1 Adding data to NumPy and Pandas

1.1 Numpy

1.1.1 Adding more rows of data

To add more rows to an existing numpy array use the *vstack* method which can add multiple or single rows. New data may be in the form of a numpy array or a list. All combined data must have the same number of columns.

```
import numpy as np

# Starting with a NumPy array
array1 = np.array([[1,2,3,4,5],
         [6,7,8,9,10],
         [11,12,13,14,15]])

# An additional 2d list
array2 = [[16,17,18,19,20],
         [21,22,23,24,25]]

# An additional single row Numpy array
array3 = np.array([26,27,28,29,30])

# We will combine all data into existing array, array1
# But a new name could be given
array1 = np.vstack([array1, array2, array3])

print (array1)

OUT:

[[ 1  2  3  4  5]
 [ 6  7  8  9 10]
 [11 12 13 14 15]
 [16 17 18 19 20]
 [21 22 23 24 25]
 [26 27 28 29 30]]
```

1.1.2 Adding more columns of data

To add more columns to an existing numpy array use the *hstack* method which can add multiple or single rows. All combined data must have the same number of rows.

```
df1 = pd.DataFrame()
names = ['Gandolf','Gimli','Frodo','Legolas','Bilbo']
types = ['Wizard','Dwarf','Hobbit','Elf','Hobbit']

df1['names'] = names
df1['type'] = types

print (df1)

# Add another column
magic = [10, 1, 4, 6, 4]
df1['magic'] = magic
```

```
print ('\n Added column:\n',df1)

OUT:

     names    type
0  Gandolf  Wizard
1    Gimli   Dwarf
2    Frodo  Hobbit
3  Legolas     Elf
4    Bilbo  Hobbit

 Added column:
     names    type  magic
0  Gandolf  Wizard     10
1    Gimli   Dwarf      1
2    Frodo  Hobbit      4
3  Legolas     Elf      6
4    Bilbo  Hobbit      4
```

We can use *concat* also to add multiple columns (in the form of another dataframe), in which case the data will be combined based on the index column. We pass the argument *axis=1* to the concat statement to instruct the method to combine by column (it defaults to axis=0, or row concatenation).

```
df1 = pd.DataFrame()
names = ['Gandolf','Gimli','Frodo','Legolas','Bilbo']
types = ['Wizard','Dwarf','Hobbit','Elf','Hobbit']

df1['names'] = names
df1['type'] = types

print (df1)

df2 = pd.DataFrame()

magic = [10, 1, 4, 6, 4]
aggression = [7, 10, 2, 5, 1]
stealth = [8, 2, 5, 10, 5]

df2['magic_power'] = magic
df2['aggression'] = aggression
df2['stealth'] = stealth

df1 = pd.concat([df1,df2], axis=1)
print(df1)

OUT:

df1 = pd.concat([df1,df2], axis=1)

print(df1)

     names    type  magic_power  aggression  stealth
0  Gandolf  Wizard           10           7        8
1    Gimli   Dwarf            1          10        2
2    Frodo  Hobbit            4           2        5
3  Legolas     Elf            6           5       10
4    Bilbo  Hobbit            4           1        5
```

There is more information here: `https://pandas.pydata.org/pandas-docs/stable/merging.html`