

# Session1-Intro&Numpy (Arrays)-new

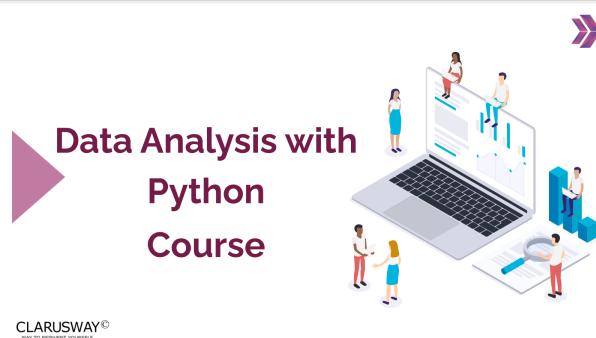
DAwithPython S-1  
Training Clarusway  
Pear Deck - January 19, 2022 at 7:48PM

## 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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## Slide 3

### Course Info



**Course Duration**  
19 January- 05 February  
12 Sessions **36 Hours in Total**

#### Structure of Course



#### Course Projects



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## Slide 4



A slide titled "Data Analysis with Python Session-1". The title is in a dark red font with a large right-pointing arrow icon to its left. Below the title is a subtitle "Session-1". To the right of the text is a 3D-style illustration of a laptop displaying a chart, with several small human figures interacting with the laptop and its data. At the bottom left is the CLARUSWAY logo.

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## Slide 5

### ▶ Table of Contents ➤

- ▶ Big Picture
- ▶ NumPy

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## Slide 6

## ▶ Big Picture



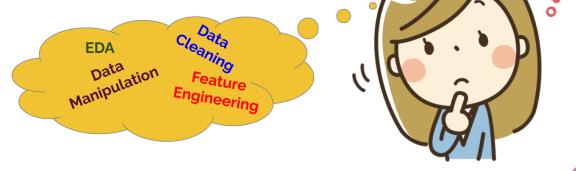
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## Slide 7

### ▶ Big Picture

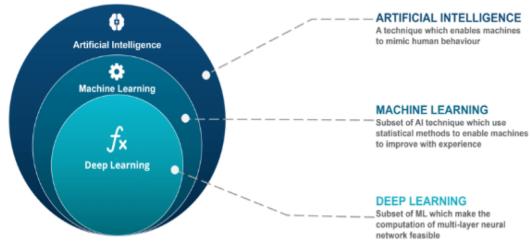
- ▶ Where am I?
- ▶ Why will I learn these?



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## Slide 8

## ► Big Picture

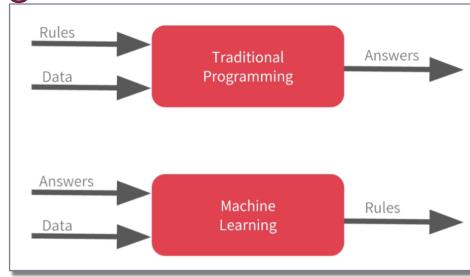


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Slide 9

## ► Big Picture

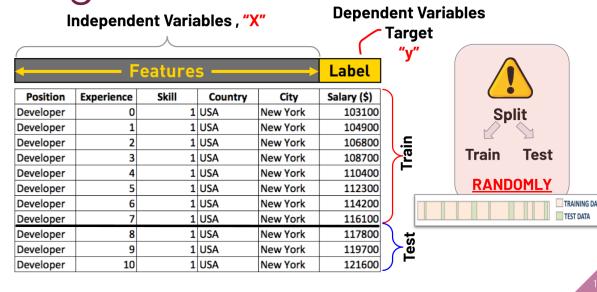


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Slide 10

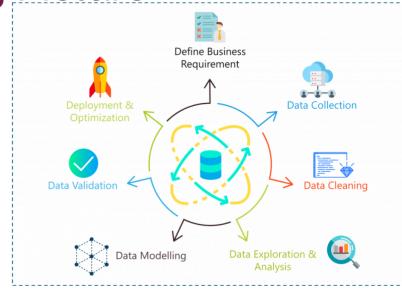
## ► Big Picture



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## Slide 11

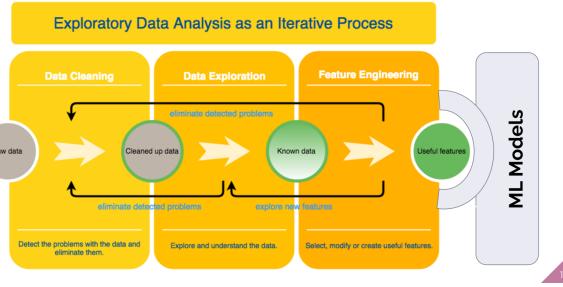
## ► Big Picture



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## Slide 12

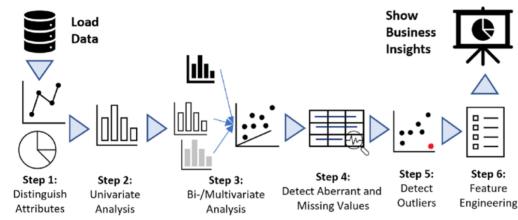
## ► Big Picture



Use this space to take notes:

## Slide 13

## ► Big Picture



Use this space to take notes:

## Slide 14

## ► Big Picture



**df\_head[1:-1]**

url	https://www.autoscout24.com/cars/audi-a1- audi-a1	https://www.autoscout24.com/offers/audi-a1- audi-a1
make_model	Sportback 1.4 TFSI S tronic Neuwagen	1.4 TFSI S tronic
body_type	System	System
price	19772	14950
km	95.0 km	95.000 km
reg_date	01/2014	02/2011
prev_owners	2 previous owners	1 owner
vin	WVA	N/A
hp	104 kW	114 kW
tax	1 Used, Direct (Particular) Tax	1 Used, General Tax
Previous Owners	N/A	N/A
Next inspection	(08/2021), valid g CDS/ÖV (on demand)	N/A
Impaired vehicle	N/A, n. in. (on demand)	N/A
Warranty	N/A	N/A
For Service	2016	N/A
Non-working vehicles	N/A	N/A
fuel	2	1
Make	volkswagen	volkswagen
Model	[n_A1, n_A1]	[n_A1, n_A1]
OfferID	[1450000000000000000]	[1450000000000000000]
Prev Registration	[n_2016, n]	[n_2017, n]
Body Color	[n_Blk, n]	[n_Med, n]

**df\_head[1:-1].T**

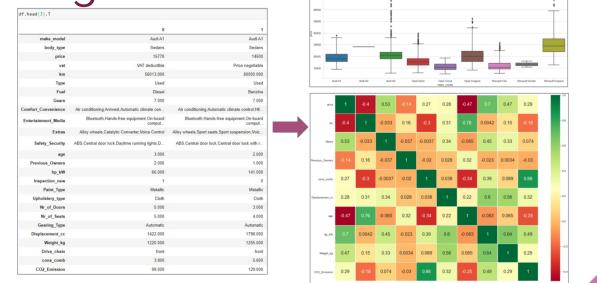
body_model	Audi A1	Audi A1
body_type	System	System
value	14772	14950
vald	1000000	Price negotiate
km	56013.000	56013.000
tax	1	Used
prev	2	Diesel
ownr	1	General
Country_Country	de	de
Entertainment_Media	Bluetooth hands-free expander On Board	Bluetooth hands-free expander On Board
Safety_Security	Alloy wheels Catalyst Converter Voice Control	Alloy wheels Sport seats Sport suspension Xtra
Feature	ABS Central door lock Daytime running light D.	ABS Central door lock Central door lock with e.
Previous_Owners	2	0
km_WP	14772	14950
Impaired_Vehicle	1	1
Paint_Type	Medio	Medio
Upkeep_Car	Club	Club
Wt_d_fuel	0.000	0.000
Wt_d_fuel	0.000	0.000
Gearbox_Type	Automatic	Automatic
Displacement_ml	1422.000	1798.000
Weight_kg	1226.000	1254.000
Drive	Front	Front
cost_cook	3.000	5.000
CZK_Annualize	30.000	120.000

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Use this space to take notes:

## Slide 15

### ► Big Picture



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Use this space to take notes:

## Slide 16

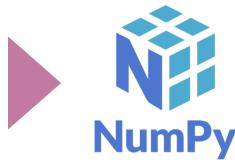
## ► Big Picture

Field	Header	Value	Header	Value
make, model	make	Audi A1	make	Audi A1
body_type	body_type	Hatchback	body_type	Hatchback
length	length	4717.0	length	4603.0
width	width	1840.0	width	1789.0
height	height	1440.0	height	1403.0
vat	VAT (excl. delivery)	Price regulation	VAT (excl. delivery)	Price regulation
km	km	0.0	km	0.0
type	Type	Used	Type	Used
fuel	Fuel	Diesel	Fuel	Diesel
CO2	CO2	99 g/km	CO2	99 g/km
CO2_Emissions	CO2 Emissions	99 g/km	CO2_Emissions	99 g/km
Contract_Condition	Condition	As conditioning	Contract_Condition	As conditioning
Entertainment_Music	Music	Bluetooth hands-free to support iPhone	Entertainment_Music	Bluetooth hands-free to support iPhone
Entertainment_Satellite	Satellite	Yes	Entertainment_Satellite	Yes
Exterior	Exterior	All black, Candy-Crystal Ceramic Black	Exterior	All black, Candy-Crystal Ceramic Black
Interior	Interior	Black leather	Interior	Black leather
Safety_Security	Safety	ABS, Central disc lock, Dual-stage airbag D.	Safety_Security	ABS, Central disc lock, Dual-stage airbag D.
Performance_Horsepower	Horsepower	100 PS	Performance_Horsepower	100 PS
Performance_KW	KW	74.0	Performance_KW	74.0
Performance_Motor	Motor	95 kW	Performance_Motor	95 kW
Performance_Performance	Performance	100.0	Performance_Performance	100.0
Performance_Torque	Torque	250 Nm	Performance_Torque	250 Nm
Transmission_Gearbox	Gearbox	7 speed S tronic	Transmission_Gearbox	7 speed S tronic
Transmission_Material	Material	Automatic	Transmission_Material	Automatic
Upholstery_Type	Type	Media	Upholstery_Type	Media
Upholstery_Club	Club	Club	Upholstery_Club	Club
Upholstery_Sport	Sport	Sport	Upholstery_Sport	Sport
Upholstery_Soft	Soft	Soft	Upholstery_Soft	Soft
Upholstery_Super	Super	Super	Upholstery_Super	Super
Upholstery_Superior	Superior	Superior	Upholstery_Superior	Superior
Geating_Wheel	Wheel	Automatic	Geating_Wheel	Automatic
Geating_Differential	Differential	Quattro	Geating_Differential	Quattro
Dimensions_Height	Height	1440.0	Dimensions_Height	1403.0
Dimensions_Width	Width	1840.0	Dimensions_Width	1789.0
Dimensions_Length	Length	4717.0	Dimensions_Length	4603.0
Weight_Ag	Weight Ag	1200.0	Weight_Ag	1200.0
Drive_chassis	Drive chassis	Front	Drive_chassis	Front
Drive_engines	Engines	1.4 TFSI	Drive_engines	1.4 TFSI
CO2_Emissions	CO2 Emissions	99 g/km	CO2_Emissions	99 g/km

Use this space to take notes:

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Slide 17



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Slide 18

## ▶ 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
  - Concatenation/Splitting/Sorting of the Arrays



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### Slide 19

### 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 remove this bar

You Chose

- **True**

Other Choices

- False

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### Slide 20

## ▶ 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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## Slide 21

## ▶ 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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## Slide 22

## ▶ 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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## Slide 23

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

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## Slide 24

## ▶ Introduction

### Installation



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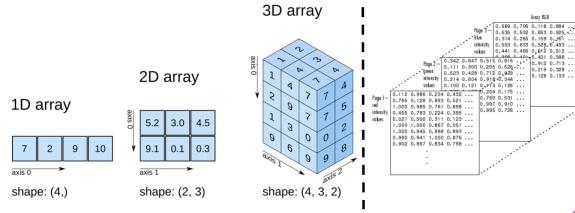
Use this space to take notes:

## Slide 25

## ▶ Numpy Arrays

### What is Array?

- ▶ 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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## Slide 26

## ▶ Numpy Arrays

### Advantages of Arrays by Lists

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



*let's see its  
implementation  
in notebook*

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### Slide 27

### Your Response

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



Students, write your response!

### Answer 1:

`np.arange np.random.randint`

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### Slide 28

## ▶ Numpy Arrays



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

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Slide 29

Your Response

Write down 4 of the array attributes in NumPy.

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Students, write your response!

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Click & Answer this slide

**Answer 1:**  
`np.sqrt`

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Slide 30

## ▶ Numpy Arrays



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

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Slide 31

## ▶ Data Analysis with Python



let's start the  
hands-on phase

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Slide 32

Your Response

Did you find this lesson interesting and challenging?

 Too hard

 Just right

 Too easy

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 Students, drag the icon! 

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Peer Deck Interactive Slide  
Do not remove this bar

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## Slide 33

# THANKS!

**Any questions?**

You can find us at:

steve\_w@clarusway.com  
michael\_g@clarusway.com



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