ENERGY GeoHackathon
Society of Petroleum Engineers

SPE International
SPE Europe Region

2022 SPE EUROPE ENERGY GEOHACKATHON

#. Introduction to Python – Part 1

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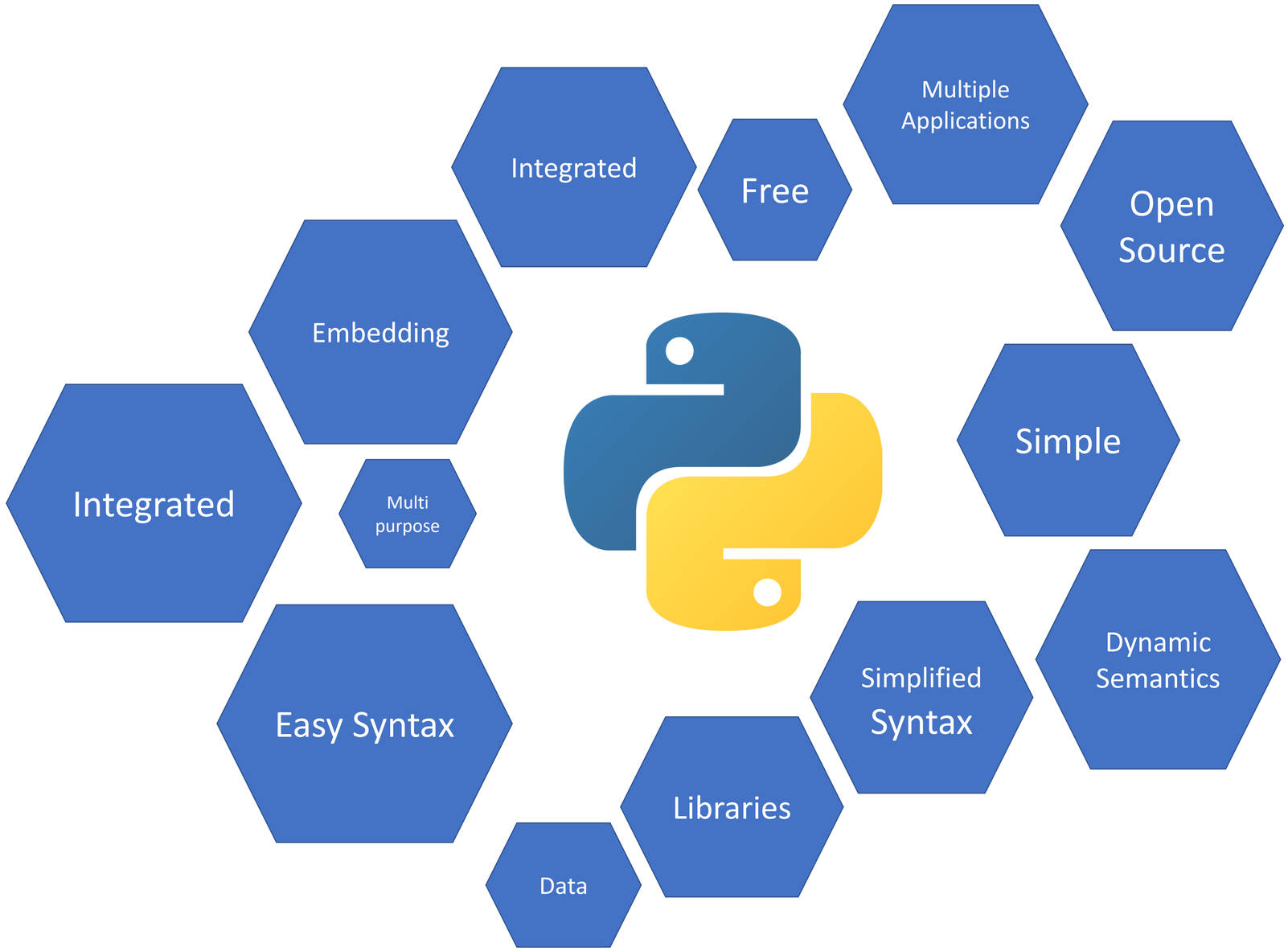
#DatafyingEnergy

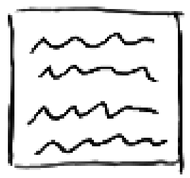
What is Python

What is Python ?



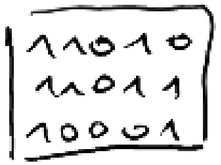
Interpreted vs Complied Programming Languages

Source code:
hello.c



COMPILER →

Machine code:

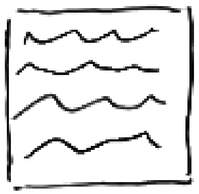


Program (also called binary, executable …)

run the program →

result

Source code:
hello.py



→ INTERPRETER → result

Python Journey (Data Science)

Basics

- Functions
- IDE knowledge
- Statements
- Basic Elements

Intermediate

- Decision Making
- Data Handling
- Object oriented programming
- Libraries

Advanced

- Recursive Functions
- Database integration
- Decorators and memorization
- Algorithms and statistics testing

Industry Specific

- Working on real time data
- Using Industry specific calculations
- Solving and handling complex problems related to the industrial subject

AI / ML, NLP,GUI, Development

- Developing and testing AI / ML codes
- Data management
- Image Analysis
- Developing Algorithms for NLP
- Deep learning
- Big data, Tensorflow

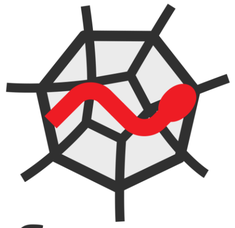
Cython, Integrate Multiple Programming Languages

- Integration with other Languages
- Blockchain development
- Software development
- Developing Automated Applications

Python Journey

- Python can be programmed on different IDEs and Operating Systems
- Python Shell and Idle are basic Python IDEs for basic use.
- For Data Science and Analytics most commonly used IDE is Jupyter Notebook.
- Google Colab is also another interesting IDE which can execute arbitrary Python code through browser for learning and analysts purpose.

IDLE



SPYDER

jupyter

colab

ANACONDA®

Python Journey

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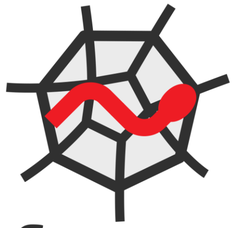
IDLE



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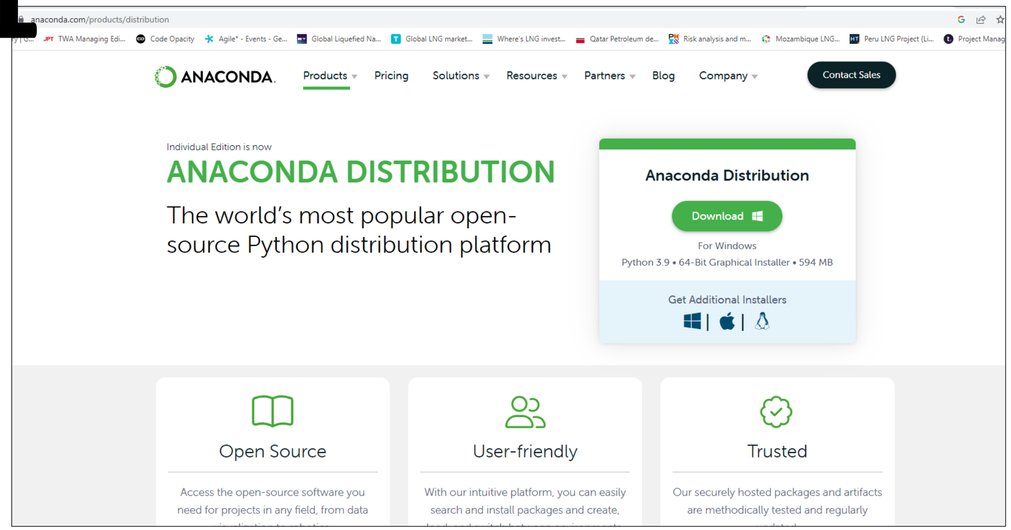
Anaconda Installation

1



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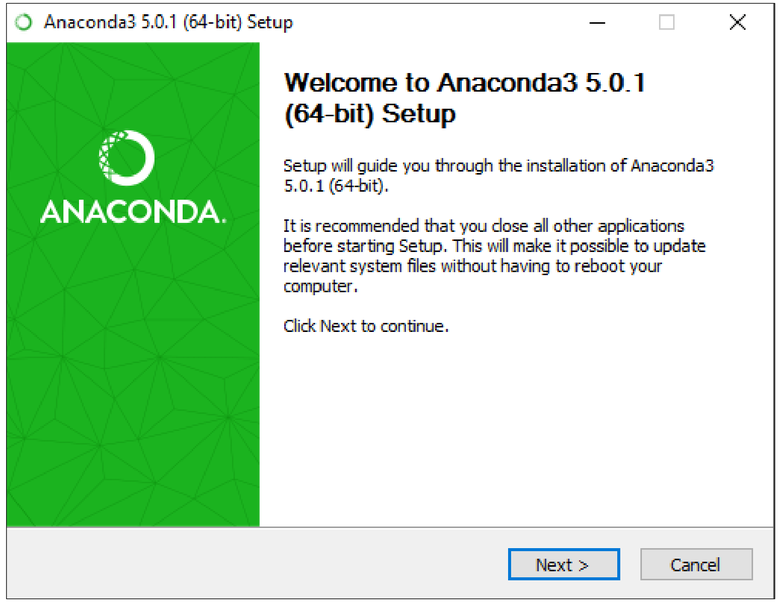

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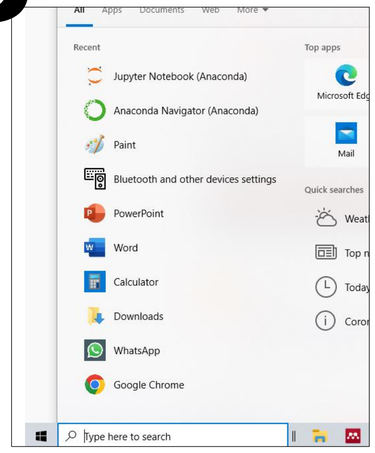

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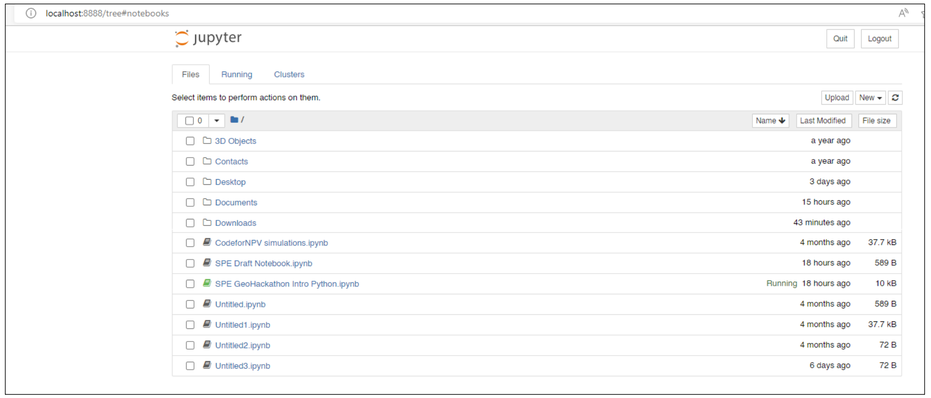
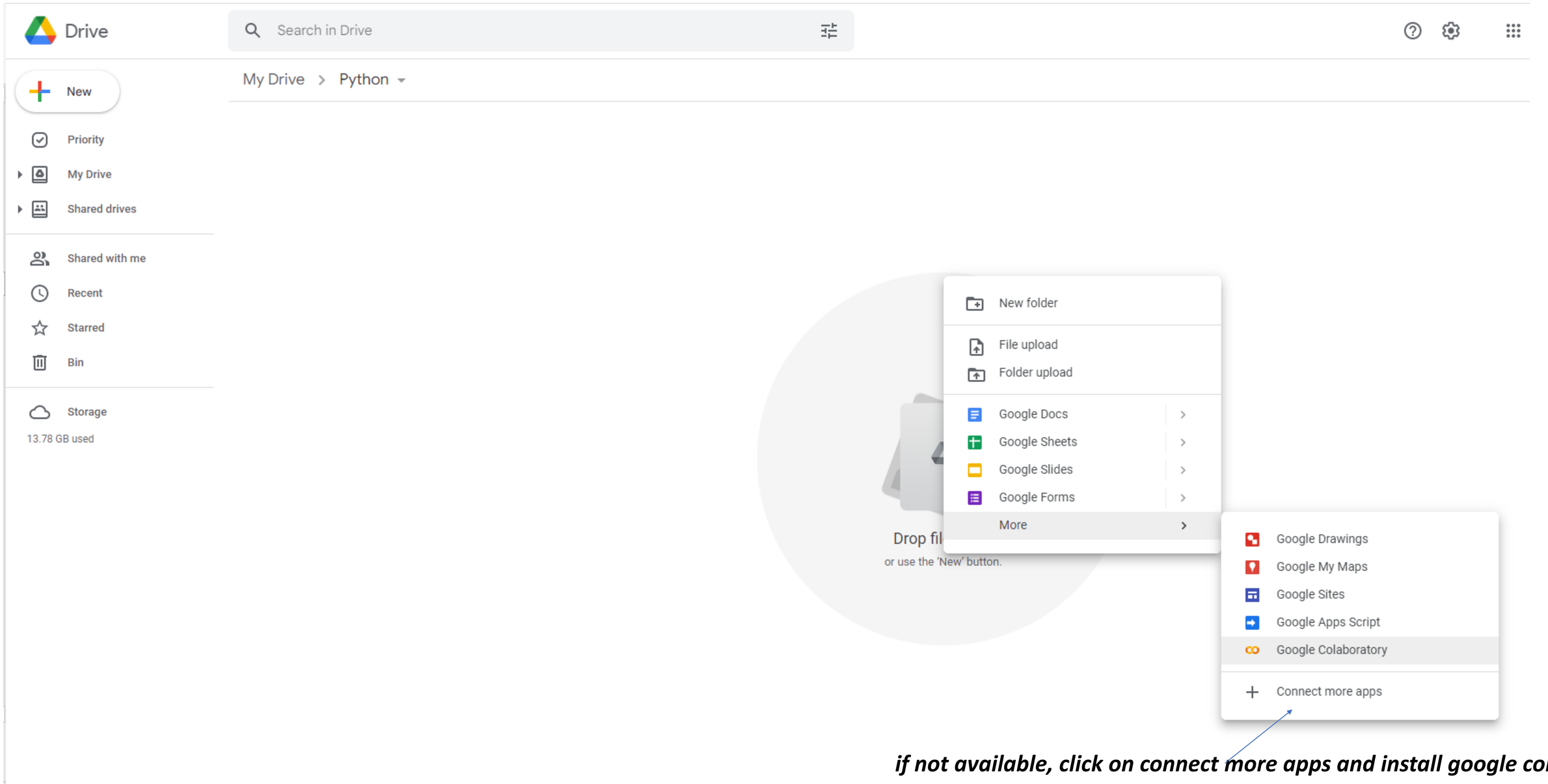


Google Colab



if not available, click on connect more apps and install google colaboratory.

Basics

- Installation
- *Google Colab and Jupyter Notebook*.*
- Interpreted vs Complied Programming Languages
- Strings, Integers & Numbers
- Variables
- Dictionaries
- Logic Statements
- Lists
- Tuples
- Loops
- Functions
- Libraries
- Importing Libraries
- Graphs and plots
- Basic Python Example (calculator)

Strings & Integers

String is **a collection of alphabets, words or other characters**. It is one of the primitive data structures and are the building blocks for data manipulation. Python has a built-in string class named str . Python strings are "immutable" which means they cannot be changed after they are created

```
"hello string"
```

```
'hello string'
```

Integers are zero, positive or negative whole numbers without a fractional part and having unlimited precision, e.g. **0, 100, -10**. The followings are valid integer literals in Python. Integers can be binary, octal, and hexadecimal values. All integer literals or variables are objects of the int class.

Variables

A Python variable is **a symbolic name that is a reference or pointer to an object**. Once an object is assigned to a variable, you can refer to the object by that name. But the data itself is still contained within the object.

```
[ ]  GeoHackathon = "Datafying Energy"
     print(GeoHackathon)
```

```
Datafying Energy
```

```
ProdRate = 50
OilPrice = 60
print(ProdRate * OilPrice)
```

```
3000
```

Dictionaries

Dictionary. Dictionaries are used to store data values in key:value pairs. A dictionary is **a collection which is ordered*, changeable and do not allow duplicates**. As of Python version 3.7, dictionaries are ordered. In Python 3.6 and earlier, dictionaries are unordered.

Dictionaries

```
[ ]  {"Company: Energy Ltd", "Role: Service", "Operation Period: 5 Years"}
```

```
{'Company: Energy Ltd', 'Operation Period: 5 Years', 'Role: Service'}
```

```
[ ]  {"Company": "Energy Ltd", "Role": "Service", "Operation Period": "5 Years"}["Company"]
```

```
'Energy Ltd'
```

Logic Statements

- **Booleans and Comparison Operators**
- **If/ Else Statements**
- **Elif / Logic Operators**
- **Except statements**

Lists

List. Lists are **used to store multiple items in a single variable**. Lists are one of 4 built-in data types in Python used to store collections of data, the other 3 are Tuple, Set, and Dictionary, all with different qualities and usage.

lists (array)

```
[ ]  ["SPE", "Energy", "Geothermal"][2]
```

```
'Geothermal'
```

```
[ ]  print("I like " + ["SPE", "Energy", "Geothermal"][2] )
```

```
I like Geothermal
```

Tuples

Tuples are **used to store multiple items in a single variable**. Tuple is one of 4 built-in data types in Python used to store collections of data, the other 3 are List, Set, and Dictionary, all with different qualities and usage. A tuple is a collection which is ordered and unchangeable.

tuples

```
[1]  a = (1,2,3,4,5)
     print(a)
```

```
(1, 2, 3, 4, 5)
```

0s

```
a[2]
```

```
3
```

0s

Loops

Loops are a control flow statement for specifying iteration, which allows code to be executed repeatedly.

While loop
A statement while a given condition is true.

For loop
Executes a sequence of statements multiple times and abbreviates the code that manages the loop variable.

Nested loops
You can use one or more loop inside any another while for do while loop

Functions

Function is a block of organized, reusable code that is used to perform a task such as calculations.

In python you have two functions:

- Built-in function

  Functions that are already defined in Python and we can call them directly.

- User defined functions

  These functions are those that are created by the user in out program and then call them whatever we want

  To create our own function we use “*def*” as the keyword. And then execute our function.

```
#user defined function
def spegeohackacthon(a,b):
  print(a+b)

spegeohackacthon(23,44)
```

```
67
```

Libraries

Library is a collection of different relatable modules which contains different codes that can be used repeatedly in different program. Libraries make python programming easy and simple for the programmer instead of making too much of noise on the code.

Around 137,000 libraries are in python for different applications and fields in programming.

Importing Libraries

After installing Anaconda various libraries and packages shall be available.

To import libraries ***Import*** module is added to the code.

Import in python is similar to #include header_file in C/C++. Python modules can get access to code from another module by importing the file/function using import. The import statement is the most common way of invoking the import machinery, but it is not the only way.

```
import math
pie = math.pi
print("The value of pi is :", pie)
```

```
The value of pi is : 3.141592653589793
```

Building A Calculator

Based on all the elements learnt, a simple code which can help in calculating numbers and figures can be made.

In this example a basic calculator is made using basic python elements.

Scientific calculator or user based calculator can also be made using different libraries and user-defined function.

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Society of Petroleum Engineers

Italian Section | London Section | Netherlands Section | Romanian Section | Copenhagen Section | Geothermal Technical Section

Q&A

Geological Survey of Denmark and Greenland | accenture | CGG | MathWorks | Microsoft | NVIDIA | Oilfield International | SAMSUNG | TNO innovation for life | TRE ALTAMIRA

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