University of M'Sila
Department of Computer Science
Master 2 AI

EXAM
Artificial vision

17/1/2024
12:30 - 14:00

LAST NAME: _____

FIRST NAME: _____

GRADE = $\dfrac{\quad}{20}$

1. Computer vision is writting software that can

   Solution: Interpret images

2. What makes emulating the human vision difficult ?

   Solution: we do not understand exactly how the brain works where perception happens.

3. What type of classification is used in diagnosing COVID-19 in CT scans ?

   Solution: Binary classification

4. What type of Segmentation is used in counting how many people appear in a photograph ?

   Solution: instance segmentation

5. What is cropping ?

   Solution: kepping a region from the image and removing the outer region

6. When we apply a function $s = T(r)$ on an image (where s is the new value of the pixel and r is the old one) ? what is the type of this transformation ?

   Solution: intensity or point transformation.

7. what are the values of the kernel of moving avrage filter ?

   Solution: $1/9 \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$,

8. what happens When we use a gaussian filter with a big value of sigma ?

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> **Solution:** the filter acts like a moving avrage filter.

9. in linear classification what dose a loss function mesure ?

> **Solution:** how bad the model is (quantifies the difference between predicted and actual values)

10. in linear classification what dose a score function mesure ?

> **Solution:** the class y of a given data point x for example $f = Wx + b$ is a score function of a somple linear classifier.

11. if the score function of a Neural network is defined as $f = W_1 max(0, W_2 x)$
    - what is the activation function used ? **reLU max(0,x)**
    - what are the weights of the first layer ? W_2

12. Given a Neural network used for binary classification where the input is 128x256 color images
    - what is the size of the input layer ? **128x256x3**
    - what is the size of the last layer ? **2 or 1**

13. if the input of a convolution layer is 32x32x1 and the filter size is 7x7x1
    - what is the size of the activation map if the stride value is 1 ? **26x26x1**
    - what is the size of the activation map if the stride value is 5 ? **6x6x1**

14. What is the use of max pooling layers in a CNN model ?

> **Solution:** Reduce dimensions / (downsampling) / reducing layer size

15. if the input of a max pooling layer is 32x32x1 and the filter size is 4x4x1
    - what is the size of the output if the stride value is 4 ? **8x8x1**
    - what is the size of the output if the stride value is 2 ? **16x16x1**

16. if we have an image classification problem with few labled images(data) how we can train a CNN ?

> **Solution:** We can use transfer learning
>
> - reinitilize tha last layer of an existing model
> - freeez the remaining layers
> - retrain the model

17. Cite three challanges in training deep Neural networks

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Solution:

- collecting data

- Fine tuning the model (changing hyperparameters and retraining)