IIT Kanpur Certificate Program on PYTHON for Artificial Intelligence, Machine Learning and Deep Learning

1st to 27th December 2024

Assignment #2

1 mark for each correct response and $-\frac{1}{4}$ for each incorrect response

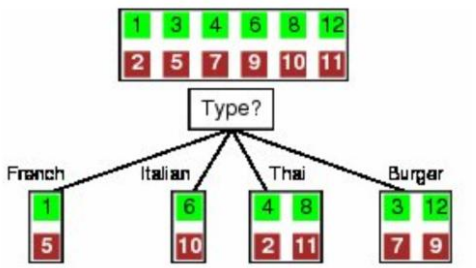
1. The centroid of the ith cluster in lth iteration, denoted by $\bar{\boldsymbol{\mu}}_i^{(l)}$, is
   a. $\frac{\sum_{j=1}^{M} \alpha_i^{(l)}(j)\bar{\mathbf{x}}(j)}{M}$
   b. $\frac{\sum_{j=1}^{M} \bar{\mathbf{x}}(j)}{M}$
   c. $\frac{\sum_{j=1}^{M} \bar{\mathbf{x}}(j)}{\sum_{j=1}^{M} \alpha_i^{(l)}(j)}$
   d. $\frac{\sum_{j=1}^{M} \alpha_i^{(l)}(j)\bar{\mathbf{x}}(j)}{\sum_{j=1}^{M} \alpha_i^{(l)}(j)}$

2. The **entropy** $H(X)$ of a source with 8 equiprobable symbols is _____

3. Consider the table below showing preferences for Avengers and Harry Potter movies. The quantity $H(y|x_1 = \overline{\mathbf{HPotter}})$ equals _____

	$x_1 = 0$ HPotter	$x_1 = 1$ HPotter
$y = 0$ Avengers	60	20
$y = 1$ Avengers	40	80

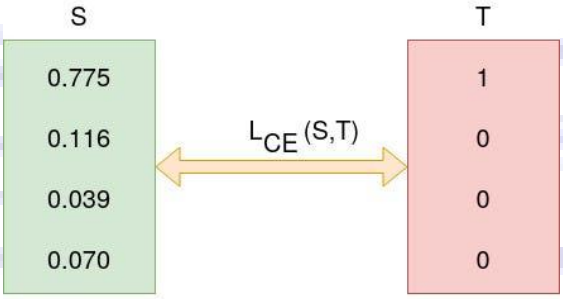
4. Consider the example below. Let Y denote the final decision. The quantity $H(Y|\text{Italian}) =$ _____



5. Consider the raw outputs for the classes as below. The softmax output corresponding to camera is _____

	logit
woman	-3.50
man	-2.37
camera	1.54
tv	5.23

6. The categorical cross-entropy loss for example below is _____

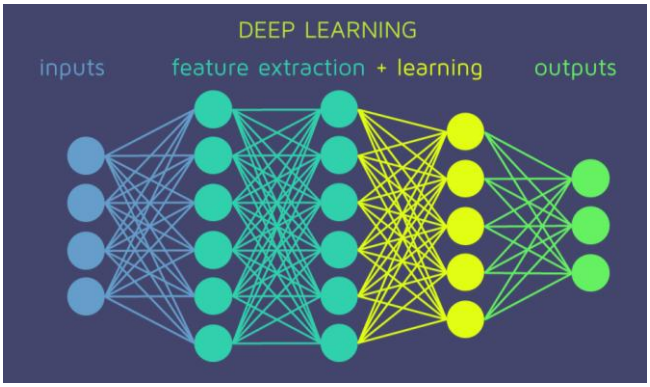


7. In a CNN it is recommended
   a. starting with filters in the range [32, 64, 128] in the earlier and increasing up to [256, 512, 1024] in the deeper layers
   b. starting with filters in the range [256, 512, 1024] in the earlier and decreasing up to [32, 64, 128] in the deeper layers
   c. keeping filters constant in the range [32, 64, 128] across all layers
   d. keeping filters constant in the range [256, 512, 1024] across all layers

8. Dropout layer
   a. lowers complexity but leads to Overfitting
   b. increases complexity and avoids Overfitting
   c. lowers complexity and avoids Overfitting
   d. increases complexity and leads to Overfitting

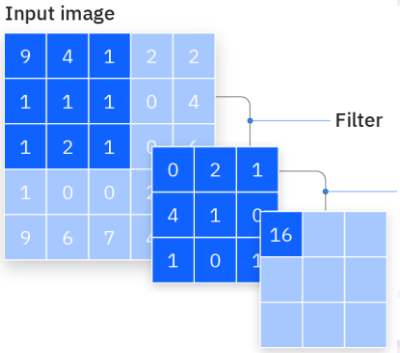
9. Given a kernel of size 5×5, for the output to have **same size** as original image, we must have number of zero padding layers p as _____

10. In the network below the size of $\mathbf{W}^{[3]}$ is _____



11. Convolutional neural nets are primarily suited for
    a. Gaussian datasets
    b. Purchase datasets
    c. Random datasets
    d. Images/ video datasets

12. Consider the frame with kernel as shown below. the dot product for the (1,2) element with same padding is _____



13. Consider an 256×256 image and 5×5 filter. The output matrix after convolution with valid padding will have the dimension of _____

14. Consider the simple image below. Max pooling with 2×2 filters and stride 2 leads to the output _____

2	2	3	1
4	3	4	2
2	2	1	1
3	5	2	3

15. Consider the simple image below. Average pooling with 2×2 filters and stride 2 leads to _____

2	2	3	1
4	3	4	2

2	2	1	1
3	5	2	3