



Exam Normal

1. During model optimization, one of the main causes for poor performance is local minima. Why is this a problem about? How can it be minimized/avoided?
2. Consider a system developed to distinguish elements of class “X” from “O”, based in a logistic regression classifier. Draw 10 instances in two 2D feature spaces (5 X + 5 O) where:
 - a. The system will yield poor classification performance.
 - b. The system will yield very good classification performance.

3. Comment the following statement: “*model regularization is a good way to decrease the risk of model underfitting*”.

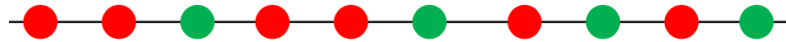
4. Consider the following matrix:

$$M: \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

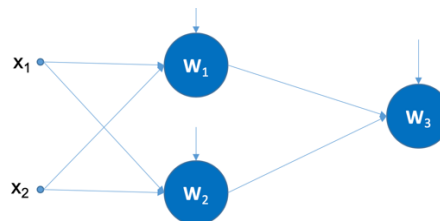
Which of the following vectors are eigenvectors of M? For these cases, provide the corresponding eigenvalues.

$[1, 1, 1]^T$; $[0, 1, 0]^T$ and $[1, 0, 1]^T$

5. Consider a binary classification problem, that produced the following scores. Draw the corresponding ROC curve.



6. Consider a 2D feature space, with elements of two classes (O/X). Represent 10 instances (5 O + 5 X) in two different spaces where:
 - a. Using the PCA algorithm before the classifier will yield very good results.
 - b. Using the PCA algorithm before the classifier will yield disastrous results.
7. Consider the small neural network below. Provide a set of possible weights for w_1 , w_2 and w_3 neurons, such that the network simulates the “exclusive OR” binary operation.



8. Comment the following statement: “*yet being a very simple change, the ReLU transfer function was one of the main factors that supported the breakthrough advances of deep learning models*”.
9. What are “Adversarial Learning” models? Can you describe one practical case where this kind of models could be used?