

Session1-Intro_Numpy (Arrays Part-1)

DAwP_S1_Numpy1_Jul30th22

Training Clarusway

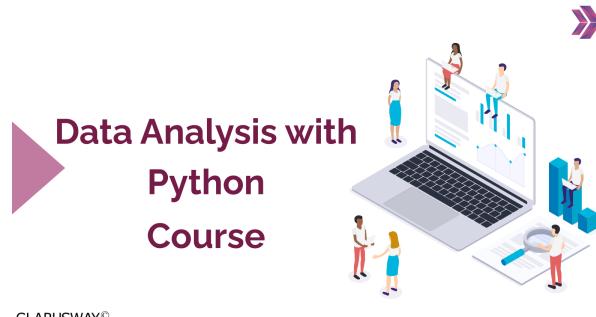
Pear Deck - July 30, 2022 at 0:36AM

Part 1 - Summary

Use this space to summarize your thoughts on the lesson

Part 2 - Responses

Slide 1



Use this space to take notes:

Slide 2



CLARUSWAY®
WAY TO REINVENT YOURSELF.

Use this space to take notes:

Slide 3

Course Info



Course Duration
30 July - 17 August
12 Sessions **36 Hours in Total**

Structure of Course



Course Projects



3

Use this space to take notes:

Slide 4

The screenshot shows a lesson plan for 'Data Analysis with Python'. At the top, there are two purple arrows pointing right. Below them is the CLARUSWAY logo with the tagline 'WAY TO REINVENT YOURSELF.' To the left is a large purple play button icon.

Lesson Plan
Data Analysis with Python

This course will give you comprehensive and valuable information about NumPy and Pandas libraries and by using hands-on exercises you will learn how to use Python to analyze data. At the end of the course, you will have the intuition to prepare the data for any Decision Support Purposes or any Machine learning algorithms.

Custodian: Matthew Connor-Instructor (matthew_c@clarusway.com)
In-class Sessions: 14 Sessions (42 hours)
Lab Sessions: 3/4 Labs (34 hours)

Certification Requirements:

1. % 70 attendance to in-class lessons (at least 10/14 for DAwPython Course)
2. Success in completing and submitting assignments & projects (at least 1 assignment & 1 project for DAwPython Course)

[Click the previous above to see the detailed syllabus of this section.](#)

Attendance Reminder 151AM
@channel Please login to zoom with your LMS email addresses and make sure your zoom names are like X#_##-Xoox (F1234-1amhere).
Have a nice class!

WARNING: A red arrow points from this word to a red rectangular box containing the certification requirements.

i: An orange info icon.

Use this space to take notes:

Slide 5

The screenshot shows the first session of the 'Data Analysis with Python' course. It features a large purple play button icon on the left. In the center, the title 'Data Analysis with Python' is displayed above 'Session-1'. To the right is a 3D illustration of a laptop screen showing various data visualizations like bar charts and a magnifying glass over a chart. Several small human figures are interacting with the laptop and the data.

Data Analysis with Python
Session-1

CLARUSWAY®
WAY TO REINVENT YOURSELF.

Use this space to take notes:

Slide 6

▶ Table of Contents



- ▶ Big Picture
- ▶ NumPy

8

Use this space to take notes:

Slide 7

▶ Big Picture



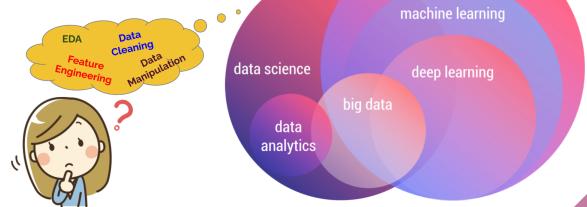
CLARUSWAY®
WAY TO REINVENT YOURSELF

Use this space to take notes:

Slide 8

► Big Picture

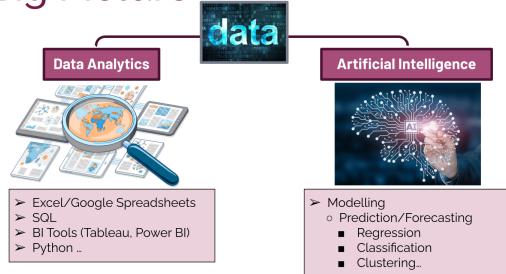
- ▶ Where am I?
- ▶ Why will I learn these?



Use this space to take notes:

Slide 9

► Big Picture



Use this space to take notes:

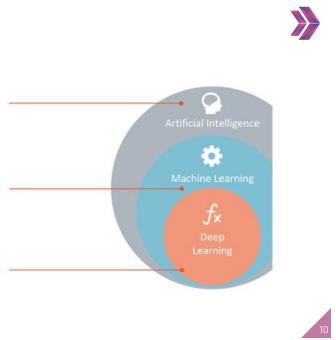
Slide 10

► Big Picture

Artificial Intelligence
Any technique which enables computers to mimic human behavior.

Machine Learning
Subset of AI techniques which use statistical methods to enable machines to improve with experiences.

Deep Learning
Subset of ML which make the computation of multi-layer neural networks feasible.

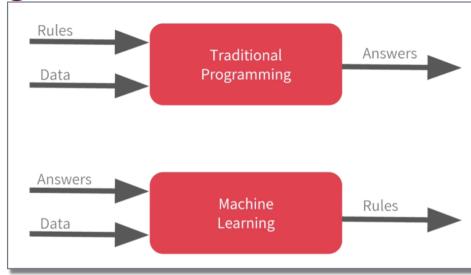


10

Use this space to take notes:

Slide 11

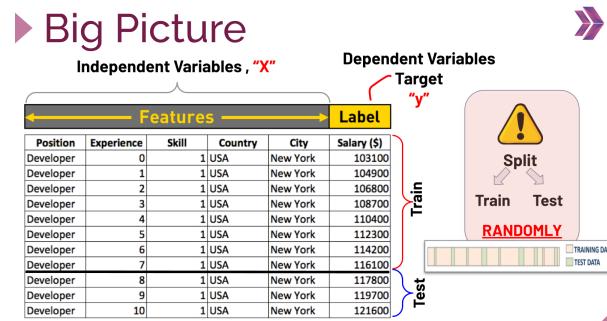
► Big Picture



11

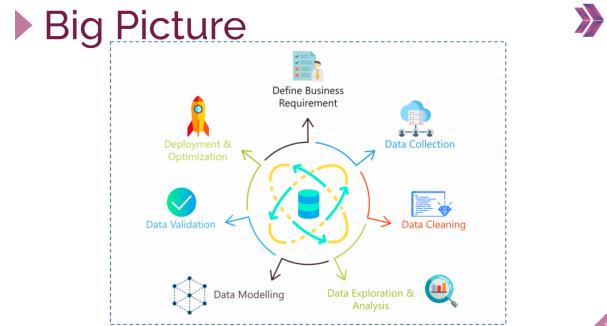
Use this space to take notes:

Slide 12



Use this space to take notes:

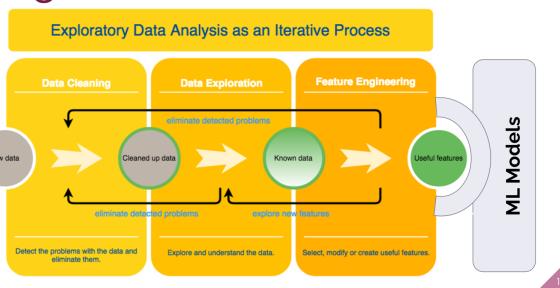
Slide 13



Use this space to take notes:

Slide 14

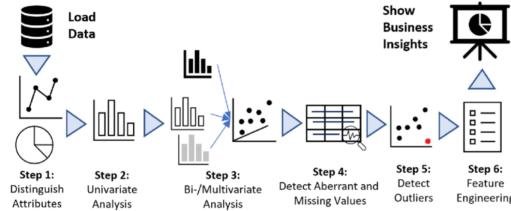
► Big Picture



Use this space to take notes:

Slide 15

► Big Picture



Use this space to take notes:

Slide 16

► Big Picture



	0	1
url	https://www.autoscout24.com/offers/audi-a1/	https://www.autoscout24.com/offers/audi-a1/
make_model	Audi A1	Audi A1
body_type	Sedan	Sedan
price	14000	14000
km	95.07 km	Price negotiable
reg_date	05/2018	05/2018
perm_mile	2 previous owners	Used
VAT	Nah	Nah
KW	60 kW	60 kW
Type	1.6l Diesel (Performance Pack)	1.6l TDI
Previous Owners	1	Used, German
Next Inspection	(06/2021) valid p.2020 (control)	Nah
Inspection now	(06/2021) valid p.2020 (control)	Nah
Fuel Service	[n..n, 100] (control)	Nah
Non-existing Vehicle	[n..n]	Nah
Adult	2	2
Male	Indifferent	Indifferent
Model	[n..n, 10]	[n..n, 10]
Other	14000	14000
First Registration	[> 2010, n]	[> 2017, n]
Body Color	[n..n, 10]	[n..n, 10]

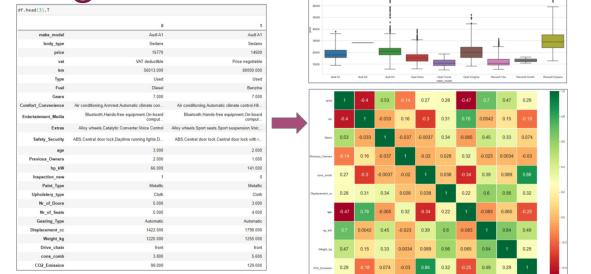
	0	1
make_model	Audi A1	Audi A1
body_type	Sedan	Sedan
price	14000	14000
km	95.07 km	Price negotiable
reg_date	05/2018	05/2018
perm_mile	2 previous owners	Used
VAT	Nah	Nah
Type	1.6l TDI	1.6l TDI
Previous Owners	1	Used, German
Next Inspection	(06/2021) valid p.2020 (control)	Nah
Inspection now	(06/2021) valid p.2020 (control)	Nah
Fuel Service	[n..n, 100] (control)	Nah
Non-existing Vehicle	[n..n]	Nah
Adult	2	2
Male	Indifferent	Indifferent
Model	[n..n, 10]	[n..n, 10]
Other	14000	14000
First Registration	[> 2010, n]	[> 2017, n]
Body Color	[n..n, 10]	[n..n, 10]

16

Use this space to take notes:

Slide 17

► Big Picture

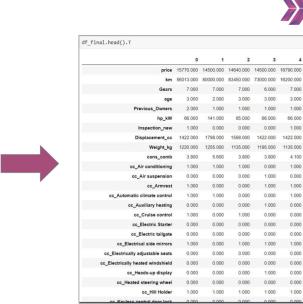


17

Use this space to take notes:

Slide 18

► Big Picture



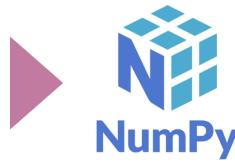
The diagram illustrates a data transformation process. On the left, a table titled "df_head(1).T" shows the initial state of the data. On the right, a table titled "df_final_head.T" shows the transformed state. A purple arrow points from the left table to the right table, indicating the flow of data processing.

	0	1	2	3	4
model	BMW 3 Series				
body_type	Sedan	Sedan	Sedan	Sedan	Sedan
price	52770	14010	14010	14010	14010
year	2013	2013	2013	2013	2013
kms	56010 000	30500 000	30500 000	30500 000	30500 000
Type	Used	Used	Used	Used	Used
Fuel	Diesel	Diesel	Diesel	Diesel	Diesel
Power	130	130	130	130	130
km_per_l	7.000	7.000	7.000	7.000	7.000
Cooling	Air conditioning				
Condition	No leather seats				
Entertainment	Bluetooth hands free equipment On board				
Caravan	Alloy wheels	Catalytic Converter Voice Control	Alloy wheels	Alloy wheels	Alloy wheels
Safety_Security	ABS Central door lock Daytime running lights D.	ABS Central door lock Central door lock with t.	ABS Central door lock Central door lock with t.	ABS Central door lock Central door lock with t.	ABS Central door lock Central door lock with t.
Phantom_Driver	Age	2.000	1.000	1.000	1.000
Insurance_new	1	1	1	1	1
Point_Type	ModelB	ModelB	ModelB	ModelB	ModelB
Upkeepcost_M	1.000	1.000	1.000	1.000	1.000
Wt_kg	1.400	1.400	1.400	1.400	1.400
Gearing_Type	Automatic	Automatic	Automatic	Automatic	Automatic
Dimensions_m	4.500 1.780 1.460	4.500 1.780 1.460	4.500 1.780 1.460	4.500 1.780 1.460	4.500 1.780 1.460
Weight_kg	1220.000	1220.000	1220.000	1220.000	1220.000
Drive_chasis	Front	Front	Front	Front	Front
Color_hex	#333333	#333333	#333333	#333333	#333333
CO2_Emissions	99.000	129.000	129.000	129.000	129.000

	0	1	2	3	4
price	52770.000	14010.000	14010.000	14010.000	14010.000
km	56010.000	30500.000	30500.000	30500.000	30500.000
Gears	7.000	7.000	7.000	7.000	7.000
age	3.000	2.000	2.000	2.000	2.000
Previous_Owner	1.000	1.000	1.000	1.000	1.000
hp_MHP	66.000	141.000	85.000	86.000	96.000
Inspector_new	1.000	0.000	0.000	0.000	1.000
Dimensions_m	4.500 1.780 1.460	4.500 1.780 1.460	4.500 1.780 1.460	4.500 1.780 1.460	4.500 1.780 1.460
Weight_kg	1220.000	1220.000	1220.000	1220.000	1220.000
car_point	3.000	5.000	3.000	3.000	4.000
car_color	Black	Black	Black	Black	Black
car_Air_suspension	0.000	0.000	0.000	0.000	0.000
car_Air_absorber	0.000	0.000	0.000	0.000	0.000
car_Audio_head	0.000	0.000	0.000	0.000	0.000
car_Cruise_control	1.000	0.000	1.000	0.000	0.000
car_Electronic_stabilizer	0.000	0.000	0.000	0.000	0.000
car_Electric_door_locks	1.000	0.000	1.000	0.000	0.000
car_Electrically_adjustable_seats	0.000	0.000	0.000	0.000	0.000
car_Driver_assistant_system	0.000	0.000	0.000	0.000	0.000
car_Hands_up_display	0.000	0.000	0.000	0.000	0.000
car_Heated_steering_wheel	5.000	0.000	0.000	0.000	0.000
car_Multifunctional_wheel	1.000	1.000	1.000	0.000	0.000
car_Park_assistant_system	0.000	0.000	0.000	0.000	0.000

Use this space to take notes:

Slide 19



CLARUSWAY®
WAY TO REINVENT YOURSELF



Use this space to take notes:

Slide 20

► Table of Contents

- ▶ Introduction to Numpy
 - What is NumPy?
 - Why is NumPy Fast?
 - Installation
- ▶ Numpy Arrays
 - What is Array?
 - Advantages of Arrays by Lists
 - Creating NumPy Arrays
 - Array Methods



20

Use this space to take notes:

Slide 21

Your Response

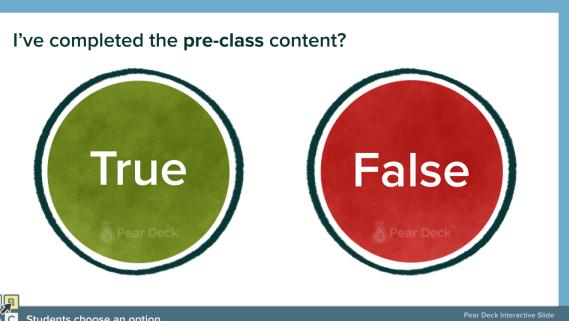
I've completed the pre-class content?

True **False**

Pear Deck

Students choose an option

Pear Deck Interactive Slide
Do not refresh this tab



You Chose

- **True**

Other Choices

- False

Use this space to take notes:

Slide 22

▶ Introduction

What is NumPy?



Numerical Python



- ▶ NumPy is the **fundamental package for scientific computing in Python**.
- ▶ It is a Python library that provides:
 - A **multidimensional array object**,
 - **Various derived objects** (such as masked arrays and matrices),
 - An assortment of routines for **fast** operations on arrays including mathematical, logical, shape manipulation, sorting, selecting, I/O, discrete Fourier transforms, basic linear algebra, basic statistical operations, random simulation and much more.
- ▶ The core of NumPy is **well-optimized C code**.

22

Use this space to take notes:

Slide 23

▶ Introduction

What is NumPy?



- ▶ At the core of the NumPy package, is the **ndarray object**.
- ▶ **Differences between NumPy arrays and the standard Python sequences:**
 - NumPy arrays **have a fixed size** at creation, unlike Python lists. Changing the size of an ndarray will create a new array and delete the original.
 - The elements in a NumPy array are all required to be of the **same data type**, and thus will be the **same size** in memory.
 - **Advanced mathematical operations** are executed more efficiently and with less code than is possible using Python's built-in sequences.

23

Use this space to take notes:

Slide 24

▶ Introduction

Why is NumPy Fast?



- ▶ Numpy draws its power from its **vectorization** and **broadcasting** features.
- ▶ **Vectorization** describes the absence of any explicit looping, indexing, etc., in the code. Vectorized code has many advantages, among which are:
 - Vectorized code is **more concise and easier to read**.
 - **Fewer lines of code** generally means **fewer bugs**.
 - The code more closely resembles **standard mathematical notation** (making it easier, typically, to correctly code mathematical constructs)
 - Vectorization results in more "**Pythonic**" **code**. Without vectorization, our code would be littered with inefficient and difficult to read for loops.

24

Use this space to take notes:

Slide 25

▶ Introduction

Why is NumPy Fast?



- ▶ **Broadcasting** is the term used to describe the implicit element-by-element behavior of operations.
- ▶ in NumPy all operations, not just arithmetic operations, but logical, bit-wise, functional, etc., behave in this implicit element-by-element fashion, i.e., they broadcast.

https://www.tutorialspoint.com/numpy/numpy_broadcasting.htm

<https://erdincuzun.com/numpy/05-numpy-broadcasting/>

25

Link(s) on this slide:

- https://www.tutorialspoint.com/numpy/numpy_broadcasting.htm
- <https://erdincuzun.com/numpy/05-numpy-broadcasting/>

Use this space to take notes:

Slide 26

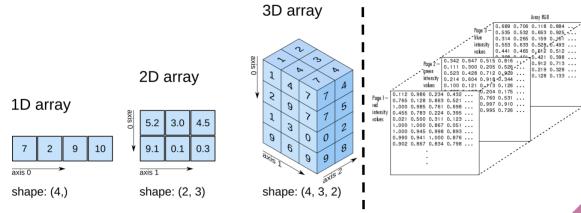


Use this space to take notes:

Slide 27



- ▶ Array is a data structure that contains a group of elements. Typically these elements are all of the same data type, such as an integer or string.



Use this space to take notes:

Slide 28

▶ Numpy Arrays

Advantages of Arrays by Lists

- ▶ Less memory
- ▶ Much faster
- ▶ Convenient
- ▶ Computations



*let's see its
implementation
in notebook*

28

Use this space to take notes:

Slide 29

Your Response

Write down 4 of the built-in methods for creating an array in NumPy.



Pear Deck

Students, write your response!

Pear Deck Interactive Slide

Answer 1:
manual np.array

Use this space to take notes:

Slide 30

► Numpy Arrays

- ▶ Built-in Array Creation Methods
 - `arange`
 - `zeros, ones, full`
 - `linspace`
 - `eye`
 - `random.rand`
 - `random.randn`
 - `random.randint`



30

Use this space to take notes:

Slide 31

Your Response

Write down 4 of the array attributes in NumPy.



Students, write your response!

Pear Deck

Pear Deck Interactive Slide

Answer 1:
max min sum sqrt

Use this space to take notes:

Slide 32

▶ Numpy Arrays

- ▶ Array Methods & Attributes
 - reshape
 - max, min, argmax, argmin
 - ndim
 - shape
 - size
 - dtype
 - itemsize



32

Use this space to take notes:

Slide 33

▶ Data Analysis with Python



let's start the
hands-on phase



33

Use this space to take notes:

Slide 34

Your Response

Slide 34

Did you find this lesson interesting and challenging?

Too hard Just right Too easy

Students, drag the icon!

Peer Deck Interactive Slide
Do not remove this bar

Your Response

Did you find this lesson interesting and challenging?

Too hard Just right Too easy

Students, drag the icon!

Peer Deck Interactive Slide
Do not remove this bar

Use this space to take notes:

Slide 35

THANKS!

Any questions?

You can find us at:

steve_w@clarusway.com
michael_g@clarusway.com



Use this space to take notes:

CLARUSWAY®
Leading to Success Worldwide

35