Take Test: Module 8 Online Assignment

Test Information

Description

Instructions

Multiple Attempts This test allows 3 attempts. This is attempt number 1.

Force Completion This test can be saved and resumed later.

Question Completion Status:

QUESTION 1

3 points Save Answer

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

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

- No because the -2 in the first row does not have the same sign as the element in position [3,1] of the matrix.
- No because it is not symmetric.
- Yes because it is a square matrix and it has zeros along the diagonal.
- Yes because it has only 2s or -2s and therefore does not have 1s and -1s in addition to 2s and -2s.

QUESTION 2

3 points Save Answer

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

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

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Save All Answers Save

- ◯ No because **not all** rows have elements that sum to 0.
- ◯ No because not all diagonal elements are 0.
- ◯ Yes because it is a symmetric matrix.

QUESTION 3 **3 points** Save Answer

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

QUESTION 4 **3 points** Save Answer

Again, consider a 3x3 matrix that represents a Hopfield Network and recall that the outer

Question Completion Status:

of bipolar values to determine the possible values of the weight matrix.

QUESTION 5 **3 points** Save Answer

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.

- ◯ Yes, because this matrix has values between -3 and 3.
- ◯ No because the possible weight matrix entries based on 3 exemplars cannot be equal to a 2 or -2.
- ◯ No because the matrix entries trained with 3 exemplars must be one of 0, 3 or -3.
- ◯ Yes, because it is symmetric and the diagonal values are all 0.

QUESTION 6 **3 points** Save Answer

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

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- Yes, this could be a matrix created by two exemplars since the values must be one of 0, 2 or -2.
- No, because no matrix element can have a value of 2.
- Yes, since the outer products of two exemplars added together produce either a 2 or a -2.

QUESTION 7

3 points Save Answer

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: $f_h(x) = \begin{cases} 1 & if\ x > 0 \\ -1 & if\ x \leq 0 \end{cases}$

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as you will need that information for the next problem.

QUESTION 8

3 points Save Answer

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?

QUESTION 9

3 points Save Answer

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

QUESTION 10

3 points Save Answer

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

- We cannot determine the long-run behavior of this system after only 3 iterations.
- The energy function associated with the vectors monotonically decreases.
- Synchronous updating by matrix/vector multiplication always leads to oscillations.
- The sequence of vectors oscillates.

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