INTRODUCTION TO PANDAS

A LIBRARY THAT IS USED FOR DATA MANIPULATION AND ANALYSIS TOOL

USING POWERFUL DATA STRUCTURES

TYPES OF DATA STRUCTUE IN PANDAS

Data Structure	Dimensions	Description
Series	1	1D labeled homogeneous array, sizeimmutable.
Data Frames	2	General 2D labeled, size-mutable tabular structure with potentially heterogeneously typed columns.
Panel	3	General 3D labeled, size-mutable array.

SERIES

- Series is a one-dimensional array like structure with homogeneous data. For example, the following series is a collection of integers 10, 23, 56,
- …

10	23	56	17	52	61	73	90	26	72

DataFrame

- DataFrame is a two-dimensional array with heterogeneous data. For example,

Name	Age	Gender	Rating
Steve	32	Male	3.45
Lia	28	Female	4.6
Vin	45	Male	3.9
Katie	38	Female	2.78

Data Type of Columns

Column	Type
Name	String
Age	Integer
Gender	String
Rating	Float

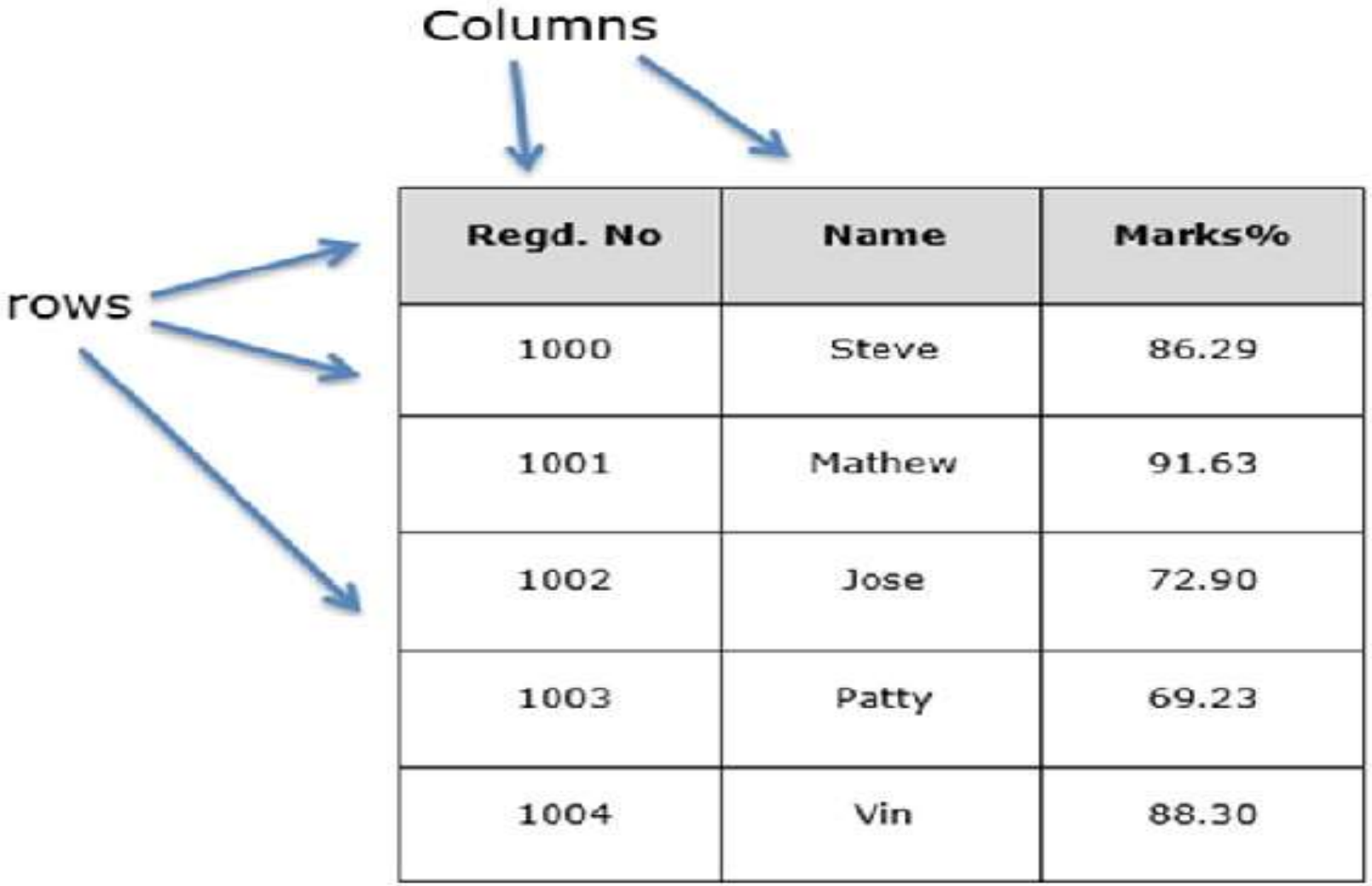
PANEL

- Panel is a three-dimensional data structure with heterogeneous data. It is hard to represent the panel in graphical representation. But a panel can be illustrated as a container of DataFrame.

DataFrame

- A Data frame is a two-dimensional data structure, i.e., data is aligned in a tabular fashion in rows and columns.
- Features of DataFrame
  - Potentially columns are of different types
  - Size – Mutable
  - Labeled axes (rows and columns)
  - Can Perform Arithmetic operations on rows and columns

Structure


Columns
rows
Regd. No
Name
Marks%
1000
Steve
86.29
1001
Mathew
91.63
1002
Jose
72.90
1003
Patty
69.23
1004
Vin
88.30

pandas.DataFrame

```
pandas.DataFrame(data, index , columns , dtype , copy )
```


- **data**
- data takes various forms like ndarray, series, map, lists, dict, constants and also another DataFrame.
- **index**
- For the row labels, the Index to be used for the resulting frame is Optional Default np.arrange(n) if no index is passed.
- **columns**
- For column labels, the optional default syntax is - np.arrange(n). This is only true if no index is passed.
- **dtype**
- Data type of each column.
- **copy**
- This command (or whatever it is) is used for copying of data, if the default is False.

- Create DataFrame
- A pandas DataFrame can be created using various inputs like –
- Lists
- dict
- Series
- Numpy ndarrays
- Another DataFrame

Example

- Example
  - import pandas as pd
  - Data = [_____]
  - Df = pd.DataFrame(data)
  - Print df

  Example 2

  Import pandas as pd

  Data = {‘Name’ : [‘__’. ‘__’],’Age’: [___]}

  Df = pd.DataFrame(data)
  print df

Example

- import pandas as pd
- data = [{'a': 1, 'b': 2},{'a': 5, 'b': 10, 'c': 20}]
- df = pd.DataFrame(data)
- print df
- _____
- import pandas as pd
- data = [{'a': 1, 'b': 2},{'a': 5, 'b': 10, 'c': 20}]
- df = pd.DataFrame(data, index=['first', 'second'])
- print df

- import pandas as pd
- data = [{'a': 1, 'b': 2},{'a': 5, 'b': 10, 'c': 20}]
- #With two column indices, values same as dictionary keys
- df1 = pd.DataFrame(data, index=['first', 'second'], columns=['a', 'b'])
- #With two column indices with one index with other name
- df2 = pd.DataFrame(data, index=['first', 'second'], columns=['a', 'b1'])
- print df1print df2

The following example shows how to create a DataFrame with a list of dictionaries, row indices, and column indices.

```
import pandas as pd
data = [{'a': 1, 'b': 2},{'a': 5, 'b': 10, 'c': 20}]
#With two column indices, values same as dictionary keys
df1 = pd.DataFrame(data, index=['first', 'second'], columns=['a', 'b'])
#With two column indices with one index with other name
df2 = pd.DataFrame(data, index=['first', 'second'], columns=['a', 'b1'])
print df1
print df2
```

Create a DataFrame from Dict of Series

- import pandas as pd
- d = {'one' : pd.Series([1, 2, 3], index=['a', 'b', 'c']), 'two' : pd.Series([1, 2, 3, 4], index=['a', 'b', 'c', 'd'])}
- df = pd.DataFrame(d)
- print df

Column Addition

- import pandas as pd
- d = {'one' : pd.Series([1, 2, 3], index=['a', 'b', 'c']), 'two' : pd.Series([1, 2, 3, 4], index=['a', 'b', 'c', 'd'])}
- df = pd.DataFrame(d)
- # Adding a new column to an existing DataFrame object with column label by passing new series
- print ("Adding a new column by passing as Series:")
- df['three']=pd.Series([10,20,30],index=['a','b','c'])
- print dfprint ("Adding a new column using the existing columns in DataFrame:")
- df['four']=df['one']+df['three']
- print df

Column Deletion

- # Using the previous DataFrame, we will delete a column
- # using del function
- import pandas as pd
- d = {'one' : pd.Series([1, 2, 3], index=['a', 'b', 'c']), 'two' : pd.Series([1, 2, 3, 4], index=['a', 'b', 'c', 'd']), 'three' : pd.Series([10,20,30], index=['a','b','c'])}
- df = pd.DataFrame(d)

- print ("Our dataframe is:")
- print df
- # using del function
- print ("Deleting the first column using DEL function:")
- del df['one']
- print df
  # using pop function
- print ("Deleting another column using POP function:")
- df.pop('two')
- print df

Slicing in python

- import pandas as pd
  d = {'one' : pd.Series([1, 2, 3], index=['a', 'b', 'c']),
  'two' : pd.Series([1, 2, 3, 4], index=['a', 'b', 'c',
  'd'])}
- df = pd.DataFrame(d)
- print df[2:4]

Addition of rows

- Df2 = pd.DataFrame([[5,6], [7,8]], columns = [‘a’, ‘b’])
- Df = df.append(df2)
- Print df

Deletion of rows

- Df2 = pd.DataFrame([[5,6], [7,8]], columns = [‘a’, ‘b’])
- Df = df.drop(0)
- Print df

Reindexing

- import pandas as pd
- import numpy as np
  df1 =
  pd.DataFrame(np.random.randn(10,3),columns=['col1','col2','col3'])
- df2 =
  pd.DataFrame(np.random.randn(7,3),columns=['col1','col2','col3'])df1
  = df1.reindex_like(df2)print df1

Concatenating objects

- import pandas as pd
- One = pd.DataFrame({ ‘Name’: [‘__’] , ‘subject_id’: [‘__’], ‘marks’: [‘__’]}, index = [])
- two= pd.DataFrame({ ‘Name’: [‘__’] , ‘subject_id’: [‘__’], ‘marks’: [‘__’]}, index = [])
- Print pd.concat([one, two])

Handling categorical data

- There are many data that are repetitive for example gender , country , and codes are always repetitive .
- Categorical variables can take on only a limited
- 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).

- import pandas as pd
- cat = pd.Categorical(['a', 'b', 'c', 'a', 'b', 'c'])
- print cat
- _____
- import pandas as pd
- import numpy as np
- cat = pd.Categorical(["a", "c", "c", np.nan], categories=["b", "a", "c"])
- df = pd.DataFrame({"cat":cat, "s":["a", "c", "c", np.nan]})
- print df.describe()
- print df["cat"].describe()