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Exercise #9

Question 8.1
AB Err (Min): 0.69
AB Err (Mean): 0.9
After examining the TstEpcLog, we are able to see that the AC error rate stays relatively high with max errors hovering around 1 or 0.9 during the initial 19 epochs which demonstrates negligible learning during this period. AB experiences a considerable error reduction from initial high rates between 1 and 0.69 which settles towards 0 during the 6th and the 9th epoch. Once we pass the 20th epoch, we are able to see that the error rates for AB begin to increase. During this time, we notice that the AC error rates begin to decrease rapidly and more smoothly compared to the earlier fluctuations in AB's performance. This pattern shows that even as AB was learning, AC had a small degree of learning. This allowed for more efficient error correction for AC compared to AB.

Question 8.2
AB Err (Min): 0.8
AB Err (Mean): 0.955
IN this trial where the inhibition in the hidden layer was increased from 1.8 to 2.2 there does not appear to be a reduction in the AB interference. This is based on the observation that both the minimum and the maximum error rates experienced an increase compared to the initial trial. This outcome suggests that enhancing the hidden layer's inhibition did not effectively mitigate inference as anticipated which resulted in higher error rates for AB.

Question 8.3
AB Err (Min): 0.29
AB Err (Mean): 0.65
Yes, there was a significant reduction in AB interference when compared to the previous trial which can be seen through the min and mean error rates. The mean error rate improved from 0.955 to 0.65 and the min error rate dropped from 0.8 to 0.29. This improvement highlights the network's potential to serve as a model for human learning and memory performance. Because of the improvement that we have seen, the progress suggests that with more adjustments and trials, this network could approximate human cognitive processes more accurately.

Question 8.4

Looking at the distribution of pattern overlaps among the hippocampal layers—most prominently in ECin and decreasing through CA1, CA3, and the least in DG—we can interpret this based on each layer's distinct role and its level of neural activity. The ECin's significant overlap is due to its critical function as the entry point for external patterns, which are then funneled through the hippocampal pathway. Following ECin, CA1 exhibits a considerable amount of overlap as well, acting as an intermediary that blends the processed patterns from CA3 with direct inputs from ECin, aiding in the completion of patterns. CA3, with a smaller degree of overlap, is involved in sparse coding and the separation of patterns, which is supported by its autoassociative network features that promote a distinct representation of each pattern. Lastly, DG shows the slightest overlap, emphasizing its role in the separation of patterns. It achieves this through strong inhibition and the generation of new neurons to distinctly separate representations for various inputs.

Question 8.5

Test Type	Total proportion of Mem
AC	0
AB	1
Lure	0

Question 8.6

Test Type	Total proportion of Mem
AC	1
AB	0.6
Lure	0

The final average memory scores for the AB, AC, and Lure tests, which you can see in the RunStats table, give us a way to stack them up against how humans perform, like what's shown in Figure 1. With people, learning new AC pairs can mess a bit with the AB pairs they've already learned, but it's usually not by a lot. The goal of the hippocampal model is to copy this situation, so it shows that you can pick up AC pairs quickly without messing up your memory of the AB pairs too much. By looking at the average memory scores for both AB and AC tests, we can figure out how close the model comes to acting like a human brain does. The average scores for

the Lure tests also tell us about how good the model is at telling apart stuff it knows from new things, which is crucial for remembering personal experiences. Because the model's results look a lot like the human results,this suggests that it's doing a good job of acting like human memory.

Question 8.7

Epoch	IsA Value
99	0.461538
0	0.0769231
0	1
0	0
0	1

Question 8.8

In the simulation, we observed that in 5 out of 25 trials, the network unexpectedly produced the incorrect response 'a' when it was supposed to generate the correct response 'b'.