1. Introduction

Pandas library of python is very useful for the manipulation of mathematical, data and is widely used in the field of machine learning for data analysis.

Why Pandas

- Intrinsic Data alignment.
- Data Operation Functions
- Functions for handling missing data
- Data standardization functions
- Data Structures handling major use cases.

Pandas Features

- Powerful data Structure
- Fast and efficient data wrangling
- Easy data aggregation and transformation
- Tools for reading/ Writing data
- Intelligent and automated data alignment
- High performance merging and joining of data sets

2. Technical Setup

I). Install Anaconda (https://www.anaconda.com/)

II). Install Pandas Package

```
!pip install pandas
```

Import pandas as pd

III). Use Jupyter notebook or Google Colab

IV). Downloading the dataset (e.g. Kaggle,..)

3. Series and DataFrames

Series:

A series is a sequence of data. A series is a one-dimensional array of indexed data. However, a Series does not have a column name, it only has one overall name. Use Series () function.

- One-dimensional labeled array.
- Support multiple data types

Syntax:

S = pd.Series(data, index = [index])

Accessing a single Series:

DataFrame[‘SeriesName’]

DataFrame[“SeriesName”]

DataFrame. SeriesName - It does not work if space in SeriesName

Accessing Multiple Series:

DataFrame[[‘SeriesName1’,’SeriesName2’]]

```
#pd.Series ([1, 2, 3, 4, 5])
#pd.Series ([3000, 3500, 4000], index=['2021 price', '2020 price', '2019 price'], name='Index A')
```

DataFrames:

Two-Dimensional data structure, like two-dimensional array, or a table with rows and columns. Use DataFrame () function.

- Two-dimensional labeled array.

- Support multiple data types
- Input cab be a Series
- Input can be another DataFrame.

type (DataFrame) : pandas.core.frame. DataFrame (check dataframe object)

#df = pd. DataFrame ({'quantity' : [10,12], 'price': [1200,1400]})

Note: DataFrame entries are not for only integers also dataframe whose values are strings.

#df=pd.DataFrame({'Nepal' : ['nepal is','beautiful', 'country.'], 'Kathmandu' : ['Kathmandu is','capital','of nepal']})

Index in DataFrame: The list of row labels used in a DataFrame is known as an Index.

#df=pd.DataFrame({'Nepal' : ['nepal is','beautiful', 'country.'], 'Kathmandu' : ['Kathmandu is','capital','of nepal']},
index=['A', 'B','c'])

df = pd.read_csv("file location")

Parameters	*Descriptions*	*DataType*
Filepath	*File location*	*str*
skiprows	*For skip rows*	*Int,list, callabel*
Usecols	*List of column no or name, if callable uses columns where the name passed to the callable result in TRUE.*	*Callable or list*
Index	*Indexing*	*Int, str*
Skip_blank_lines	*TRUE to skip blank lines rather than reading NAN values.Default is TRUE*	*bool*

Sep	*This sep parameter tells the interpreter, which delimiter is used in our dataset or in Layman's term, how the data items are separated in our CSV file.*	*str*
Delimiter	*Alish for sep*	*str*
Name	*List of columns name to use*	*Arrary like*

4. Data Input and Validation

Data Input

Functions	Description
read_csv ()	Read CSV file
read_json()	Read JSON file
read_htm()	Read HTML file
read_xml()	Read XML file
read_sql()	Read SQL file
read_excel()	Read Excel file
to_csv("file name")	Save DataFrame in CSV file format.

Shape:

The Shape attribute returns a tuple. Representing rows and columns the dimensionality of the DataFrame.

#DataFrame.shape

E.g. df.shape

Out: (rows, columns)

#df.shape[0]

Out: display rows

#df.shape[1]

Out: display columns

head () and tail() :

#DataFrame.head(n)

Return first n rows of Dataframe.

note: if you not pass any number, display first five rows.

#DataFrame.tail(n)

Return last N rows of Dataframe.

note: if you not pass any number, display last five rows.

info()

info() provides a summary of the data frame, including the number of entries, the data type and the number of non-null entries for each series in the data frame.

#DataFrame.info ()

5. Basic Analysis

value_counts ():

value_counts () method is very useful in pandas. It returns a series object, counting all the unique values in DataFrame. Returns a object containing counts of unique values.

By default, results are in descending order so first element is most frequently occurring element.

#Series.value_counts (normalize = False, sort=True, ascending=False, bins=None, drope=True)

→ you can use above parameters as your needs.

sort_values():

#Series.sort_values(axis=0, ascending=True, inplace=False, kind='quicksort',na_position='last')

➔ sort values along either axis.

#DataFrame.sort_values(by, axis=0, ascending= True, inplace=False, kind='quicksort',na_position='last)

Boolean Indexing:

➔ Boolean vectors can be used to filter data.

Operator	Symbol
AND	**&**
OR	|
NOT	**~**
EQUAL-TO	**==**

- ➔ Multiple Boolean conditions must be grouped using brackets.

Eg. df[(df.DataFrame.value == 'value') & (df.DataFrame.value == 'value')]

String Handling:

- ➔ Available to every Series using the str attribute.
- ➔ Series.str – access values of series as strings and apply several methos to it

```
# Series.str.contains('string value')
#Series.str.startswith()
# Series.str.isnumeric()
```

Indexing:

- ➔ The index object is an immutable array.
- ➔ Indexing allows you to access a row or column using a label

```
#type(DataFrame.index)
#DataFrame.index[ 20 ]
```

set_index():

```
#DataFrame.set_index(keys, drop=True, append=False, inplace=False, verify_integrity=Flase)
```

- ➔ Set the Dataframe using one or more columns

```
#set_index(keys, inplace=True
```

reset_index():

```
#DataFrame.reset_index(level=None, drop=False, inplace=False,..)
```

- ➔ Returns a DataFrame with default (integer-based) index.

```
#DataFrame.reset_index(inplace =True)
```

reset_index():

```
#DataFrame.sort_index(axis=0, level=None, ascending=True, inplace=False, … by=None)
```

- ➔ *Sort objects by a label along the axis.*

loc[]:

- ➔ DataFrame.loc [] / Dataframe.Series.loc []
- ➔ A label-based indexer for selection by label
- ➔ loc[] will raise a KeyError when the items are not found

iloc[]:

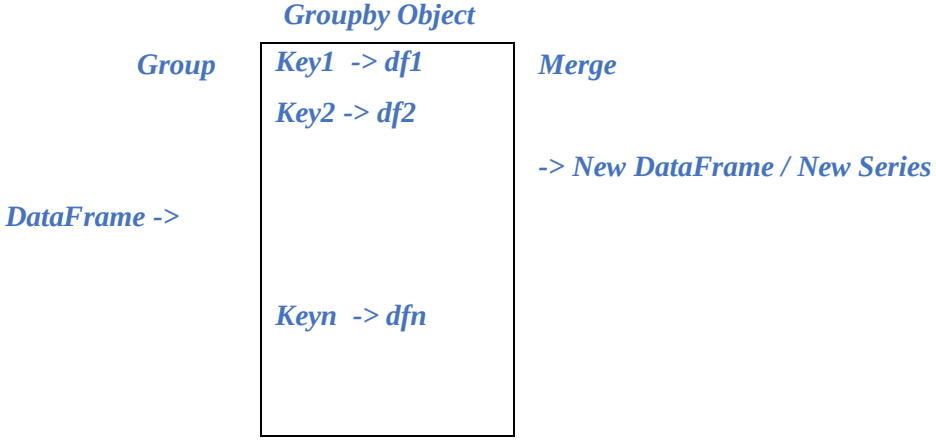
- ➔ DataFrame.iolc[]
- ➔ iloc[] is primarily integer position based (from 0 to length-1 of the axis)
- ➔ Allows traditional Pythonic slicing.

6. GroupBy

Groupby is one of the most important functionalities available in Pandas. Groupby does three things.

- Split DataFrame into group Based on some criteria.
- Apply a function to each group independently
- Combine the results into a DataFrame.
- Return a groupby object

*#pandas.DataFrame.groupby(by=None, axis=0, level=None, as_index=True, sort=True, group_keys=True, squeeze=False, **kwargs)*



Iterate through a group:

- for key,group in DataFrame.groupby():

  print(key)

  print(group)

  type(group_value)

Groupby Computations:

```
# GroupBy.size()
# GroupBy.count()
# GroupBy.first(),GroupBy.last()
# GroupBy.head(), GroupBy.tail()
#  GroupBy.mean()
#  GroupBy.max(), GroupBy.min()
agg() ->  multiple statistics in one calculation per group
# DataFrame.groupby(agg([…]))
```

7. Reshaping

stack():

```
#DataFrame.stack(level= -1, dropna=True)
```

➔ *Returns a DataFrame or Series.*

Pivot a level of the column labels, returning a DataFrame or Series, with a new innermost level of row labels.

Unstack():

```
#DataFrame.unstack(level=-1, full_value=None)
```

- *Pivot a level of the index labels, returning a DataFrame having a new level of columns labels.*
- *If the index is not a multi-Index, the output will be a Series-the level involved will automatically get sorted*