1 Warm up

1.1 Question 1

The error function used by the “perform” function is the Mean Squared Error of the classification by the feedforward neural network. Mentioning MSE alone gave half the mark, briefly describing what the MSE measures gave full marks.

1.2 Question 2

0.0479

This was the only acceptable answer since this part was simply copying and pasting existing code.

1.3 Question 3

This question saw a variety of answers, the correct answer was 0.2166 but 0 and 0.1712 were also accepted. Anything above those values was rejected.

2 A Perceptron for Mammals and Birds

A large number of students did not set the perceptron for this section up correctly, resulting in wrong answers. The wrong set up was only penalized once in Q4 as long as the rest of the answers in this section were consistent. The wrong setup was usually the result of setting the output layer transfer function to ‘tansig’.
2.1 Question 4

The correct answer in this instance was 0, which was given by the majority of students. Another common answer was 0.2735, which was penalized.

2.2 Question 5

The correct answer was that all animals were classified correctly however as long as the result was consistent with the answer to Q4, marks were awarded.

2.3 Question 6

The correct answer was 3 iterations. Students who set up the perceptron incorrectly generally answered with 1000, which was accepted as valid. Two iterations was however wrong and was penalized.

2.4 Question 7

The correct answer was 0.1667, and most students got this correct. Some students confused training and test error and were penalized.

2.5 Question 8

The perceptron misclassified the following animals due to the listed feature weights and strengths:

- 'beaver' due to a weight of 0.1295 for 'has_a_tail' with a feature strength of 0.2759.
- 'raccoon' due to a weight of 0.1296 for 'has_a_tail' with a feature strength of 0.15
- 'dolphin' has no overlapping weight or feature therefore defaulting to bird.
- 'platypus' due to a weight of 0.205 for 'has_a_beak' and a feature strength of 0.1667
• 'bat’ due to a 0.1266 weight for 'beh-flies' and a feature strength of 0.225.

Providing the correct misclassifications was enough for half the marks. Mentioning either the feature weights or strengths would provide additional marks. For full marks all three should have been discussed.

3 A neural Network for Mammals and Birds

3.1 Question 9

Any answer in the range 0.02-0.2 was acceptable here. Students who confused training and testing error were penalized. Full marks were only given when the student compared the perceptron and NN, giving a correct reason for the difference in performance.

3.2 Question 10

There were two correct answers here due to the confusion about whether to reinstantiate the network between each iteration.

3.2.1 Correct answer

The perfect answer would have discussed the variability in the performance of the individual neural networks. Some discussion of the learning trajectories would award marks, so discussion of the difference between training and testing error. For full marks the answer should have discussed the reason for the variability, namely the randomized weight initialization.

3.2.2 Alternative Answer

Students who didn’t reset their network between iterations should have observed continued improvement in MSE on both training and test data, where improvements in test data quickly level off. Observations of U-shaped learning awarded marks, so did answers that mentioned that retraining on the same dataset can result in improvements but should also have mentioned the possibility of overfitting.
3.3 Question 11

This question was open ended and there were some good hyperparameter explorations. Good answers should have discussed the observed effect of each parameter in light of the students theoretical knowledge. Marks were also awarded for discussing interactions between parameters. Simply describing what was observed was not sufficient for a top mark. Not providing the best parameter setting was also penalized.