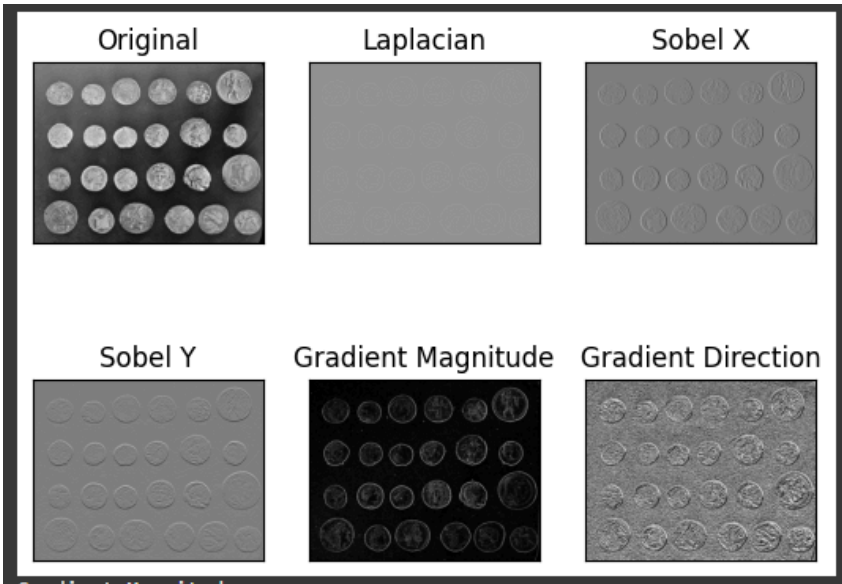
ECMM426: Computer Vision Report & GenAI Declaration

Question 1:

- Returns two 2D arrays for gradient magnitude and gradient direction.



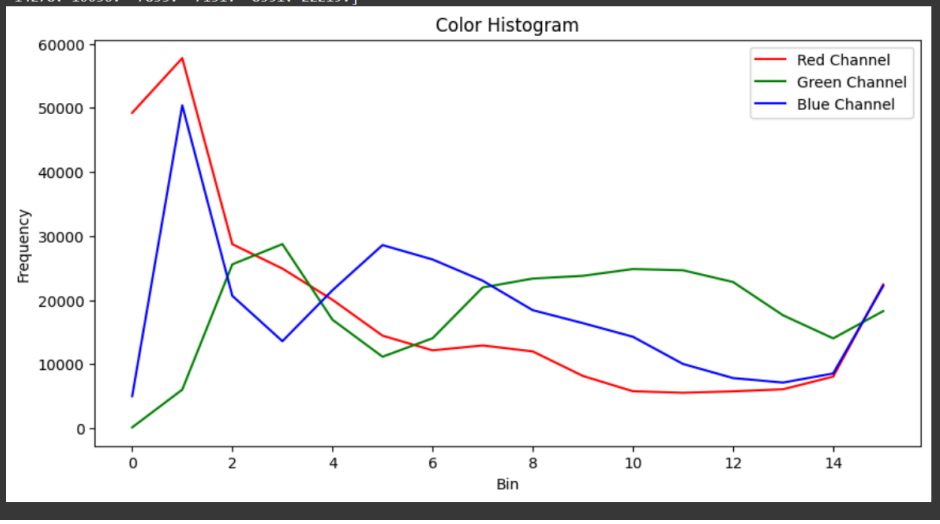

```
Gradient Magnitude:
[[  0.         474.         252.         ...   4.           2.
    0.        ]
 [288.         484.86905449 170.55790805 ...  15.55634919  11.3137085
    2.        ]
 [230.         312.16021527  63.63961031 ...  22.13594362  22.13594362
    4.        ]
 ...
 [ 14.          12.64911064  39.59797975 ...   0.           0.
    0.        ]
 [ 10.          12.64911064  40.02499219 ...   0.           0.
    0.        ]
 [  0.          18.          32.         ...   0.           0.
    0.        ]]

Gradient Direction:
[[ 0.          0.          0.         ...  0.          0.
   0.        ]
 [ 1.57079633  0.51070426  0.50823746 ...  0.78539816  2.35619449
  -1.57079633]
 [ 1.57079633  0.45791701  0.78539816 ...  0.32175055  2.8198421
   1.57079633]
 ...
 [-1.57079633 -1.24904577 -2.35619449 ...  0.          0.
   0.        ]
 [-1.57079633 -0.32175055  2.91479381 ...  0.          0.
   0.        ]
 [ 0.          0.          3.14159265 ...  0.          0.
   0.        ]]
```

Question 2:

- Returns 1D arrays, each with histograms for the R, G and B channel.

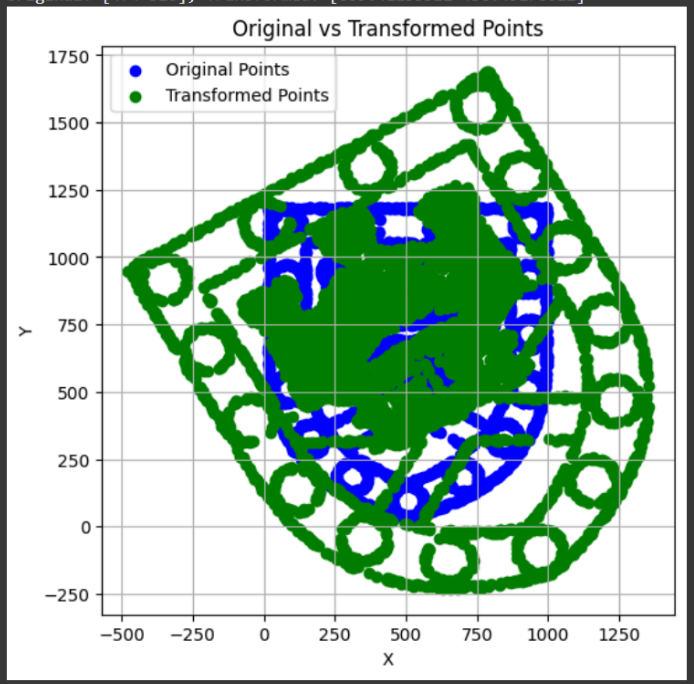
```
Red Channel Histogram:
 [49224. 57751. 28725. 24912. 20046. 14445. 12157. 12922. 11989.  8168.
  5774.  5541.  5756.  6087.  8060. 22443.]
Green Channel Histogram:
 [  139.  6027. 25579. 28735. 16937. 11161. 14049. 21972. 23359. 23782.
 24845. 24652. 22824. 17622. 14027. 18290.]
Blue Channel Histogram:
 [ 5010. 50379. 20664. 13587. 21538. 28585. 26333. 23024. 18424. 16408.
 14278. 10036.  7833.  7131.  8551. 22219.]
```



Question 3:

- Returns a 3x3 transformation matrics and visualization of original and transformed points.

```
Original: [295 966], Transformed: [ 42.38353229 881.61275525]
Original: [325 760], Transformed: [235.85467546 636.51090548]
Original: [434 888], Transformed: [281.44982898 884.53778301]
Original: [ 53 549], Transformed: [ 40.76631072 158.41386518]
Original: [474 520], Transformed: [609.41135321 436.49176012]
```




```
Transformation Matrix:
[[   1.29903811   -0.75        383.66729112]
 [   0.75          1.29903811 -594.50805483]
 [   0.            0.           1.        ]]
```

Question 4:

- The best model is saved at data/weights_resnet.pth.

Question 5:

- The output returns with a 1-dimensional numpy array of predictions

```
Predictions: [1 4 4 ... 1 3 5]
```

- Returns the classification accuracy percentage.

```
Accuracy: 81.10000000000001
```

Question 6:

- Returns a 2D array for all the classes in the dataset.
- Prints the MAPE percentage computed for each image in the Validation set, and the average Mape value 5.13%.

```
Final Average MAPE: 5.126862530887299
```

- The model is saved at data/weights_counting.pth.

Student declaration: You must prepare a declaration saying which of these applies.

- ☐ I have used GenAI tools for developing ideas.
- ☐ I have used GenAI tools to assist with research or gathering information.
- ☑ I have used GenAI tools to help me understand key theories and concepts.
- ☐ I have used GenAI tools to identify trends and themes as part of my data analysis.
- ☐ I have used GenAI tools to suggest a plan or structure for my assessment.
- ☑ I have used GenAI tools to give me feedback on a draft.
- ☐ I have used GenAI tools to generate image[s], figures or diagrams.
- ☑ I have used GenAI tools to proofread and correct grammar or spelling errors.
- ☐ I have used GenAI tools to generate citations or references.
- ☑ Other [code comments and structure].
- ☐ I have not used any GenAI tools in preparing this assessment.

Please note that submitting your work without an accompanying declaration, or one with no ticked boxes, will be considered a declaration that you have not used GenAI tools in preparing your work.