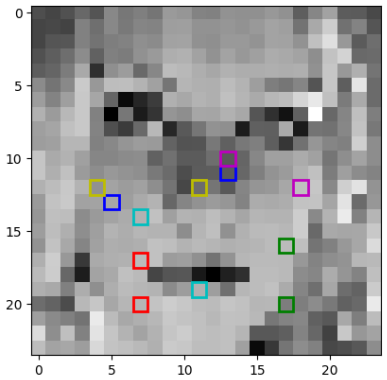
4)

n	trainingAccuracy	testingAccuracy
400	0.84	0.7171772428884027
600	0.83	0.75
800	0.81875	0.7407002188183808
1000	0.819	0.7565645514223195
1200	0.805	0.7582056892778993
1400	0.8042857142857143	0.7565645514223195
1600	0.79375	0.7658643326039387
1800	0.7988888888888889	0.7653172866520788
2000	0.79	0.7603938730853391

We can see from the table that the training accuracy decreases as n increases. This may be due to the fact we are adding more data while the amount of features is still remaining the same, therefore resulting in a lower accuracy since it's harder to fit every single case in a larger amount of data. On the other hand, as n increases, testing accuracy initially rises, indicating that the model is getting better at generalizing to additional data. However, the testing accuracy levels off after a specific threshold (in this case, n=1000) and slightly decreases after n=1400. This is a sign that the model is beginning to fit the training set of data too closely and is losing the ability to generalize to new data. This is also known as overfitting. If we saw continuous improvement in testing accuracy as n increases in the training data, then it would not be sufficient to say the model is overfitting.

5)



same colors correspond to the same feature but different coordinate

console output:

```
Found a pair [(21, 16, 17, 7)]
Found a pair [(21, 16, 17, 7), (13, 4, 11, 14)]
Found a pair [(21, 16, 17, 7), (13, 4, 11, 14), (20, 6, 15, 8)]
Found a pair [(21, 16, 17, 7), (13, 4, 11, 14), (20, 6, 15, 8), (12, 5, 11, 13)]
Found a pair [(21, 16, 17, 7), (13, 4, 11, 14), (20, 6, 15, 8), (12, 5, 11, 13), (18, 7, 16, 7)]
Found a pair [(21, 16, 17, 7), (13, 4, 11, 14), (20, 6, 15, 8), (12, 5, 11, 13), (18, 7, 16, 7), (14, 7, 1, 4)]
training accuracy for 400 training samples= 0.84
testing accuracy for 400 training samples (over entire test set) = 0.7171772428884027
Found a pair [(21, 16, 16, 8)]
Found a pair [(21, 16, 16, 8), (13, 5, 11, 13)]
Found a pair [(21, 16, 16, 8), (13, 5, 11, 13), (19, 5, 15, 6)]
Found a pair [(21, 16, 16, 8), (13, 5, 11, 13), (19, 5, 15, 6), (12, 5, 16, 17)]
Found a pair [(21, 16, 16, 8), (13, 5, 11, 13), (19, 5, 15, 6), (12, 5, 16, 17), (18, 11, 16, 6)]
Found a pair [(21, 16, 16, 8), (13, 5, 11, 13), (19, 5, 15, 6), (12, 5, 16, 17), (18, 11, 16, 6), (12, 5, 11, 13)]
training accuracy for 600 training samples= 0.83
testing accuracy for 600 training samples (over entire test set) = 0.75
Found a pair [(20, 7, 17, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (18, 12, 16, 17)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (18, 12, 16, 17), (13, 18, 15, 8)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (18, 12, 16, 17), (13, 18, 15, 8), (19, 8, 14, 16)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (18, 12, 16, 17), (13, 18, 15, 8), (19, 8, 14, 16), (12, 19, 0, 5)]
training accuracy for 800 training samples= 0.81875
testing accuracy for 800 training samples (over entire test set) = 0.7407002188183808
Found a pair [(20, 7, 17, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17), (12, 19, 12, 13)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17), (12, 19, 12, 13), (19, 8, 15, 8)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17), (12, 19, 12, 13), (19, 8, 15, 8), (12, 7, 11, 11)]
training accuracy for 1000 training samples= 0.819
testing accuracy for 1000 training samples (over entire test set) = 0.7565645514223195
Found a pair [(20, 7, 17, 7)]
Found a pair [(20, 7, 17, 7), (13, 6, 15, 16)]
Found a pair [(20, 7, 17, 7), (13, 6, 15, 16), (20, 17, 16, 17)]
Found a pair [(20, 7, 17, 7), (13, 6, 15, 16), (20, 17, 16, 17), (11, 19, 12, 13)]
Found a pair [(20, 7, 17, 7), (13, 6, 15, 16), (20, 17, 16, 17), (11, 19, 12, 13), (19, 11, 12, 17)]
Found a pair [(20, 7, 17, 7), (13, 6, 15, 16), (20, 17, 16, 17), (11, 19, 12, 13), (19, 11, 12, 17), (13, 7, 9, 9)]
training accuracy for 1200 training samples= 0.805
testing accuracy for 1200 training samples (over entire test set) = 0.7582056892778993
```

Found a pair [(20, 7, 17, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 6)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 6), (20, 17, 16, 17)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 6), (20, 17, 16, 17), (13, 5, 10, 11)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 6), (20, 17, 16, 17), (13, 5, 10, 11), (18, 12, 16, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 6), (20, 17, 16, 17), (13, 5, 10, 11), (18, 12, 16, 7), (4, 14, 15, 16)]
training accuracy for 1400 training samples= 0.8042857142857143
testing accuracy for 1400 training samples (over entire test set) = 0.7565645514223195
Found a pair [(20, 7, 17, 7)]
Found a pair [(20, 7, 17, 7), (13, 6, 16, 17)]
Found a pair [(20, 7, 17, 7), (13, 6, 16, 17), (18, 12, 16, 7)]
Found a pair [(20, 7, 17, 7), (13, 6, 16, 17), (18, 12, 16, 7), (13, 5, 0, 19)]
Found a pair [(20, 7, 17, 7), (13, 6, 16, 17), (18, 12, 16, 7), (13, 5, 0, 19), (19, 12, 16, 7)]
Found a pair [(20, 7, 17, 7), (13, 6, 16, 17), (18, 12, 16, 7), (13, 5, 0, 19), (19, 12, 16, 7), (13, 19, 16, 17)]
training accuracy for 1600 training samples= 0.79375
testing accuracy for 1600 training samples (over entire test set) = 0.7658643326039387
Found a pair [(20, 7, 17, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 16)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 16), (18, 12, 16, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 16), (18, 12, 16, 7), (13, 19, 16, 17)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 16), (18, 12, 16, 7), (13, 19, 16, 17), (19, 12, 15, 17)]
Found a pair [(20, 7, 17, 7), (13, 5, 16, 16), (18, 12, 16, 7), (13, 19, 16, 17), (19, 12, 15, 17), (12, 5, 11, 12)]
training accuracy for 1800 training samples= 0.7988888888888889
testing accuracy for 1800 training samples (over entire test set) = 0.7653172866520788
Found a pair [(20, 7, 17, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17), (12, 18, 10, 13)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17), (12, 18, 10, 13), (19, 11, 14, 7)]
Found a pair [(20, 7, 17, 7), (13, 5, 11, 13), (20, 17, 16, 17), (12, 18, 10, 13), (19, 11, 14, 7), (12, 4, 12, 11)]
training accuracy for 2000 training samples= 0.79
testing accuracy for 2000 training samples (over entire test set) = 0.7603938730853391