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| --- | --- |
|  | Answer the Questions:  You can either complete the code in the Jupyter Notebook first, and then answer the homework questions here in the course shell (recommended); Or develop your code in the Notebook and answer the questions here at the same time  No matter which approach, please **read very carefully** every **description and requirement** **in the juypter Notebook** descriptions & code comments, **as well as in the question** asked here in the course shell.  Submission:  You can download the Jupyter Notebook base file [DSCI471\_HW3.ipynb](https://learn.dcollege.net/bbcswebdav/pid-12969408-dt-content-rid-286425469_1/xid-286425469_1)  here, and then click "File" > "Save as" in the menu after opening it with your Jupyter Notebook, and give it a new name "**Yourname**" to continue developing your code upon it.  After finalizing and executing all cells in your Jupyter Notebook without any errors, save it as " **Yourname.ipynb**" that **contains all the outputs** of execution, and submit it to the last question of this homework. |
|  |  |

Expand Question Completion Status:

**QUESTION 1**

1. For **##-Q1** (and all following **##-Qx**) in the Jupyter Notebook DSCI471\_HW3.ipynb:

What line of code you would develop to fulfill the requirement in the code comments "## import the namespace "layers" and "optimizer" of Keras from Tensorflow "?

Copy your executed error-free code line to fill in the blank here.

\* Be **careful**for all the **blanks**in this homework:  
      - For example do not include any extra spaces in front or in the end of your code line when you fill it in the blank here.  
              e.g. if the expected code line is:  XXX xxx.xxx XXX xxx, xxx, then an answer     XXX       xxx. xxx           XXX xxx,        xxx    will be wrong  
\* Reminder: python is **case sensitive**, so is your answer here to fill in the blank.  
\* You may also find some coding **inspirations**from **previous HomeWork** assignment



**QUESTION 2**

1. For **##-Q2**:

According to the dimension you explored for the `**data`** variable (that has been assign a value of loaded data as a *Pandas DataFrame* datatype),   
What is the total number of records/samples in this data? -- In another word, how many days' record of stock attributes did you obtain, using proper measure with the DataFrame datatype?



**QUESTION 3**

1. For **##-Q3**:

What is the stock price of the `**close**` stock price on the date `2021-05-18`, that you observed from exploring pieces of the `**data**` variable?

Please copy from executing your exploration code's output directly to fill in the blank here with the exact value (i.e. no space nor other character symbol other than . ("dot") involved anywhere in your answer)



**QUESTION 4**

1. For **##-Q4**:

According to the assumption (# of avg. trading days per month), how many trading days/records we assume be in 1 year?     
We will use that amount of data as test data

Please fill in the blank with your answer to the similar pattern as above (i.e. no space involved anywhere in your answer and use only pure digit number)



**QUESTION 5**

1. for **##-Q5**:

The value you have assigned to the variable `**idx**` is ?

\* fill the pure integer number value without comma or spaces.



**QUESTION 6**

1. For **##-Q6**:

What is the code you would write (e.g. using existed variable with EXACT variable names to compose a formula) to replace the first ??? in the code line:

data\_test = data.iloc[??? : , ???:???].values ?

i.e. fill in the blank: data\_test = data.iloc[days\_total-days\_oneYear:, idx:idx+1].values

Please fill in the blank without any comma or space, e.g.  xxx-xxx   instead of    xxx - xxx .



**QUESTION 7**

1. For **##-Q7**:

What is the code line you developed to construct (utilizing what has been imported in the beginning of the code,*i.e. the code you've developed to have answered in****##-Q1***) the first RNN layer according to the requirements in the comment?

i.e. copy the whole code line together with your answers that replace the ??? in the code line:   layers.SimpleRNN(units=80, activation='tanh', return\_sequences=True),

Please copy your correct code to fill in the blank here (including the ending comma) without extra spaces. For example:

should be:  
xxx.SimpleRNN(xxx, activation='xxx', return\_sequences=xxx),    
**instead of**:  
xxx. SimpleRNN(xxx , activation='  xxx '    , return\_sequences = xxx)



**QUESTION 8**

1. For **##-Q8**:

What is the code line you developed to construct **a full-connected output layer with a unit** that can predict the price of next day?

i.e. copy the whole code line together with your answers that replaced the ???s in the code line:   layers.Dense(units=1)

Please copy your correct code to fill in the blank here without extra spaces. For example:

should be:  
xxx.xxx(units=xxx)    
**instead of**:  
xxx.  xxx(unit =xxx )



**QUESTION 9**

1. For **##-Q9**:

What is the code you would fill in the 1st and 2nd ??? in the code line    my\_optimizer = ???.???(learning\_rate=???) to fulfill its requirements in the comment (i.e .Select an optimizer that implements the Adam algorithm)?

Please fill in the blank with EXACT characters you've executed error-free:   my\_optimizer = optimizers.Adam(learning\_rate=my\_learn\_rate)

Please fill in the blank without any comma or space, e.g.  xxx.xxx   instead of    xxx .  xxx .

my\_optimizer = .(learning\_rate=my\_learn\_rate)

**QUESTION 10**

1. for **##-Q10**:

What are the values you should fill in the blank for the below code to fulfill the requirements of compiling your model **with your chosen optimizer** and **the mean of squares of errors as losses** (since it is a regression task) ?

.(  
    optimizer=,  
    loss=keras..()  
)

\* fill in the blank exactly as you developed in replacing the ??? in the notebook, which contains no extra comma or spaces.

\* You could always refer to the provided clickable links in section description of the Notebook above the code cell for more on the **syntaxes**from the **API documentaions**

**QUESTION 11**

1. For **##-Q11**:

What is the function name of Numpy you use to convert a list ot a numpy array?

pastDays\_trainSet, nextDay\_trainSet = np.array(pastDays\_trainSet), np.array(nextDay\_trainSet)

Please fill in the blank a pure character of string without any comma or space.



**QUESTION 12**

1. For **##-Q12**:

How many records/samples you have generated in the ***training record set***(to form together with the *training label set*a *training dataset* later)?

Please fill in the blank your answer with no space involved anywhere in your answer and use only pure digit number



**QUESTION 13**

1. For **##-Q13**:

What is the code you would fill in the 1st and 3nd ??? in the code line    pastDays\_trainSet = np.???(pastDays\_trainSet, (???, pastDaysRange, ???))     
to fulfill its requirements in the section description, i.e. Use a function of Numpy to reshape the training record set to satisfy the model accepted format [#sample, #timesteps, #feature] ?

Please fill in the blank with EXACT characters or number you've executed error-free:      pastDays\_trainSet = np.reshape(pastDays\_trainSet, (pastDays\_trainSet.shape[0], pastDaysRange,1))

Please fill in the blank without any comma or space

pastDays\_trainSet = np.(pastDays\_trainSet, (pastDays\_trainSet.shape[0], pastDaysRange, ))

**QUESTION 14**

1. Copy of

For **##-Q14**:

What is the code you would fill in the 2nd and 4th ??? in the code line    ???.???(???, ???=epochs\_count) to train your model with epochs of your choice?

Please fill in the blank with EXACT characters you've executed error-free:     model.fit(dataset\_train, epochs=epochs\_count)

Please fill in the blank without any comma or space

model.(dataset\_train, =epochs\_count)

**QUESTION 15**

1. For **##-Q15**:

How many parameters in total have been learned druing your model training?

Please fill without any spaces, comma, or characters



**QUESTION 16**

1. For **##-Q16**:

How many records/samples you have generated in the *test record set* i.e. `**pastDays\_testSet**` (to, together with the *test label set*, form a *test dataset* i.e.`pastDays\_testSet` later)?

Please fill without any spaces, comma, or characters



**QUESTION 17**

1. For **##-Q17**:

What is the code line you developed to batch the test dataset?   (Test dataset does not need shuffle)

i.e. copy the whole code line together with your answers that replace the ??? in the code line:   dataset\_test = dataset\_test.batch(test\_batch\_size)

Please copy your correct code to fill in the blank here without extra spaces. For example:

should be:  
 dataset\_test = xxx.xxx(xxx)      
**instead of**:  
 dataset\_test = xxx. xxx( xxx)



**QUESTION 18**

1. For **##-Q18**:

What is the function name to fill in the second ??? in the code line  ???.???(???)  to evaluate your mode with test dataset?

i.e. fill in the blank: model.evaluate(dataset\_test)

Please fill in the blank without any comma or space



**QUESTION 19**

1. For **##-Q19**:

What is the function name to fill in the second ??? in the code line       predicted\_stock\_prices = model.predict(pastDays\_testSet)   to predict on test dataset by your trained model?

i.e. fill in the blank:     predicted\_stock\_prices = model.predict(pastDays\_testSet)

Please fill in the blank without any comma or space



**QUESTION 20**

1. **Copy**your final settings of the **hyperparameters**in the code after tunning, for example:

\* Reminder, you need to**tune your model** by adjusting the values of hyperparameters such as learning rate, batch size, and epochs to reach an loss **at least**lower than 0.01

**Tuned Hyperparameters:**

my\_learn\_rate = 0.001

train\_batch\_size = 32

epochs\_count = 20

And also **copy**all the ouput **verbose** information during the **training**and **testing** procedure, for example:

**Training verbose:**

Epoch 1/???  
???/??? [==============================] - 29s 184ms/step - loss: 0.0976    
Epoch 2/???  
???/??? [==============================] - 3.........  
.........  
.........  
.........  
Epoch ???/???  
???/??? [==============================] - 37s 185ms/step - loss: 0.0099

->

Epoch 1/20

67/67 [==============================] - 14s 75ms/step - loss: 0.3574

Epoch 2/20

67/67 [==============================] - 2s 35ms/step - loss: 0.1216

Epoch 3/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0705

Epoch 4/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0460

Epoch 5/20

67/67 [==============================] - 2s 35ms/step - loss: 0.0312

Epoch 6/20

67/67 [==============================] - 4s 55ms/step - loss: 0.0246

Epoch 7/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0196

Epoch 8/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0153

Epoch 9/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0122

Epoch 10/20

67/67 [==============================] - 4s 53ms/step - loss: 0.0105

Epoch 11/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0095

Epoch 12/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0088

Epoch 13/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0089

Epoch 14/20

67/67 [==============================] - 3s 46ms/step - loss: 0.0072

Epoch 15/20

67/67 [==============================] - 2s 35ms/step - loss: 0.0070

Epoch 16/20

67/67 [==============================] - 2s 35ms/step - loss: 0.0065

Epoch 17/20

67/67 [==============================] - 3s 49ms/step - loss: 0.0058

Epoch 18/20

67/67 [==============================] - 2s 36ms/step - loss: 0.0054

Epoch 19/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0050

Epoch 20/20

67/67 [==============================] - 2s 34ms/step - loss: 0.0042

**Testing verbose:**

???/??? [==============================] - 0s 2ms/step - loss: 0.0269

->

1/1 [==============================] - 0s 498ms/step - loss: 0.0468

|  |
| --- |
| For the toolbar, press ALT+F10 (PC) or ALT+FN+F10 (Mac).  Paragraph  Arial  10pt  P  0 WORDS[POWERED BY TINY](https://www.tiny.cloud/?utm_campaign=editor_referral&utm_medium=poweredby&utm_source=tinymce&utm_content=v5) |

**QUESTION 21**

1. **Submit here.**

your **completed** and **executed**Notebook (**with all the outputs** remains including the last plot) where the model trained to reach the required **loss** of less than**0.01**, and

has the Notebook named as **yourname.ipynb**

After submission, you are highly encouraged to **explore more**, including:

* + construct different architecture of your model by
  + change number of layers,
  + change dropout rate,
  + change activation function,
  + change RNN layer type using LSTM and GRU instead, (reference API documents provided in the corresponding section description in the Notebook)
  + ...
  + Also, can you use your model to forcast the stock price on '2021-05-19'? What about  '2021-05-20'?

Happy tunning life !!! :)

Attach File