Artificial Neural Networks and Deep Learning - 08/07/2021 Exam

During the whole exam, you should have only one screen active shared via Zoom. No external monitors or virtual screens are allowed.

You should only have a browser open and no other application besides a text editor open next to the browser to keep a safety copy of your answers. The browser should have only the exam tabs open. The exam is saved into the browser cookies so if you close it and reopen it nothing should happen, but we cannot guarantee.

Do not maximize the window of your browser. Do not share only the application window, but the entire screen.

You do not need to work on paper so keep your eyes on the browser and do not look around you. You cannot go out of sight. Your microphone should be on all the time.

You will have a fixed amount of time, after which the Form is automatically closed and there will be no possibility to submit your answers anymore. You will be noticed 15' in advance by the teacher not to miss the delivery time. Exams that are not submitted within the given time will be considered as RITIRATO.

In case you do not see the IMAGES try to reload the page.

SECTION 1: MACHINE LEARNING AND DEEP LEARNING

TIP: Answer BRIEFLY with short and focused answers and provide motivation whenever possible. On AVERAGE 2 to 3 sentences per 10 points are sufficient ... provided they follow the previous suggestion.

1

What is word embedding and what it is used for?
(20 punti)

Inserisci la risposta

2

Is word embedding a supervised or an unsupervised machine learning task? Why?
(10 punti)

Inserisci la risposta

3

How is the word embedding loss function defined?
(10 punti)

Inserisci la risposta

4

Can word embedding overfit? Motivate your answer and, in case it does, suggest a way to detect it.
(20 punti)

Inserisci la risposta

SECTION 2: NEURAL NETWORK TRAINING

TIP: Answer BRIEFLY with short and focused answers and provide motivation whenever possible. On AVERAGE 2 to 3 sentences per 10 points are sufficient ... provided they follow the previous suggestion.

5

Backpropagation suffers the vanishing problem issue. What is it and what is it caused by?
(20 punti)

Inserisci la risposta

6

Can the choice of the activation functions help with the vanishing gradient issue? Why?
(10 punti)

Inserisci la risposta

7

Can the choice of the weight initialization help with the vanishing gradient issue? Why?
(10 punti)

Inserisci la risposta

8

Can the use of dropout help with the vanishing gradient issue? Why?
(10 punti)

Inserisci la risposta

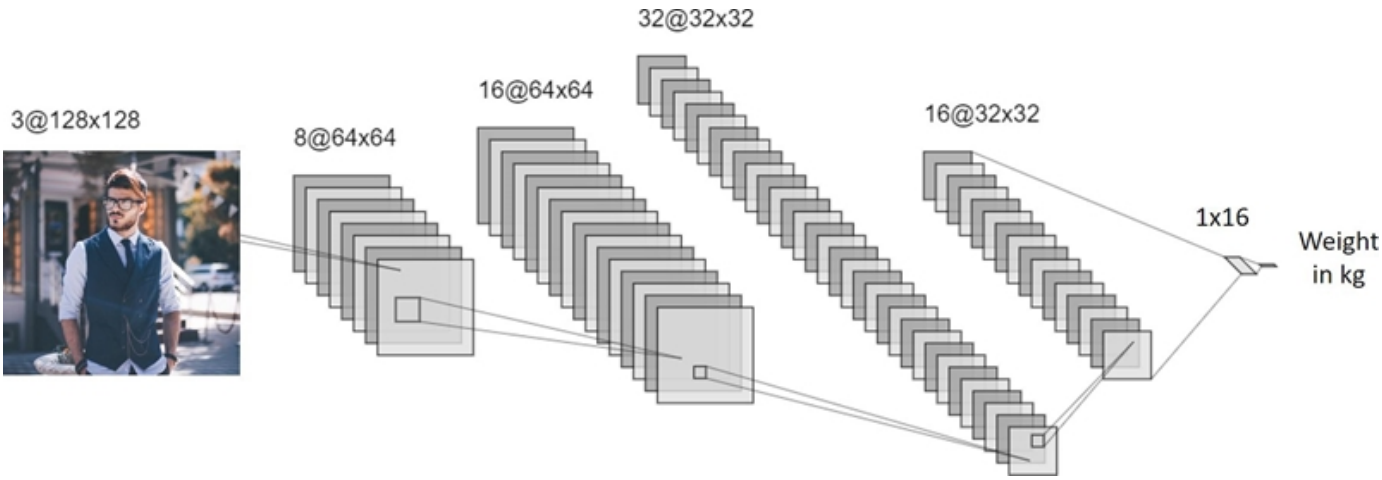
9

Can transfer learning help with the vanishing gradient issue? Why?
(10 punti)

Inserisci la risposta

SECTION 3: CONVOLUTIONAL NEURAL NETWORKS

TIP: Answer BRIEFLY with focused answers and provide motivation whenever possible. On AVERAGE 1 to 2 sentences per 10 points are sufficient ... provided they follow the previous suggestion.



10

What task is addressing the network illustrated above?

What loss would you use for training?

How would you modify the network to also predict whether the human is an engineer or not?

How would you train the network in this latter case?
(20 punti)

Inserisci la risposta

11

Enumerate the building blocks of the above network as if you were going to implement it in Keras. Consider that there might be different viable options in terms of layers type and parameters. You can choose the one you prefer, but you need to:
1) report any assumption you make
2) include *all* the layers and for each of them report
- the layer type
- the input and output sizes
- the formula used to compute the number of parameters in the layer, e.g., 3x5x5=45 and not just 45.

List each layer of the network in a different row of your answer to improve readability.

(Yes you can use the calculator, but we are more interested in the formula than on the numbers !)
(40 punti)

Inserisci la risposta

12

A) Illustrate the major differences between a classification and an object detection network, and what are the major advantages of these latter over baselines built upon a CNN for classification. Consider R-CNN as a reference for object detection network.

B) Describe what are the major changes introduced by Fast R-CNN and Faster R-CNN with respect to the baseline R-CNN.
(30 punti)

Inserisci la risposta

SECTION 4: RECURRENT NEURAL NETWORKS

TIP: Answer BRIEFLY with short and focused answers and provide motivation whenever possible. On AVERAGE 2 to 3 sentences per 10 points are sufficient ... provided they follow the previous suggestion.

13

When we could prefer the use of Recurrent Neural networks instead of Long Short-Term Memory networks? Why?
(10 punti)

Inserisci la risposta

14

Describe briefly the seq2seq model. Can it be used with RNN or it can only be used with LSTM? Why?
(20 punti)

Inserisci la risposta

15

How does the transformer model works?
(20 punti)

Inserisci la risposta

Indietro Avanti