

Session1-Intro_Numpy (Arrays Part-1)

DAwP_S1_Numpy1_Jul30th22

Training Clarusway

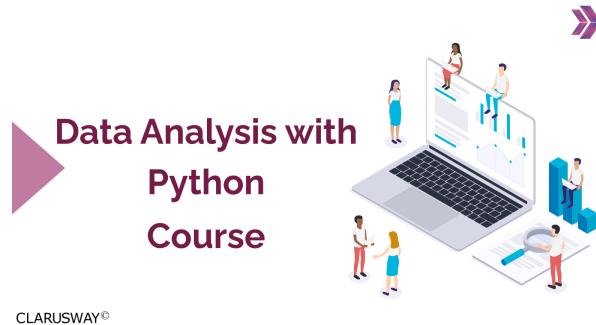
Pear Deck - July 30, 2022 at 0:36AM

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



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Course Info



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

Structure of Course



Course Projects



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Slide 4

The screenshot shows the CLARUSWAY website with a purple header. Below it, a large purple play button icon is positioned on the left. The main content area has a white background with a purple border. At the top right, there is a red 'WARNING' stamp with a red arrow pointing towards it. The page title is 'Data Analysis with Python'. It includes sections for 'Lesson Plan', 'Certification Requirements', and 'Attendance Reminder'. A small orange info icon is located on the right side.

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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 (3/4 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 15:14 AM
@channel Please login to zoom with your LMS email addresses and make sure your zoom names are like X#_##-Xox (F1234-1amhere).

Have a nice class!

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WARNING

i

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Slide 5

The screenshot shows the CLARUSWAY website with a purple header. Below it, a large purple play button icon is positioned on the left. The main content area has a white background with a purple border. In the center, there is a 3D illustration of a laptop screen displaying a chart, with several small human figures interacting around it. The title 'Data Analysis with Python' and 'Session-1' are displayed in large purple text. A small purple info icon is located at the bottom right.

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Data Analysis with Python

Session-1

i

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Slide 6

▶ Table of Contents



- ▶ Big Picture
- ▶ NumPy

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Use this space to take notes:

Slide 7

▶ Big Picture



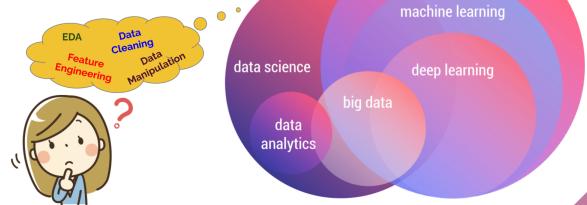
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► Big Picture

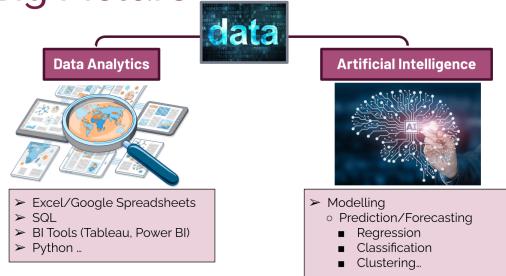
- ▶ Where am I?
- ▶ Why will I learn these?



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Slide 9

► Big Picture



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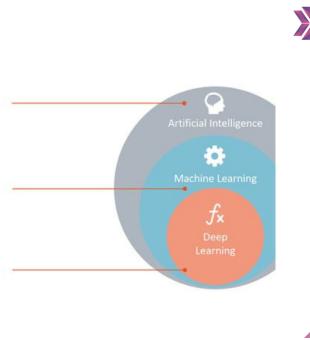
Slide 10

► 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.

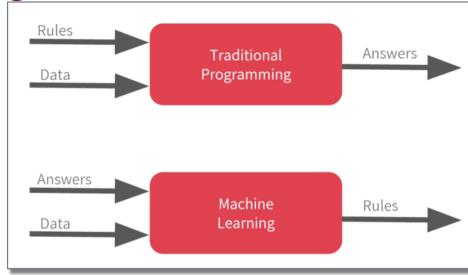


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Slide 11

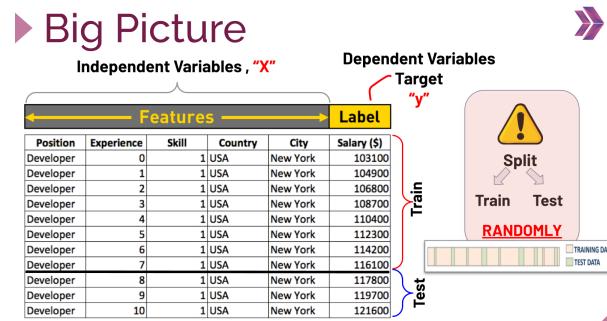
► Big Picture



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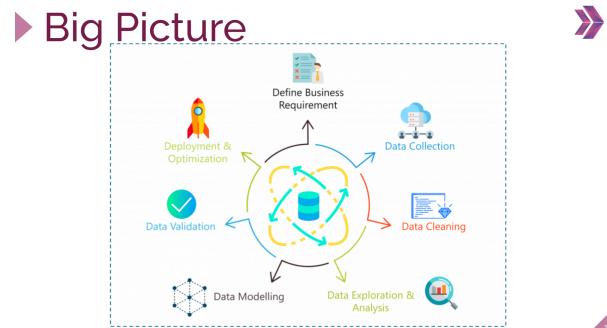
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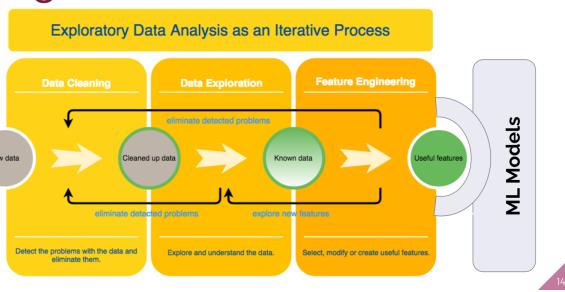
Slide 13



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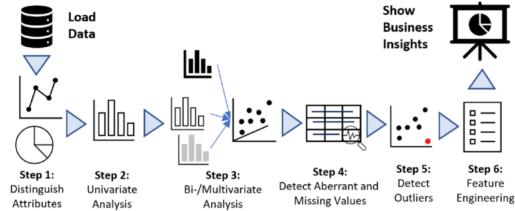
► Big Picture



Use this space to take notes:

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► 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	1.6 liter, Diesel (Performance Pack)	1.6 liter, Diesel (Performance Pack)
Previous Owners	1	1
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]

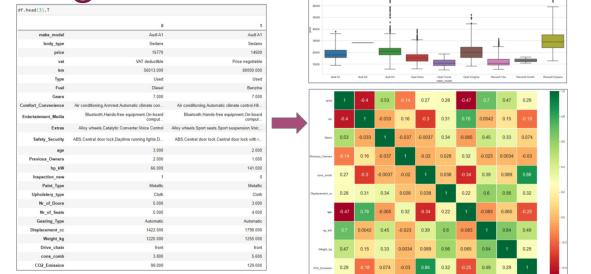
	0	1
make_model	Audi A1	Audi A1
body_type	Sedan	Sedan
price	14000	14000
km	95.07 km	Price negotiable
reg_date	05/2018	05/2018
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Adult	2	2
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Model	[n..n, 10]	[n..n, 10]
Other	14000	14000
First Registration	[> 2010, n]	[> 2017, n]
Body Color	[n..n, 10]	[n..n, 10]

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Use this space to take notes:

Slide 17

► Big Picture

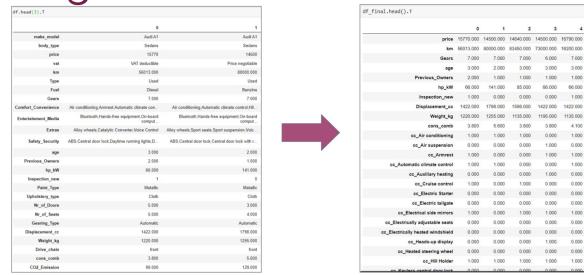


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Use this space to take notes:

Slide 18

► Big Picture



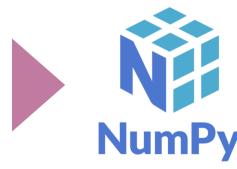
The diagram illustrates a data transformation process. On the left, a table titled "df_head(1).T" shows the initial state of the data. On the right, a table titled "df_final_head.T" shows the transformed state. A purple arrow points from the left table to the right table, indicating the flow of data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

	0	1	2
model	BMW 3 Series	BMW 3 Series	BMW 3 Series
body_type	Sedan	Sedan	Sedan
price	52770	14010	14010
year	2013	2013	2013
kms	56010 000	30500 000	30500 000
Type	Used	Used	Used
Fuel	Diesel	Diesel	Diesel
Power	130	130	130
km_per_l	7.000	7.000	7.000
Cooling_Console	No	No	No
Entertainment_Music	Bluetooth hands free equipment On board	Bluetooth hands free equipment On board	Bluetooth hands free equipment On board
Carries	Alloy wheels	Catalytic Converter Voice Control	Alloy wheels Sport seats
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.
Phantom_Driver	0.000	2.000	2.000
Impression_new	1	1	1
Paint_Type	Metallic	Metallic	Metallic
UpkeepYear_Hyp	2013	2013	2013
Mr_v_Sales	4.000	4.000	4.000
Gearing_Type	Automatic	Automatic	Automatic
Dimensions_m	4.550 000	4.550 000	4.550 000
Weight_kg	1220 000	1220 000	1220 000
Drive_chasis	Front	Front	Front
Color_hexcode	#000000	#000000	#000000

	0	1	2
price	51911.000	14010.000	14010.000
km	56111.000	30500.000	30500.000
age	7.000	7.000	7.000
Power	3.000	2.000	2.000
Previous_Owner	1.000	1.000	1.000
hp_MPH	66.000	141.000	85.000
Inspector_new	1.000	0.000	0.000
Dimensions_m	4.550 000	4.550 000	4.550 000
Weight_kg	1220.000	1220.000	1220.000
car_paint	3.000	5.000	3.000
car_color	1.000	1.000	1.000
car_Air_suspension	0.000	0.000	0.000
car_Air_absorber	1.000	0.000	0.000
car_Air_cooling	0.000	0.000	0.000
car_Air_heating	0.000	0.000	0.000
car_Cruise_control	1.000	0.000	0.000
car_Electronic_stabilizer	0.000	0.000	0.000
car_Electric_steer	0.000	0.000	0.000
car_Electric_seats	1.000	0.000	0.000
car_Electronic_steer	0.000	0.000	0.000
car_Electronic_steer	0.000	0.000	0.000
car_Four_wheel_driv	0.000	0.000	0.000
car_Handbrake	0.000	1.000	0.000
car_Handbrake	0.000	0.000	0.000

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► 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



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Your Response

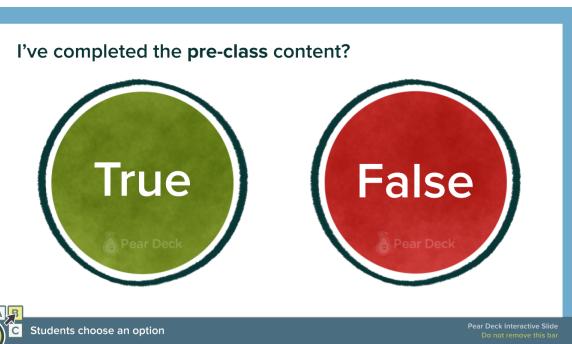
I've completed the pre-class content?

True **False**

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Students choose an option

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Do not refresh this tab



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▶ 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**.

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▶ 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.

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▶ 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.

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▶ 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/>

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Link(s) on this slide:

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

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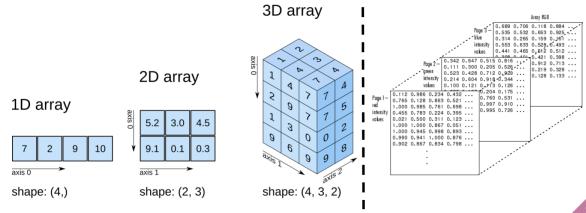


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- ▶ Array is a data structure that contains a group of elements. Typically these elements are all of the same data type, such as an integer or string.



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▶ Numpy Arrays

Advantages of Arrays by Lists

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



*let's see its
implementation
in notebook*

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Your Response

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



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Students, write your response!

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► Numpy Arrays

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



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Your Response

Write down 4 of the array attributes in NumPy.



Students, write your response!

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► Numpy Arrays

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



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► Data Analysis with Python



let's start the
hands-on phase



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Your Response

Slide 34

Your Response

Did you find this lesson interesting and challenging?

Too hard Just right Too easy

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Students, drag the icon!

Peer Deck Interactive Slide
Do not remove this bar

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THANKS!

Any questions?

You can find us at:

steve_w@clarusway.com
michael_g@clarusway.com



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