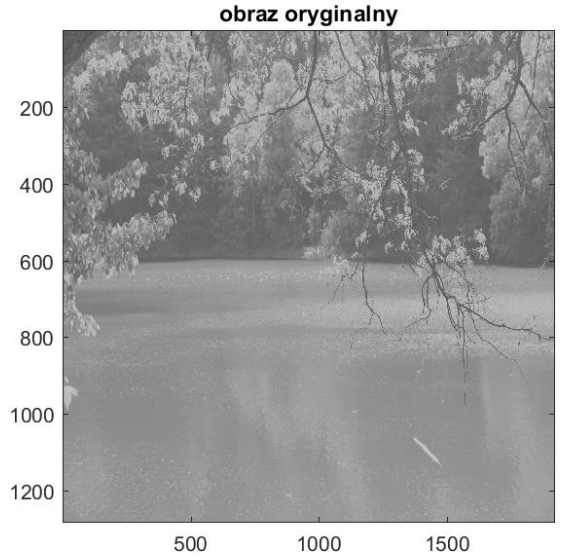


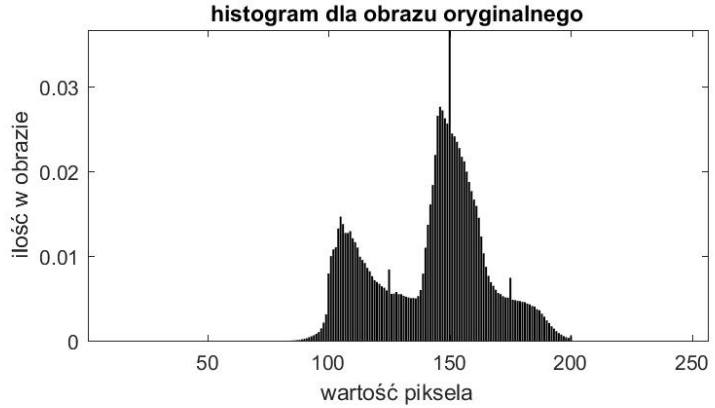


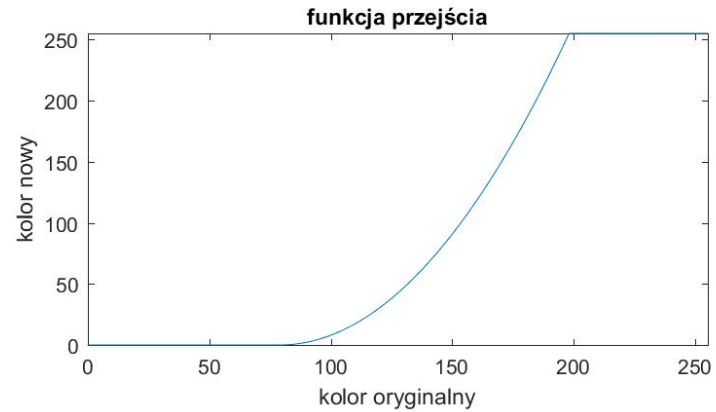


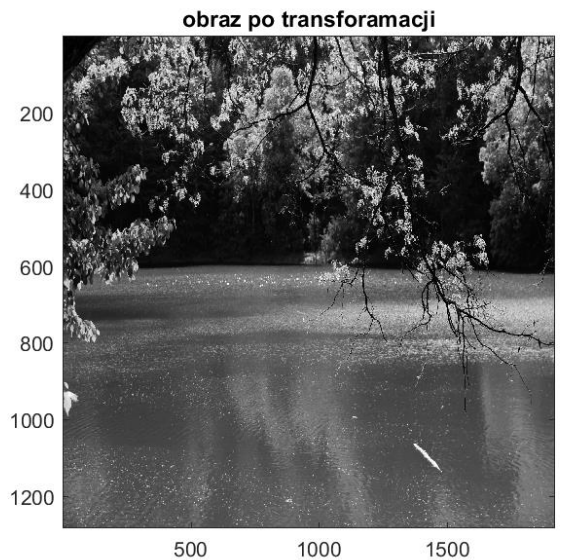
Rozciąganie histogramu

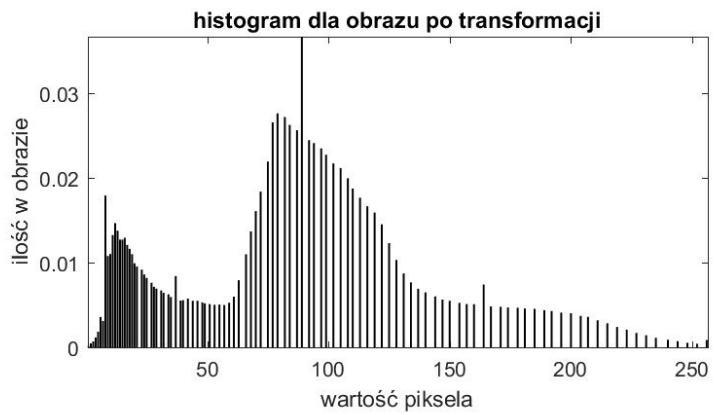
www.mkramarczyk.zut.edu.pl/?cat=PO&l=02





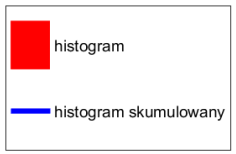


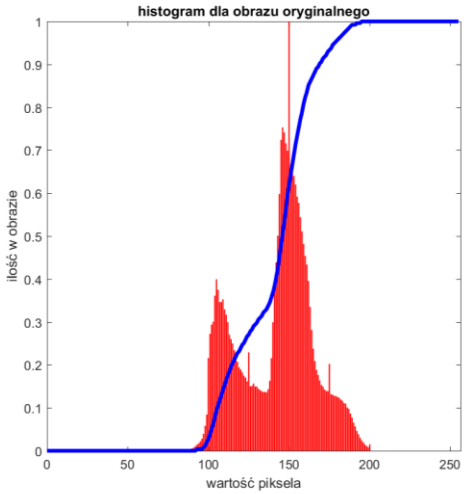


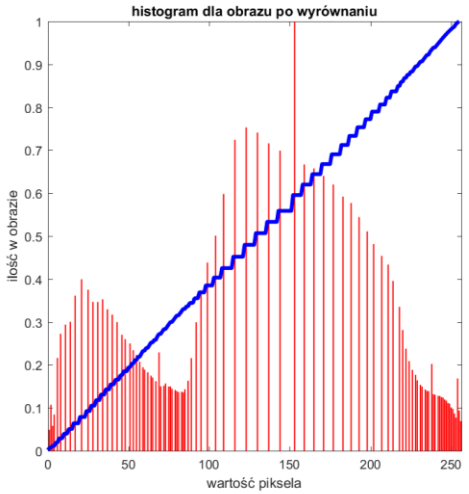


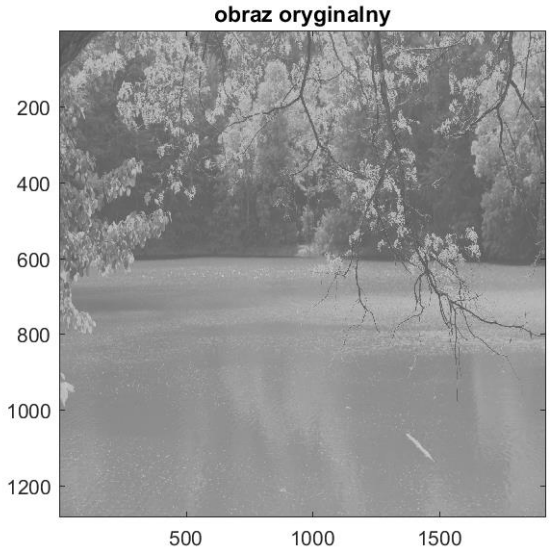
www.mkramarczyk.zut.edu.pl/?cat=PO&l=02

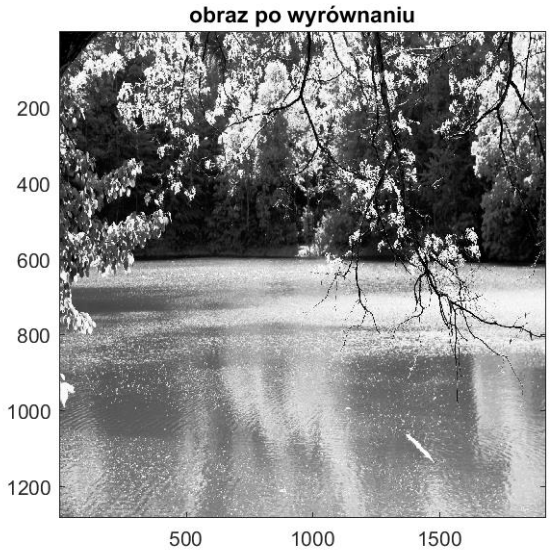
Wyrównanie histogramu

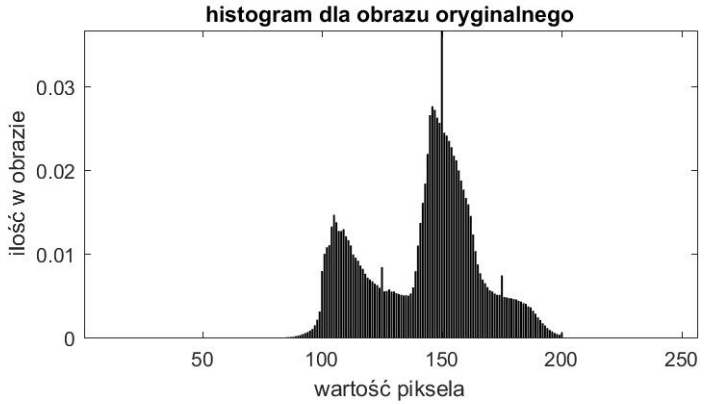


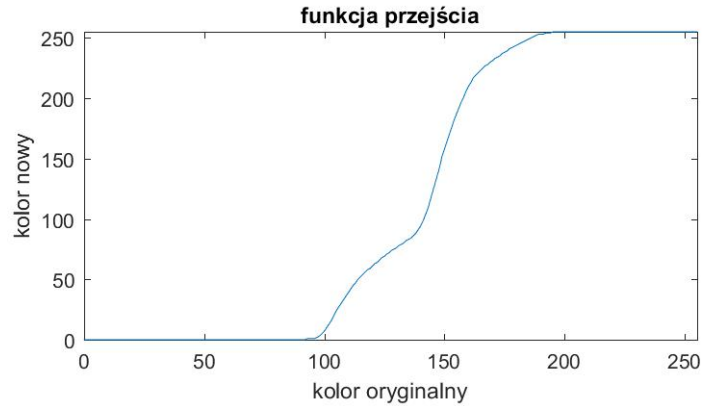


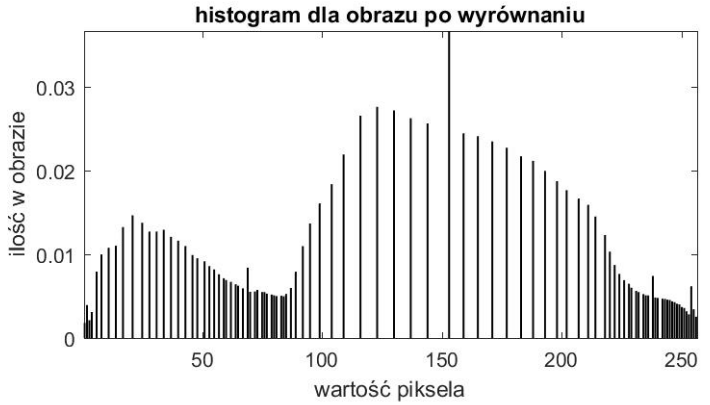






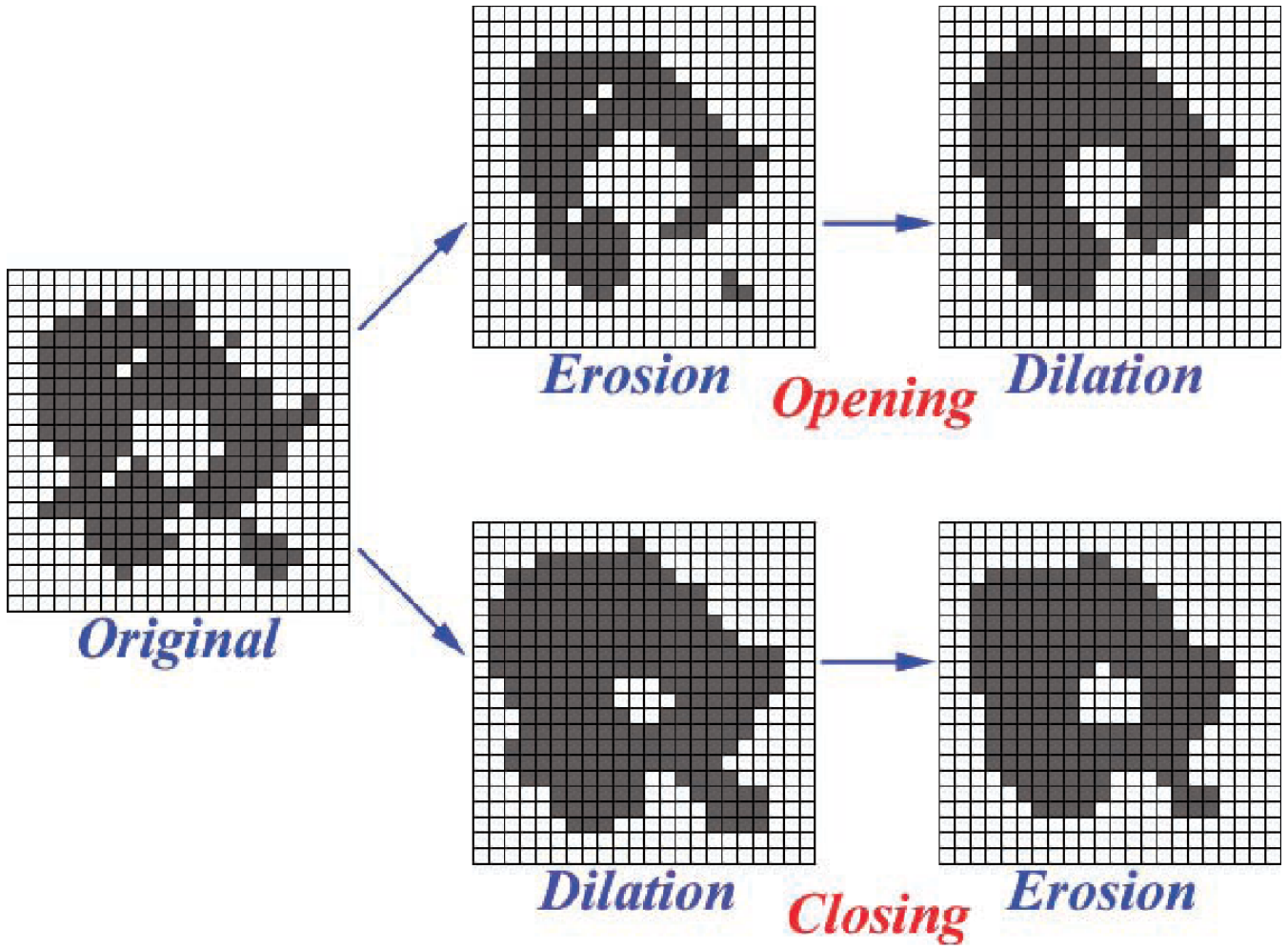






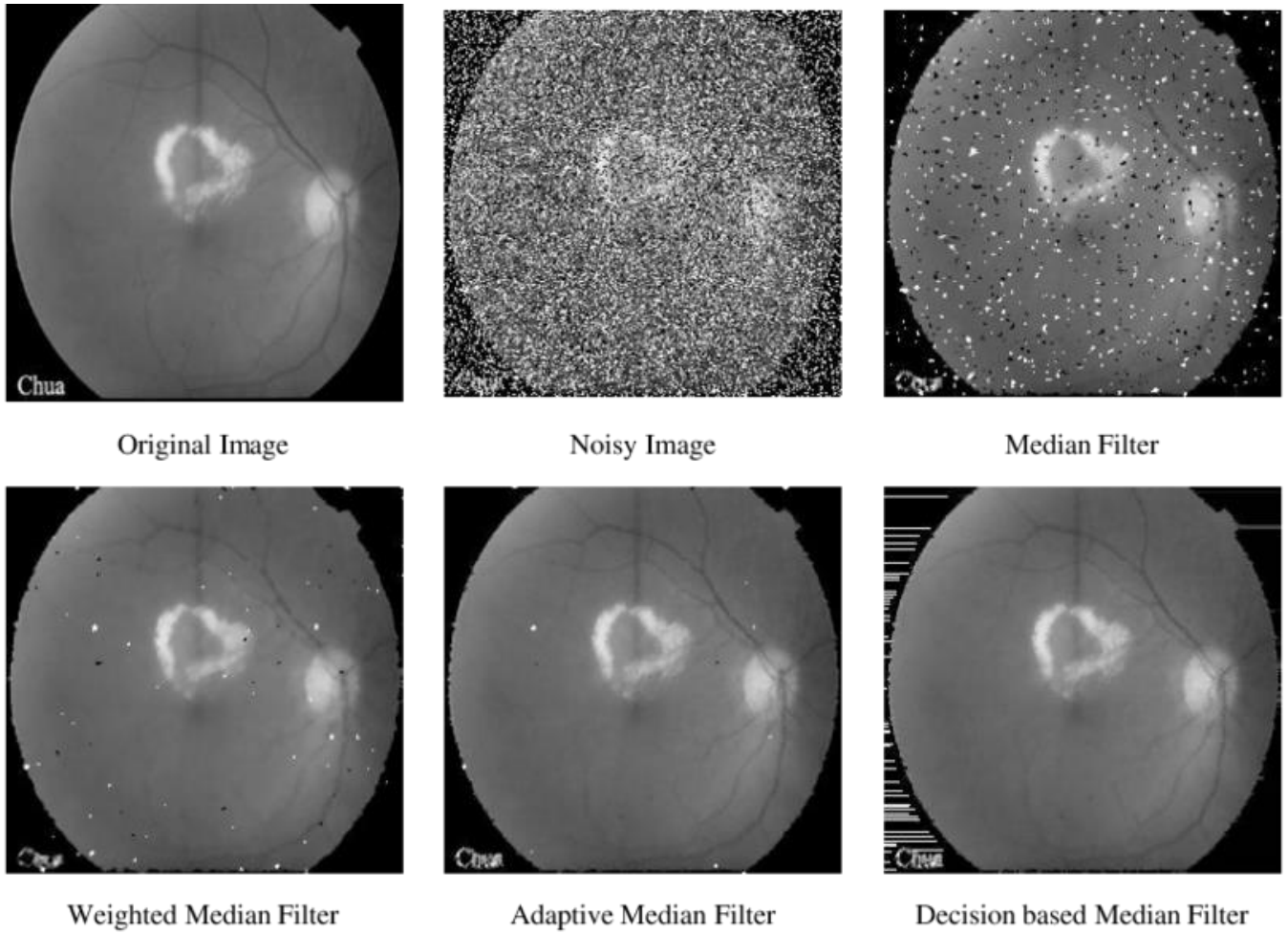
www.mkramarczyk.zut.edu.pl/?cat=PO&l=02

Operacje morfologiczne



www.semanticscholar.org/paper/DIGITAL-IMAGES-EDGE-DETECTION-USING-MATHEMATICAL-Ali/23fbb2f72e97178e931719f83a7f05775e22a512

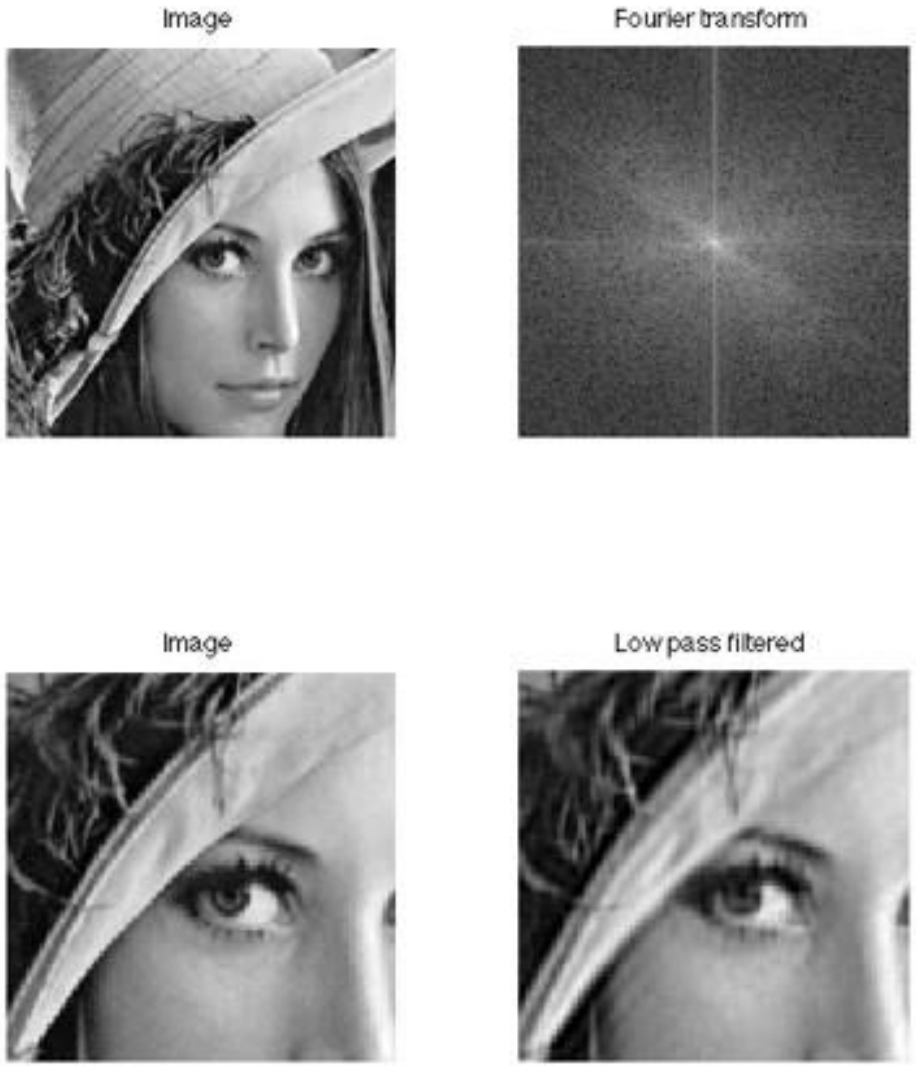
Usuwanie szumu



www.researchgate.net/figure/Performance-of-Median-filter-Weighted-Median-filter-Adaptive-Median-filter-and-Decision_fig2_298790524

Fourier transforms in image processing

Transformata Fouriera



Przydatne biblioteki

- Scikit-learn
- OpenCV
- Pillow/PIL
- Scikit-Image
- SciPy
- NumPy
- Pydicom