Python for Data Science

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Agenda

1. NumPy - Scientific Computing
2. Pandas - Data Manipulation
3. NumPy - Key Operations
4. Pandas - Key Operations
5. Use of merge and join

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Gauge Your Understanding

1. What are the different libraries for data manipulation in Python?
2. What are the key operations that can be performed using NumPy & Pandas?

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Key Libraries for Data Manipulation - NumPy & Pandas

Numpy

- **Num**erical **Py**thon
- Fundamental package for scientific computing
- A powerful N-dimensional array object - ndarray
- Useful in linear algebra, vector calculus, and random number capabilities, etc.

Pandas

- Extremely useful for data manipulation and exploratory analysis
- Offers two major data structures - ***Series*** & ***DataFrame***
- A ***DataFrame*** is made up of several ***Series*** - Each column of a ***DataFrame*** is a ***Series***.
- In a DataFrame, each column can have its own data type unlike NumPy array which creates all entries with the same data type.

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NumPy Key Operations

NumPy provides many useful operations for data manipulation. Some of the most commonly used operations and functions of NumPy are:

Operation	Numpy Function
Declare a NumPy array or convert a list into a NumPy array	array()
Reshape an n-dimensional array without changing the data inside the array	reshape()
Concatenate two or more arrays along a specified axis	concatenate()
Create evenly spaced elements in an interval, particularly useful while working with loops	arange(), linspace()
Working with matrices and perform different operations on them	dot(), transpose(), eye()

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Pandas Key Operations (1/2)

Pandas is one of the most famous data manipulation tool which is built on top of NumPy. Some of the commonly used operations and functions of Pandas are:

Operation	Pandas Function
Load or import the data from different sources/formats	read_csv(), read_excel(),
Information about the data - dimension, column dtypes, non-null values and memory usage	info()
View of basic statistical details of numeric data - quartiles, min, max, mean, std	describe()
Merge two data frames with different types of join - inner join, left join, right join, and full outer join	merge()
Explore data frames by different groups, and apply summary functions on each group	groupby()

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Pandas Key Operations (2/2)

Operation	Pandas Function
To get top n (5 by default) rows of a DataFrame or Series	head()
To concatenate pandas objects (Series or DataFrames) along a particular axis with optional set logic along the other axes	concat()
To get a Series (in descending order) containing counts of unique values	value_counts()
To convert a particular column data type to another data type	astype()
To see the unique values in a particular column	unique()

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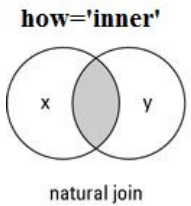
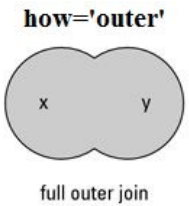
Merge vs Join

- **Join –** The **join** method works best when we are joining dataframes on their indexes (though you can specify another column to join on for the left dataframe).
- **Merge –** The **merge** method is more versatile and allows us to specify columns besides the index to join on for both dataframes.

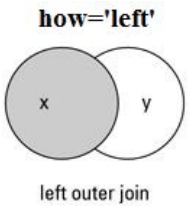
Natural join - Intersection	Full outer join - Union	Left outer join	Right outer join
To keep only rows that match from the data frames how=**'inner'.**	To keep all rows from both data frames, how=**'outer'.**	To include all the rows of your data frame x and only those from y that match how =**'left'.**	To include all the rows of your data frame y and only those from x that match, how=**'right'.**



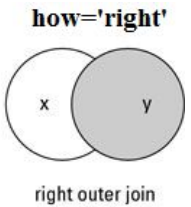
natural join



full outer join



left outer join



right outer join

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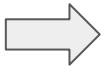
Uses of Merge and Join

id	Name	Age
1	Alex	21
2	Amy	24
3	Allen	25
4	Alice	22
5	Ayoung	19

id	Country	Income
1	India	30000
2	US	24000
3	Brazil	34000
4	UK	14000
5	China	28000



id	Name	Age	Country	Income
1	Alex	21	India	30000
2	Amy	24	US	24000
3	Allen	25	Brazil	34000
4	Alice	22	UK	14000
5	Ayoung	19	China	28000

```
import pandas as pd
left = pd.DataFrame({
   'id':[1,2,3,4,5],
   'Name': ['Alex', 'Amy', 'Allen', 'Alice', 'Ayoung'],
   'Age':['21','24','25','22','19']})
print (left)
```

```
right = pd.DataFrame(
   {'id':[1,2,3,4,5],
   'Country': ['India', 'US', 'Brazil', 'UK', 'China'],
   'Income':['30000','24000','34000','14000','28000']})
print (right)
```

```
print (pd.merge(left,right,on='id'))
```

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Happy Learning !