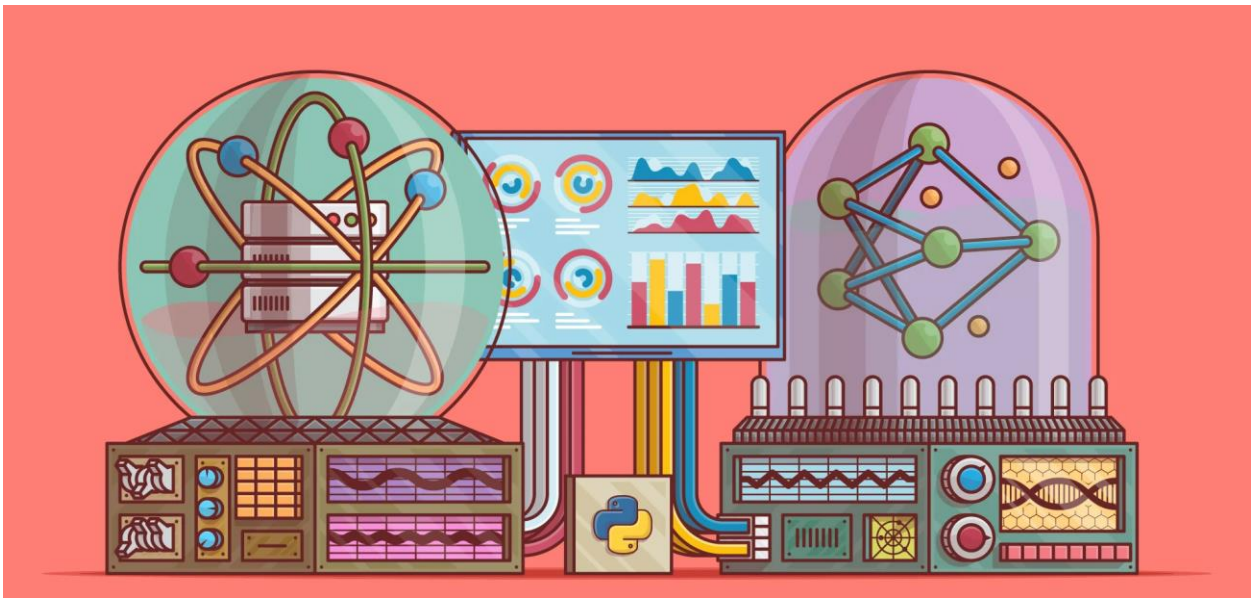

Neural Network and Deep Learning Workshop

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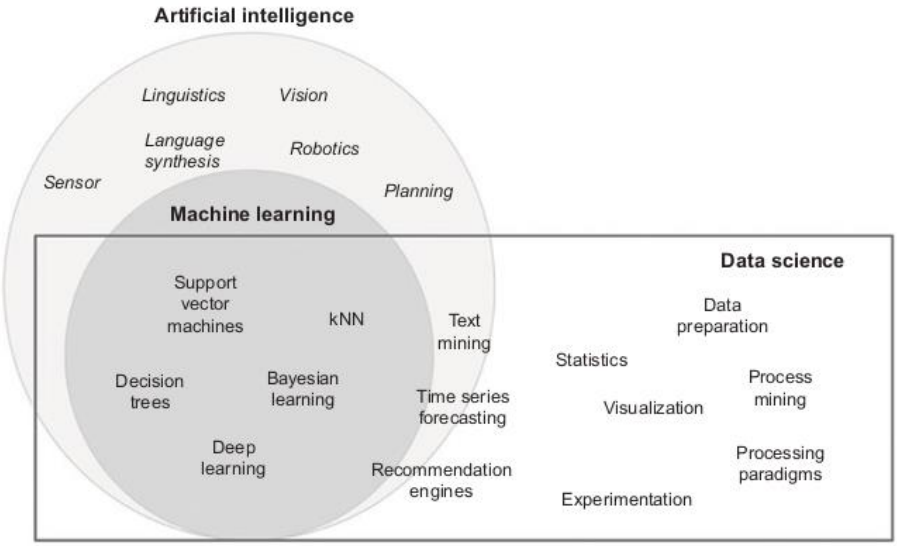
Goals

1. Getting to know the practical basics of learning topics (such as learning, machine learning, deep learning, statistical inference, and interactive learning).
2. Enhance your knowledge to deal with real projects.
3. Increase your learning rate (**α**), and decrease your forgetting factor (**λ**).

Data Science

Data Science is an interdisciplinary discipline that encompasses a variety of scientific procedures, algorithms, tools, and machine learning algorithms that work together to uncover common patterns and gain valuable insights from raw input data using statistical and mathematical analysis. Gathering business needs and related data is the first step; data cleansing, data staging, data warehousing, and data architecture are all procedures in the data acquisition process. Exploring, mining, and analyzing data are all tasks that data processing does, and the results may then be utilized to provide a summary of the data's insights.



Following the exploratory phases, the cleansed data is exposed to many algorithms, such as predictive analysis, regression, text mining, pattern recognition, and so on, depending on the needs. In the final last stage, the outcomes are aesthetically appealingly when conveyed to the business. This is where the ability to see data, report on it, and use other business intelligence tools come into play.

Python

Python is a general-purpose, high-level, interpreted programming language. The correct tools/libraries may be used to construct practically any application because it is a general-purpose language. Python also has features like objects, modules, threads, exception handling, and automated memory management, which aid in modeling real-world issues and developing programs to solve them.

Python Advantages

Python is a general-purpose programming language with a simple, easy-to-learn syntax that prioritizes readability and lowers program maintenance costs. Furthermore, the language is scriptable, open-source, and enables third-party packages, promoting modularity and code reuse.

Its high-level data structures, along with the dynamic type and dynamic binding, have attracted a large developer community for Rapid Application Development and deployment.

Pandas

Pandas are a Python open-source toolkit that allows for high-performance data manipulation. Pandas get its name from "panel data," which refers to econometrics based on multidimensional data. It was created by Wes McKinney in 2008 and may be used for data analysis in Python. It can conduct the five major processes necessary for data processing and analysis, regardless of the data's origin, namely load, manipulate, prepare, model, and analyze.

Numpy

NumPy is a Python-based array processing program. It includes a high-performance multidimensional array of objects and utilities for manipulating them. It is the most important Python module for scientific computing. An N-dimensional array object with a lot of power and sophisticated broadcasting functions.

NumPy is a Python module that is used for Scientific Computing. The NumPy package is used to carry out many tasks. A multidimensional array called ndarray (NumPy Array) holds the

same data type values. These arrays are indexed in the same way as Sequences are, starting at zero.

NumPy array in Pandas

Numerical Python (Numpy) is a Python module that allows you to do different numerical computations and handle multidimensional and single-dimensional array items. Numpy arrays are quicker than regular Python arrays for computations.

Neural Network

Neural Networks are a simplified version of how people learn, inspired by how neurons in our brains work.
Three network layers make up the most typical Neural Networks:

- There is an input layer.
- A layer that is not visible (this is the most important layer where feature extraction takes place, and adjustments are made to train faster and function better)
- A layer for output

MLP (Multilayer Perceptron)

MLPs have an input layer, a hidden layer, and an output layer, just like Neural Networks. It has the same structure as a single layer perceptron with more hidden layers. MLP can identify nonlinear classes, whereas a single layer perceptron can only categorize linear separable classes with binary output (0,1). Each node in the other levels, except the input layer, utilizes a nonlinear activation function. This implies that all nodes and weights are joined together to produce the output based on the input layers, data flowing in, and the activation function. Backpropagation is a supervised learning method used by MLP. The neural network estimates the error with the aid of the cost function in backpropagation. It propagates the mistake backward from the point of origin (adjusts the weights to train the model more accurately).

Descriptive Questions:

1. What is the definition of dynamically typed language?

   #Your_Answe: Dynamically-typed languages are those (like JavaScript) where the interpreter assigns variables a type at runtime based on the variable's value at the time. in dynamically typed languages, type checking takes place at runtime or execution time. This means that variables are checked against types only when the program is executing. Some examples of programming languages that belong to this category are Python, JavaScript, Lisp, PHP, Ruby, Perl, Lua, and Tcl.

2. Explain the definition of decorators in Python.

   #Your_Answe: A decorator is a design pattern in Python that allows a user to add new functionality to an existing object without modifying its structure. Decorators are usually called before the definition of a function you want to decorate.

3. What are the definitions of dict and list comprehensions?

   #Your_Answe: List comprehensions provide a concise way to create lists. Common applications are to make new lists where each element is the result of some operations applied to each member of another sequence or iterable or to create a subsequence of those elements that satisfy a certain condition. A dict comprehension, in contrast, to list and set comprehensions, needs two expressions separated with a colon followed by the usual “for” and “if” clauses. When the comprehension is run, the resulting key and value elements are inserted in the new dictionary in the order they are produced.

4. What is the definition of lambda in Python? What is purpose of it?

   #Your_Answe: a lambda function is a single-line function declared with no name, which can have any number of arguments, but it can only have one expression. Such a function is capable of behaving similarly to a regular function declared using the Python's def keyword

5. What is the purpose of reindexing in Pandas?

   #Your_Answe: Reindexing in Pandas can be used to change the index of rows and columns of a DataFrame. Indexes can be used with reference to many index DataStructure associated with several pandas series or pandas DataFrame

6. Can you explain how to use categorical data in Pandas?

   #Your_Answe: The categorical data type is useful in the following cases:

- A string variable consisting of only a few different values. Converting such a string variable to a categorical variable will save some memory.

- The lexical order of a variable is not the same as the logical order (“one”, “two”, “three”). By converting to a categorical and specifying an order on the categories, sorting and min/max will use the logical order instead of the lexical order.
- As a signal to other Python libraries that this column should be treated as a categorical variable (e.g. to use suitable statistical methods or plot types).

7. How Do I Remove Indices, Rows, and Columns from a Pandas Data Frame?

#Your_Answe: Pandas provide data analysts a way to delete and filter data frame using . drop() method. Rows can be removed using index label or column name using this method.

8. What is the best way to transform a DataFrame into a NumPy array?

#Your_Answe: To convert Pandas DataFrame to Numpy Array, use the function DataFrame. to_numpy() . to_numpy() is applied on this DataFrame and the method returns object of type Numpy ndarray. Usually the returned ndarray is 2-dimensional.

9. How can I make a two-dimensional (2D)array?

#Your_Answe:

Syntax:

```
[[r1,r2,r3,..,rn],[c1,c2,c3,.......,cn]]
```

r stands for rows and c stands for columns

Example: Following is the example for creating

2D array with 4 rows and 5 columns

```
array=[[23,45,43,23,45],[45,67,54,32,45],[89,90,87,65,44],[23,45,67,32
,10]]

#display

print(array)
```

10. How to reshape and multiply an array in shape 1×4 with a matirx in shape2×2 to have a matrix in shape 4×4?

#Your_Answe: reshape 2*2 matrix to a 4*1 matrix then multiply 4*1 matrix with a 1*4 matrix . we will have a 4*4 matrix.

B=a.reshape(4*1)

numpy.dot(B,B.T)

11. What is the best way to identify the data type of a NumPy array?

#Your_Answe: numpy.ndarray.dtype shows the type of data

12. Print a range of 1 to 100 and show four integers at random.

#Your_Answe: for I in range(4): print(random.randint(1,100))

13. How will you handle missing values in your data analysis?

#Your_Answe: When dealing with missing data, data scientists can use two primary methods to solve the error: imputation or the removal of data. The imputation method develops reasonable guesses for missing data. It's most useful when the percentage of missing data is low.

Multiple-Choice Test:

Suppose we run the following commands in Jupyter Notebook

What would be the output of this code?

14. Given that y = ax 3 + 7, which of the following is not a correct statement for this equation?

A. y = a * x * x * x + 7
B. y = a * x ** 3 + 7
C. y = a * (x * x * x) + 7
D. y = a * x * (x * x + 7)

15. import numpy as np
a = np.array([0, 1, 2])
M = np.ones((3, 3))
M + a

A.

```
array([[ 1.,  2.,  3.],
       [ 1.,  2.,  3.],
       [ 1.,  2.,  3.]])
```

B. array([[1., 2., 3.]])

C.TypeError: invalid type promotion

D.

```
array([[ 0.,  1.,  2.],
       [ 0.,  1.,  2.],
       [ 0.,  1.,  2.]])
```

16. import numpy as np
    b = np.array([1, 2, 3, 4, 5])
    np.tile(b.reshape(5, 1), (1, 4))

A.

```
array([[1, 1, 1, 1],
       [2, 2, 2, 2],
       [3, 3, 3, 3],
       [4, 4, 4, 4],
       [5, 5, 5, 5]])
```

B. TypeError: invalid type promotion

C.

```
array([[1, 2, 3, 4],
       [1, 2, 3, 4],
       [1, 2, 3, 4],
       [1, 2, 3, 4],
       [1, 2, 3, 4]])
```

D.

```
array([[1, 1, 1, 1,1],
       [2, 2, 2, 2,2],
       [3, 3, 3, 3,3],
       [4, 4, 4, 4,4]])
```

17. import numpy as np
    x = np.array([1, 2, 3])
    X[1]

    A. 0
    B. 1
    C. 2
    D. 3

18. import numpy as np
    time = np.arange(0, 10, 0.1) # time values of wave
    x   = np.sin(time)   # Amplitude of wave

    A. The current system time would be stored
    B. Variable named time is created
    C. The plot of values specified in the variable time
    D. Variables named time and x are created

19. word = 'Python'
    word[1]

    A. 'P'
    B. 'p'
    C. 'y'
    D. 'Y'

20. mybirds = ["Parrot", "Sparrow", "Crow", "Eagle"]
    mybirds.insert(1,'Crow')
    mybirds

    A. ['Parrot', 'Sparrow', 'Crow', 'Eagle']
    B. ['Parrot', 'Sparrow', 'Crow', 'Crow', 'Eagle']
    C. ['Parrot', 'Crow', 'Sparrow', 'Crow', 'Eagle']
    D. ['Crow', 'Parrot', 'Sparrow', 'Crow', 'Eagle']

21. n = 4
    myfile = open("days_of_week.txt")

```
for k, observation in enumerate(myfile):
        if k % n==0:
            print('Sampling rows: ' + str(k) + ',
Retrieved data ' + observation)
```

A. 1

B. 2

C. 3

D. 4

22. import pandas as pd
myseries2 = pd.Series([1, -3, 5, 20], index =['a', 'b', 'c', 'd'])
myseries2[2:3]

A. c 5

B. b −3
c 5

C. c 5
d 20

D. 5 c

23. We combine the data through the connection of rows using one or more keys by typing?

A. pandas.DataFrame.combine_first( )

B. pandas.merge( )

C. pandas.concat( )

D. All of the above.

24. Suppose we want to predict the income of a person based upon some features related to his/her lifestyle. This is an example of _____.

A. Classification

B. Regression

C. Either Classification or Regression

D. Clustering

Fill the blank:

25. Function _____np.arange/range_____ generates a sequence of integers.

26. If x is 7 , the value of x after evaluating x *= 5 is_____35_____.

27. The random module's _____random.seed()_____ function enables reproducibility of random sequences.

28. The _____==_____ operator tests whether its right operand's iterable contains its left operand's value.

29. A(n) _____module_____ defines related functions, data and classes. A(n) _____package_____ groups related modules

30. Every Python source code (.py) file you create is a(n) _____python script_____.

31. To define a function with an arbitrary argument list, specify a parameter of the form _____*args_____.

32. An identifier's _____scope_____ describes the region of a program in which the identifier's value can be accessed.

33. The stack operations for adding an item to a stack and removing an item from a stack are known as _____push_____ and _____pop_____, respectively.

34. A stack's items are removed in _____reverse_____ order.

35. Python's string and tuple sequences are _____immutable_____ they cannot be modified.

36. Assume you have a list called names . The slice expression ___names[::-1]_____ creates a new list with the elements of names in reverse order.

37. Given a list numbers containing 1 through 10, del numbers[-2] removes the value _____9_____ from the list.

38. A(n) ____neural_____ network passes the output of one layer as the input to the next layer in sequence.

39. A(n) _convolutional_____ layer uses the relationships between pixels that are close to one another to learn useful features (or patterns), such as edges, straight lines and curves.

40. A problem called _____computational issues_____ tends to occur in deep learning as the dimensionality of the layers becomes too large.

41. The _____softmax_____ activation function converts neuron outputs into classification probabilities for multiple-classification.

42. _____nlp_____ is used to predict two possible classes—such as positive or negative sentiment in sentiment analysis.

True or False:

43. The Python language supports popular programming paradigms—pro-cedural, functional, object-oriented and reflective. true

44. Python does not have constants. false

45. The following are valid variable names: 3g , 87 and score_4 in python. false

46. When an argument with a default parameter value is omitted in a function call, the interpreter automatically passes the default parameter value in the call. false

47. Parameters with default parameter values must be the leftmost arguments in a function's parameter list. false

48. A variable always references the same object. false

49. Once a code block terminates (e.g., when a function returns), all identifiers defined in that block "go out of scope" and can no longer be accessed. true

50. Attempts to modify mutable objects create new objects. false

51. A += augmented assignment statement may not be used with strings and tuples, because they're immutable. false

52. Tuples can contain only immutable objects. false

53. The following expression causes an error: false

```
'-' * 10
```

54. In Keras, you must specify the input shape for each new layer you add to your neural network model. false

55. In a convnet, learning the relationships among features and performing classification is accomplished with convolution layers. false

56. When performing deep learning on text sequences, you must create your own word embeddings to learn relationships among the words in your dataset.. true