# Review Test Submission: Module 8 Online Assignment

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| User | BRIAN THOMAS LOUGHRAN |
| Course | EN.605.647.81.SP21 Neural Networks |
| Test | Module 8 Online Assignment |
| Started | 3/17/21 5:56 PM |
| Submitted | 3/22/21 8:07 PM |
| Due Date | 3/23/21 11:59 PM |
| Status | Completed |
| Attempt Score | 27 out of 30 points |
| Time Elapsed | 122 hours, 11 minutes |
| Results Displayed | Submitted Answers |

## Question 1

3 out of 3 points

Given the following matrix, determine whether it can represent the matrix of a Hopfield Network. Please choose the best answer.

$$\begin{bmatrix} 0 & 2 & -2 \\ -2 & 0 & 2 \\ 2 & 2 & 0 \end{bmatrix}$$

Selected Answer: No because it is not symmetric.

## Question 2

3 out of 3 points

Again, consider the following matrix. Is this a possible representation of a Hopfield Network? Choose the best answer.

$$\begin{bmatrix} 0 & 1 & -1 \\ 1 & 0 & 0 \\ -1 & 0 & 1 \end{bmatrix}$$

Selected Answer: No because not all diagonal elements are 0.

## Question 3

0 out of 3 points

Consider a 3x3 matrix that represents a Hopfield Network that has been trained with 3 exemplars. How many possible exemplars are there?

Selected Answer: 512

## Question 4

3 out of 3 points

Again, consider a 3x3 matrix that represents a Hopfield Network and recall that the outer product of the exemplars produces the matrix elements that are summed together as shown in the video. What is the lowest possible value of a matrix entry if 3 exemplars are used to establish the weight matrix? You may want to consider all possible summations of bipolar values to determine the possible values of the weight matrix.

Selected Answer: -3

## Question 5

3 out of 3 points

Consider the following matrix:

$\begin{bmatrix} 0 & 2 & -2 \\ 2 & 0 & 2 \\ -2 & 2 & 0 \end{bmatrix}$. Can this represent a Hopfield Network that was trained with 3 exemplars? Choose the best answer.

Selected Answer: No because the possible weight matrix entries based on 3 exemplars cannot be equal to a 2 or -2.

## Question 6

3 out of 3 points

For the matrix in 8.2, presented again here, $\begin{bmatrix} 0 & 2 & -2 \\ 2 & 0 & 2 \\ -2 & 2 & 0 \end{bmatrix}$, can it represent the weight matrix for a Hopfield net that has been trained to recognize 2 exemplars? Please choose the best answer.

Selected Answer: No, because it is impossible for there to be entries in positions [1,3] and [3,1] with a value of -2 and a 2 in positions [1,2] and [2,1].

## Question 7

3 out of 3 points

Given a Hopfield Network weight matrix $\begin{bmatrix} 0 & -2 & 0 \\ -2 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ and an input vector x = [-1, -1, 1], what is the value of the middle vector element after one iteration? Use the following for the hard-limiting function definition: $f_h(x) = \begin{cases} 1 & if\ x > 0 \\ -1 & if\ x \leq 0 \end{cases}$

In answering this question, you will need to calculate the entire vector --- keep it in mind as you will need that information for the next problem.

Selected Answer: 1

## Question 8

3 out of 3 points

Use the output vector from the preceding problem to calculate the output vector after the second iteration. What is the value of the middle element in the output vector now?

Selected Answer: -1

## Question 9

3 out of 3 points

Perform a third iteration. What is the value of the middle element of the output vector now?

Selected Answer: 1

## Question 10

3 out of 3 points

From the preceding sequence, which of the following statements is true.

Selected Answer: The sequence of vectors oscillates.

Monday, March 22, 2021 8:07:22 PM EDT

← OK