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Artificial Intelligence
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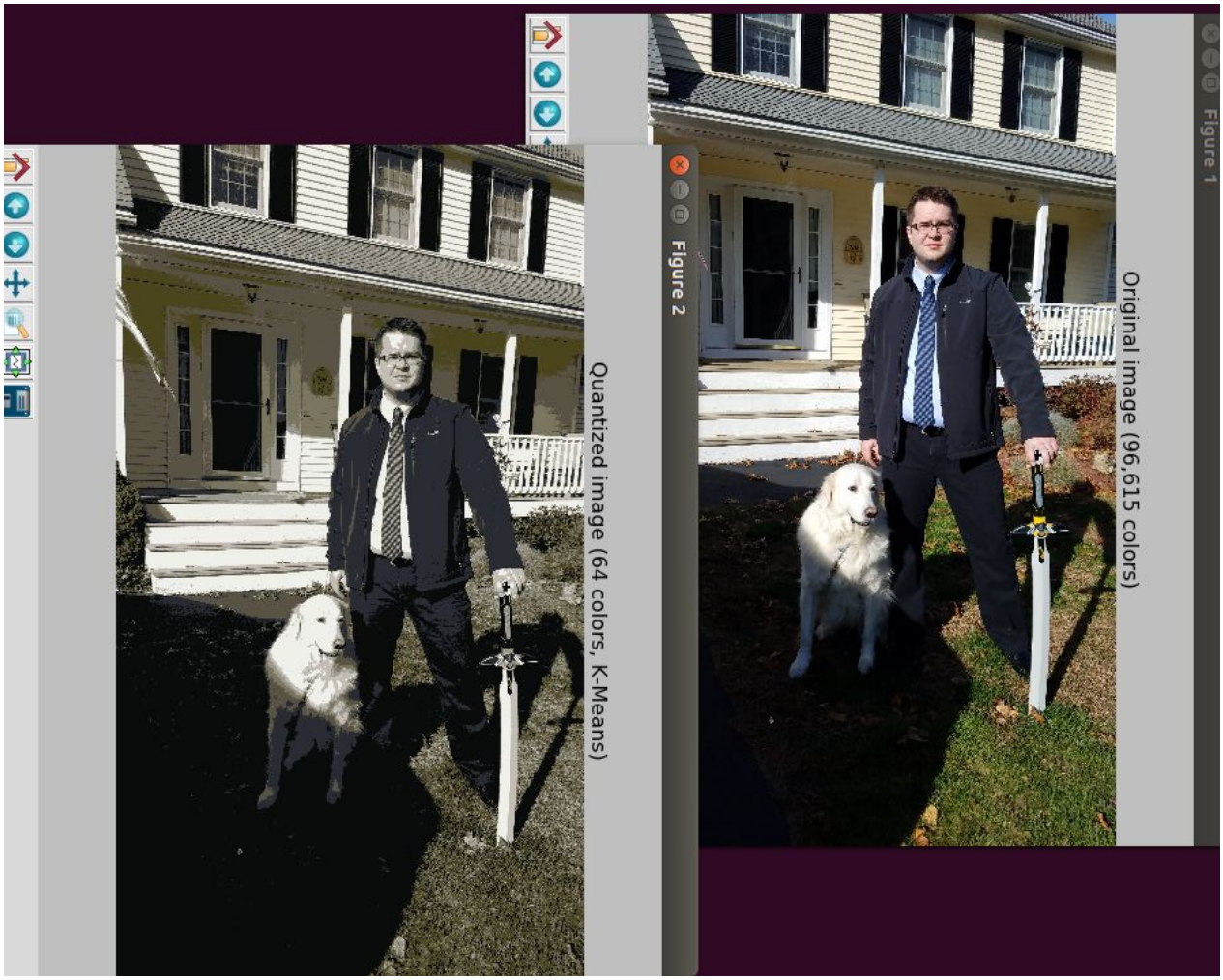
Homework 5

1.e.i.) Altering the n_colors value changes the amount of colors available to choose from. The higher the value, the larger selection of the colors. The picture also takes longer to generate when the number of n_colors is larger.

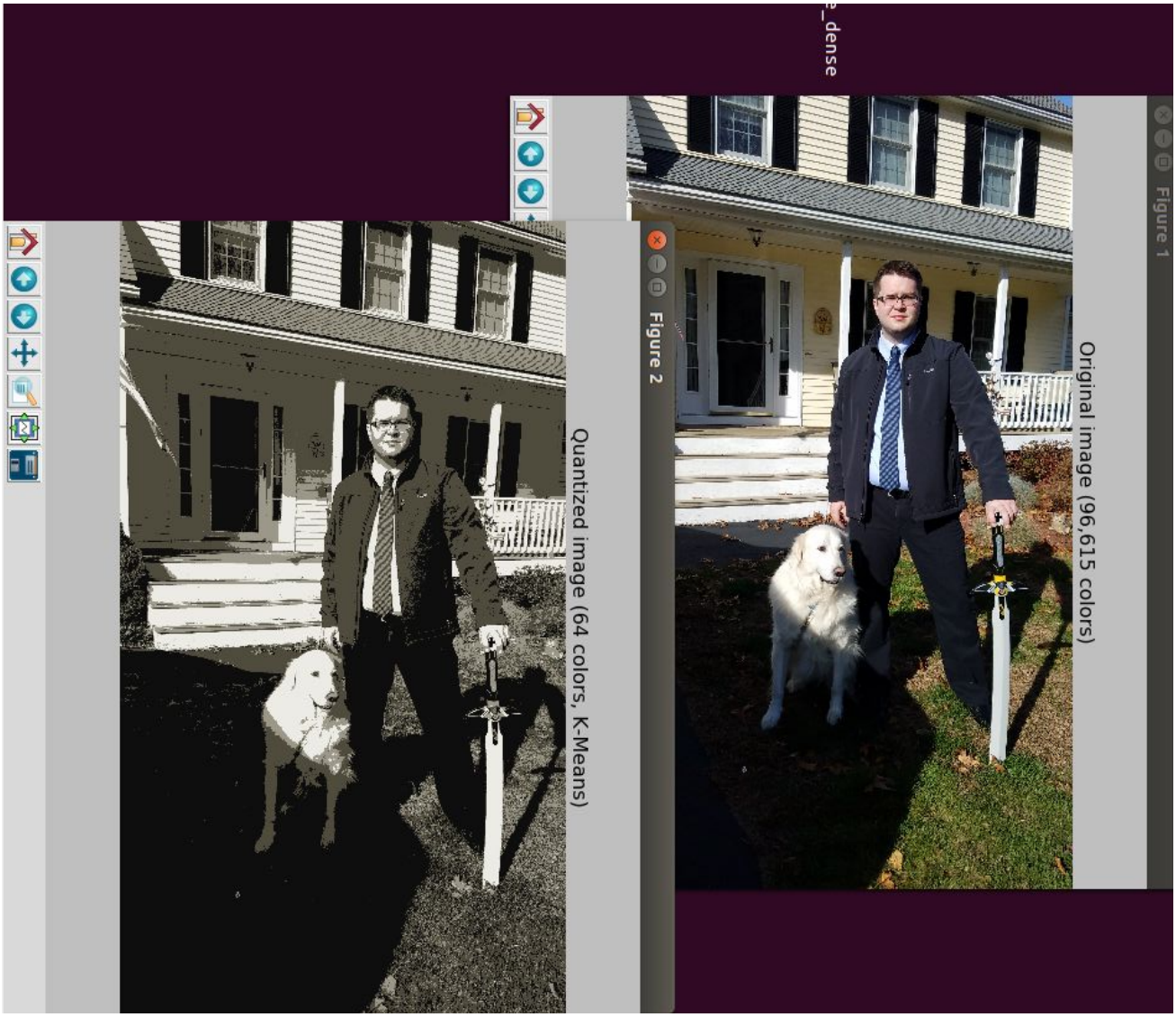
ii.) This can be applicable in image compression. The lower number of n_colors means that there is less data required for the picture to be saved. Therefore we can sacrifice image quality in order to saved data.

iii.) The resulting picture at the end was funny due to the fact that image gets so compressed. It essentially becomes colorless and blurry. Many of the details in the picture where blended together. The picture ends up looking fake and completely different.

This is my picture at 8 colors



This is my picture at 4 colors



2.d.) The first time I ran it I only got 41 neurons. This did not seem like a large amount so I ran it again and got 98 neurons. The larger number of neurons seem to mean that the network is much more accurate. At 41 neurons the graph was all over the place but at 98 neurons it seemed much more condensed and closer to the true value. With more neurons the network is better.

41 neurons

```
charlie@charlie-VirtualBox:~/Documents/ArtificialIntelligence/Hill/hill05$ sudo python hw5.MLP.sol.py
Neurons 1, eta 0.1. Testing set CV score: -19.307150
Neurons 1, eta 0.3. Testing set CV score: -12.688195
Neurons 1, eta 0.5. Testing set CV score: -5.446100
Neurons 1, eta 0.7. Testing set CV score: -5.121770
Neurons 2, eta 0.6. Testing set CV score: -4.867575
Neurons 4, eta 0.6. Testing set CV score: -4.171543
Neurons 25, eta 0.2. Testing set CV score: -3.405482
Neurons 41, eta 0.2. Testing set CV score: -2.741129
```

98 neurons

```
charlie@charlie-VirtualBox:~/Documents/ArtificialIntelligence/Hill/hill05$ sudo python hw5.MLP.sol.py
[sudo] password for charlie:
Neurons 1, eta 0.1. Testing set CV score: -5.809160
Neurons 1, eta 0.3. Testing set CV score: -4.752659
Neurons 3, eta 0.1. Testing set CV score: -3.389541
Neurons 4, eta 0.1. Testing set CV score: -3.296853
Neurons 10, eta 0.1. Testing set CV score: -3.036099
Neurons 12, eta 0.1. Testing set CV score: -3.019421
Neurons 19, eta 0.2. Testing set CV score: -2.262209
Neurons 23, eta 0.2. Testing set CV score: -2.063621
/usr/local/lib/python2.7/dist-packages/sklearn/neural_network/multilayer_perceptron.py:563: ConvergenceWarning: Stochast
  % (), ConvergenceWarning)
Neurons 59, eta 0.1. Testing set CV score: -1.829400
Neurons 85, eta 0.1. Testing set CV score: -1.765691
Neurons 98, eta 0.1. Testing set CV score: -1.732252
Iteration 1, loss = 2.58402923
Iteration 2, loss = 0.62472523
Iteration 3, loss = 0.19959974
Iteration 4, loss = 0.14445058
Iteration 5, loss = 0.08422815
Iteration 6, loss = 0.06860369
Iteration 7, loss = 0.03639032
Iteration 8, loss = 0.03364842
Iteration 9, loss = 0.02544758
Iteration 10, loss = 0.02318198
Iteration 11, loss = 0.01747586
Iteration 12, loss = 0.01649694
Iteration 13, loss = 0.01435721
Iteration 14, loss = 0.01300089
Iteration 15, loss = 0.01140288
Iteration 16, loss = 0.01064081
Iteration 17, loss = 0.01004342
Iteration 18, loss = 0.00982072
Iteration 19, loss = 0.00941876
Iteration 20, loss = 0.00957083
Iteration 21, loss = 0.00913433
Iteration 22, loss = 0.00964044
Iteration 23, loss = 0.00998914
Iteration 24, loss = 0.00957040
Training loss did not improve more than tol=0.000100 for two consecutive epochs. Stopping.
Training set score: 0.902141
Testing set score: 0.879659
charlie@charlie-VirtualBox:~/Documents/ArtificialIntelligence/Hill/hill05$
```