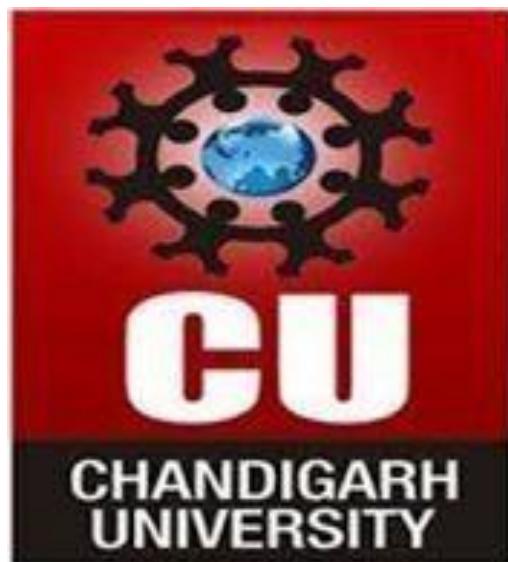

SUMMER TRAINING

ON MACHINE LEARNING



PROJECT TITLE:

ROCK, PAPER, SCISSORS

(PYTHON BASED)

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CLASS-CSE19/A

DATE-10/12/20

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ACKNOWLEDGEMENT

"I would like to express my special thanks of gratitude to my teacher who gave me the golden opportunity to do this wonderful project on the topic ROCK, PAPER SCISSORS, which also helped me in doing a lot of Research and I came to know about so many new things I am really thankful to them.

Secondly I would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame".

INTRODUCTION OF PROJECT

In this project you will make a Rock, Paper, Scissors game and play against the computer (using python).

Rules: You and the computer both choose rock, paper or scissors. The winner is decided by these rules:

- Rock blunts scissors
- Paper covers rock
- Scissors cut paper

Player's Turn

First, let the player choose Rock, Paper or Scissors.

- The project already contains the code to import a function that you are going to use in this project.

```
main.py
#!/bin/python3

from random import randint
```

- You'll use `randint` later to generate random numbers.
- First, let the player choose Rock, Paper or Scissors by typing the letter 'r', 'p' or 's'.

```
from random import randint
player = input('rock (r), paper (p) or scissors (s)? ')
```

- Now print out what the player chose:

```
player = input('rock (r), paper (p) or scissors (s)? ')
print(player, 'vs')
```

- Test your code by clicking **Run**. Click in the trinket output window and enter your choice.

Computer's Turn

Now it's the computer's turn. You can use the function to generate a random number to decide between rock, paper and scissors.

- Use to generate a random number to decide whether the computer has chosen rock, paper or scissors.

```
player = input('rock (r), paper (p) or scissors (s)?')  
print(player, 'vs')  
  
chosen = randint(1,3)  
print(chosen)
```

rock (r), paper (p) or
scissors (s)? s
s vs
3

- Run your script lots of times (you'll need to enter 'r', 'p' or 's' each time.)

You should see that 'chosen' is randomly set to either 1, 2 or 3.

- Let's say:

- 1 = rock (r)
- 2 = paper (p)
- 3 = scissors (s)

Use == to check if the chosen number is 1 (== is used to see if 2 things are the same).

```
chosen = randint(1,3)  
print(chosen)  
  
if chosen == 1:  
    # code here
```

Don't forget the colon ':'

- Python uses indentation (moving the code to the right) to show which code is inside the if . You can either use two spaces (tap the spacebar twice) or tap the tab key (usually above CAPSLOCK on the keyboard.)

Set computer to 'r' inside the using indentation:

```
if chosen == 1:  
    computer = 'r'
```

Two spaces or a 'tab'

- You can add an alternative check using elif (short for else if):

```
if chosen == 1:  
    computer = 'r'  
  
elif chosen == 2:  
    computer = 'p'
```

indent with two spaces or tab

- This condition will only be checked if the first condition fails (if the computer didn't choose).
- And finally, if the computer didn't choose or then it must have chosen . This time we can just use which means otherwise.

```
if chosen == 1:  
    computer = 'r'  
  
elif chosen == 2:  
    computer = 'p'  
  
else:  
    computer = 's'
```

- Now, instead of printing out the random number that the computer chose you can print the letter.

```
chosen = randint(1,3)  
#print(chosen) ← Comment out this line  
if chosen == 1:  
    computer = 'r'  
  
elif chosen == 2:  
    computer = 'p'  
  
else:  
    computer = 's'  
  
print(computer)
```

rock (r), paper (p) or
scissors (s)? r
r vs
s

You can either delete the line or make the computer ignore it by adding a at the start of the line.

- Test your code by clicking Run and choosing your option.
- Hmm, the computer's choice gets printed on a new line. You can fix that by adding after, that tells Python to end with a space instead of a new line.

```
print(player, 'vs', end=' ')  
chosen = randint(1,3)  
#print(chosen)
```

rock (r), paper (p) or
scissors (s)? p
p vs r

- Play the game a few times by clicking Run and making a choice.

Check the Result

Now let's add the code to see who won.

- You need to compare the player and computer variables to see who won.

If they're the same then it's a draw:

```
print(computer)                                rock (r), paper (p) or scissors (s)? s
if player == computer:                         s vs s
    print('DRAW!')                            DRAW!
```

- Test your code by playing the game a few times until you get a draw.

You'll need to click **Run** to start a new game.

- Now let's look at the cases where the player chose 'r' (rock) but the computer didn't.

If the computer chose(scissors) then the player wins (rock beats scissors).

If the computer chose 'p' (paper) then the computer wins (paper beats rock).

We can check the player choice *and* the computer choice using **and**.

```
if player == computer:
    print('DRAW!')

elif player == 'r' and computer == 's':
    print('Player wins!')

elif player == 'r' and computer == 'p':
    print('Computer wins!')
```

- Next let's look at the cases where the player chose 'p' (paper) but the computer didn't:

```
elif player == 'r' and computer == 's':
    print('Player wins!')

elif player == 'r' and computer == 'p':
    print('Computer wins!')

elif player == 'p' and computer == 'r':
    print('Player wins!')

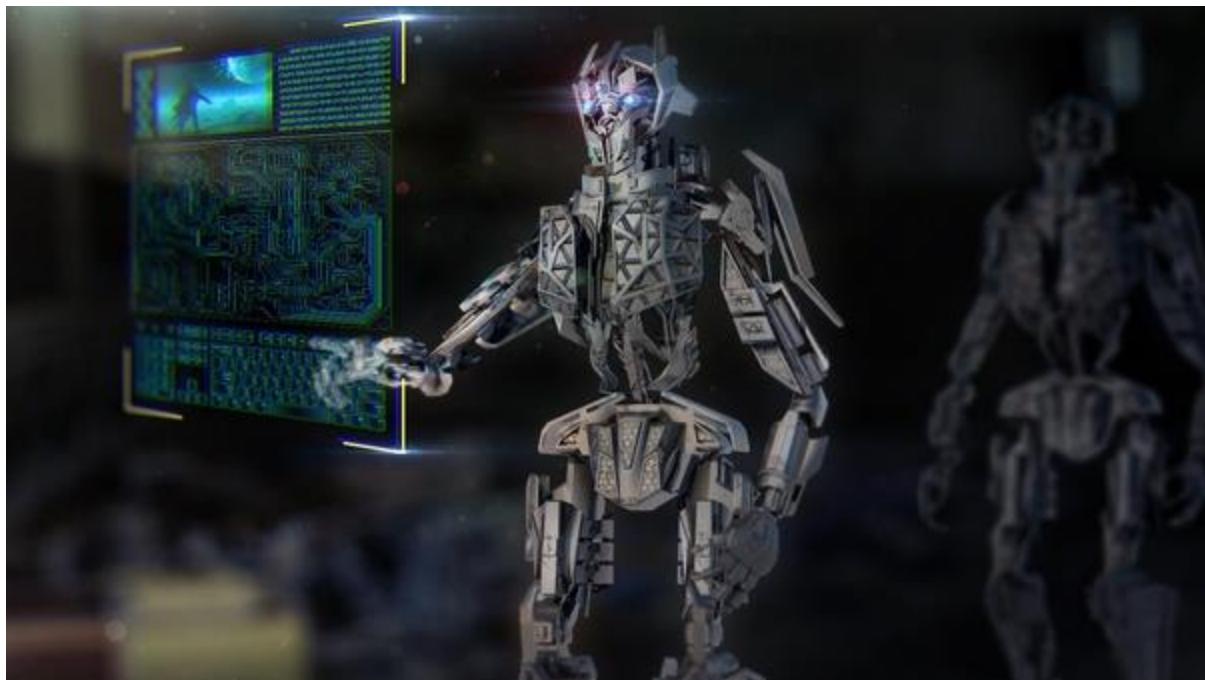
elif player == 'p' and computer == 's':
    print('Computer wins!')
```

- And finally, can you add the code to check for the winner when the player chose 's' (scissors) and the computer chose rock or paper?
- Now play the game to test your code.

```
rock (r), paper (p) or scissors (s)? s
s vs p
Player wins!
```

Click **Run** to start a new game.

MACHINE LEARNING



Machine Learning

Machine Learning is a sub-area of artificial intelligence, whereby the term refers to the ability of IT systems to independently find solutions to problems by recognizing patterns in databases. In other words: Machine Learning enables IT systems to recognize patterns on the basis of existing algorithms and data sets and to develop adequate solution concepts. Therefore, in Machine Learning, artificial knowledge is generated on the basis of experience. The system can perform the following tasks by Machine Learning:

- Finding, extracting and summarizing relevant data
- Making predictions based on the analysis data
- Calculating probabilities for specific results
- Adapting to certain developments autonomously
- Optimizing processes based on recognized patterns.

Artificial intelligence

Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that act and respond like humans. Computers with artificial intelligence are designed for:

- Remembering words
- Learning with the teacher

-
- Plan for something different
 - Problems with ease

Artificial intelligence is a branch of computer science that aims to create intelligent machines. It has become an important part of the technology industry.

Knowledge engineering is a major part of AI research. Machines often act like humans and react only when there is plenty of information about the world. To implement knowledge engineering, Artificial Intelligence requires the interrelation of objects, categories, characteristics, and shares. Launching common sense, reasoning, and problem-solving power in machines is a difficult and laborious task.

Machine learning is also a core part of AI. Learning without any supervision requires the ability to detect patterns in the flows of inputs, but with adequate supervision, learning involves classification and numerical regression. Classification determines the category that an object belongs to and regression functions to obtain a set of numerical input or output examples, thereby finding functions that enable the production of appropriate outputs from related inputs. The mathematical analysis of machine learning algorithms and their performance is a well-defined branch of theoretical computer science, often called computational learning theory.

Machine learning algorithms are categorized into two classes –

supervised and unsupervised.

Supervised machine learning algorithms

In supervised machine learning, you train the system with a dataset of labeled examples, which the system can draw upon to make inferences or predictions. These labeled examples are already tagged with their correct answers to help the system make the right correlations. After sufficient training with a training dataset, the system is able to provide accurate predictions about an output.

For instance, if a system or machine must help you predict how long it will take you to drive from home to your workplace, it must be trained with data that contain the time it took you to drive to work from home in different weather conditions, along different routes, at different times of the day, and at different days of the week.

With this training data, the machine can infer what routes take longer to get to work, which weather conditions prolong your drive to work, and at what time of the day driving to work will be faster.

This dataset forms a sequence of “thoughts” with which the machine can tell you how long it will take you to drive to work on any given day.

Unsupervised machine learning algorithms

Unsupervised machine learning algorithms train a system using data that is neither classified nor labeled. So in this form of machine learning training, the system is not given correct

answers and, thus, not required to yield an accurate output value. Instead, it is trained to draw inferences that describe hidden information from unlabeled data.

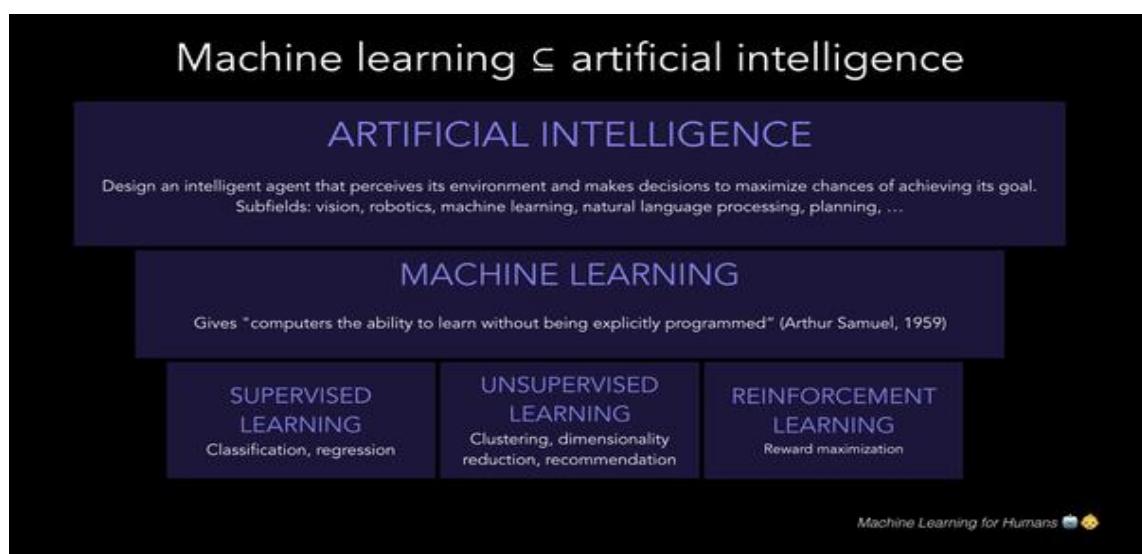
Unsupervised machine learning algorithms are largely used in image recognition applications. For example, you can build a machine model that can identify people who are laughing in a video without actively training it to identify them. The machine infers from similar patterns of people laughing and associates these patterns with text, sound, and speech in the video.

While the model is not told that such inferences are right or wrong, in contrast to supervised learning, the machine builds confidence in and consolidates these inferences upon subsequent exposures to such patterns

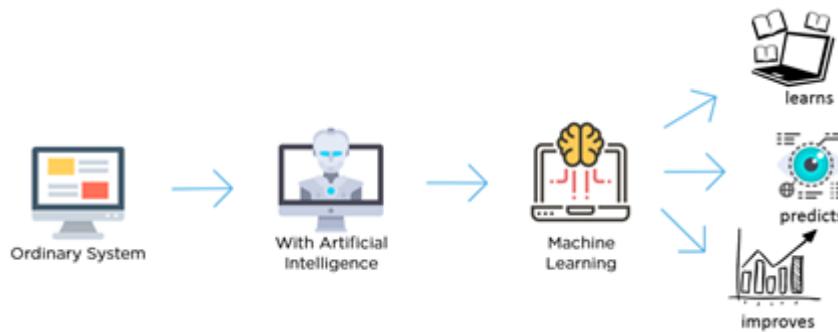
This form of machine learning mirrors human unsupervised learning behavior such as visual recognition. For instance, a child sees his father's car and identifies it as a car. After a few days, he sees a neighbor's car and quickly infers that it is a car, without being told, by observing similar patterns - the shape, features, and sound.

Future of machine learning

Scope of Machine Learning (ML) is vast, and in the near future, it will deepen its reach into various fields like medical, finance, social media, facial and voice recognition, online fraud detection, and biometrics. Gartner predicts that 30% of Government and large enterprise contracts will require AI-fueled solutions by 2025. Cyber security is another area where we will see huge adoption of ML, which aids multi-layer protection. ML shall also fuel areas that are highly dependent on data. For example, in marketing, machine learning can analyse data and evaluate it for better results. Similarly, in the education field, institutes and colleges can use predictive analytics to recognise patterns in students and assess their abilities.



How machine learning works



The image above roughly explains how machine learning works.

Let's say we have a dataset that contains pictures of different kinds of fruits and we want machine learning to segregate the photos based on the kind of fruits.

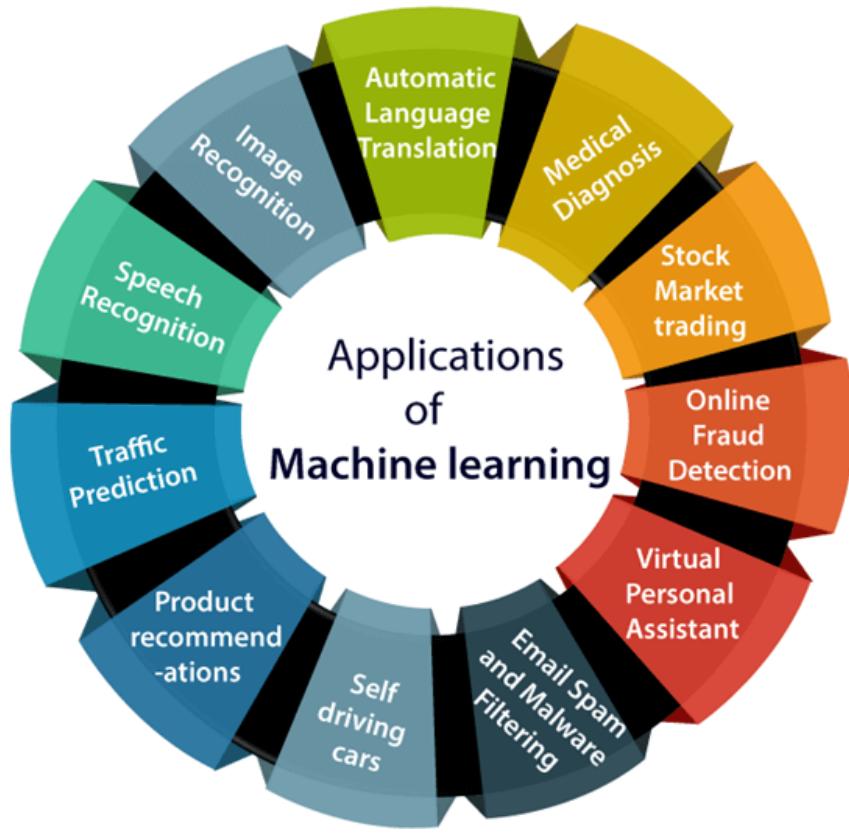
Here is how **Machine Learning** will do our work for us in this case:



1. First we provide the dataset to the system i.e we provide the input data.
2. The system goes through the entire dataset or analyses it to find patterns based on size, shapes, colors, etc.
3. Now that it has figured out the patterns, the system takes decisions and starts separating the photos based on the patterns.
4. Once the work is done, the system learns from the feedback it gets. If it gets any of the fruit type wrong, it will make sure it does not happen in the future.

So, that's essentially **how Machine Learning works**, it analyzes the input data, looks for patterns in it and then takes decision based on the patterns and finally learns from the feedback it gets.

APPLICATIONS OF MACHINE LEARNING



Machine learning is a very popular example of AI. Following are some of the examples of machine learning which we use everyday.

1) Virtual Personal Assistants

Siri, Alexa, Google Now are some of the popular examples of virtual personal assistants. As the name suggests, they assist in finding information, when asked over voice. All you need to do is activate them and ask a question or instruct them to do a certain task. To answer you, these assistants look for previously stored data and related questions.

Machine learning is an important part of these personal assistants as they collect and refine the information on the basis of your previous involvement with them. Later, this data is used to find answers for your queries or to perform other tasks.

2) Email Spam and Malware Filtering

Over 325, 000 malwares are detected everyday and each piece of code is 90–98% similar to its previous versions. The system security programs that are powered by machine learning understand the coding pattern. Therefore, they detect new malware with 2–10% variation easily and offer protection against them.

3) Online Customer Support

A number of websites nowadays offer the option to chat with customer support representative while they are navigating within the site. However, not every website has a live executive to answer your queries. In most of the cases, you talk to a chatbot. These bots tend to extract information from the website and present it to the customers. Meanwhile, the chatbots advances with time. They tend to understand the user queries better and serve them with better answers, which is possible due to its machine learning algorithms.

4) Search Engine Result Refining

Google and other search engines use machine learning to improve the search results for you. Every time you execute a search, the algorithms at the backend keep a watch at how you respond to the results. If you open the top results and stay on the web page for long, the search engine assumes that the the results it displayed were in accordance to the query. Similarly, if you reach the second or third page of the search results but do not open any of the results, the search engine estimates that the results served did not match requirement. This way, the algorithms working at the backend improve the search results.

5) Online Fraud Detection

Machine learning is proving its potential to make cyberspace a secure place and tracking monetary frauds online is one of its examples. For example: Paypal is using ML for protection against money laundering. The company uses a set of tools that helps them to compare millions of transactions taking place and distinguish between legitimate or illegitimate transactions taking place between the buyers and sellers.

6) Video Surveillance

The video surveillance system nowadays are powered by AI that makes it possible to detect crime before they happen. They track unusual behavior of people like standing motionless for a long time, stumbling, or napping on benches etc. The system can thus give an alert to human attendants, which can ultimately help to avoid mishaps. And when such activities are reported and counted to be true, they help to improve the surveillance services. This happens with machine learning doing its job at the backend.

7) Social Media Services

From personalizing your news feed to better ads targeting, social media platforms are utilizing machine learning for their own and user benefits.

- *People You May Know:* Machine learning works on a simple concept: understanding with experiences. Facebook continuously notices the friends that you connect with, the profiles that you visit very often, your interests, workplace, or a group that you share with someone etc. On the basis of continuous learning, a list of Facebook users are suggested that you can become friends with.
- *Face Recognition:* You upload a picture of you with a friend and Facebook instantly recognizes that friend. Facebook checks the poses and projections in the picture, notice the unique features, and then match them with the people in your friend list. The entire process at the backend is complicated and takes care of the precision factor but seems to be a simple application of ML at the front end.
- *Similar Pins:* Machine learning is the core element of Computer Vision, which is a technique to extract useful information from images and videos. Pinterest uses

computer vision to identify the objects (or pins) in the images and recommend similar pins accordingly.

8) Email Spam and Malware Filtering

Over 325, 000 malwares are detected everyday and each piece of code is 90–98% similar to its previous versions. The system security programs that are powered by machine learning understand the coding pattern. Therefore, they detects new malware with 2–10% variation easily and offer protection against them.



**"COMPUTERS ARE
ABLE TO SEE, HEAR
AND LEARN. WELCOME
TO THE FUTURE."
-DAVE WATERS**

The quote is presented in large, bold, black capital letters. It is framed by two thick black horizontal lines at the top and bottom. The quote is attributed to "DAVE WATERS" at the bottom right. The background of the quote area is a blurred, blue-toned image of a person's profile.

LIMITATIONS OF MACHINE LEARNING

With all those advantages to its powerfulness and popularity, Machine Learning isn't perfect. The following factors serve to limit it:

1. Data Acquisition

Machine Learning requires massive data sets to train on, and these should be inclusive/unbiased, and of good quality. There can also be times where they must wait for new data to be generated.

2. Time and Resources

ML needs enough time to let the algorithms learn and develop enough to fulfill their purpose with a considerable amount of accuracy and relevancy. It also needs massive resources to function. This can mean additional requirements of computer power for you.

3. Interpretation of Results

Another major challenge is the ability to accurately interpret results generated by the algorithms. You must also carefully choose the algorithms for your purpose.

4. High error-susceptibility

Machine Learning is autonomous but highly susceptible to errors. Suppose you train an algorithm with data sets small enough to not be inclusive. You end up with biased predictions coming from a biased training set. This leads to irrelevant advertisements being displayed to customers. In the case of ML, such blunders can set off a chain of errors that can go undetected for long periods of time. And when they do get noticed, it takes quite some time to recognize the source of the issue, and even longer to correct it.



MACHINE LEARNING IN PYTHON

“Machine learning is at the top now and a lot of students want to learn machine learning as they don't want to lose this continuously changing technology race, In addition, experts and professionals also need to stay updated with latest changes in machine learning to win the race”.



PYTHON- Python is an **object-oriented programming language** that provides rapid application development. It was released in 1991 by Guido van Rossum. It has huge demand in the Rapid Application Development field due to its dynamic binding and dynamic typing options.

Python needs a unique syntax that covers readability which makes the language easy and simple to learn. It supports modules and packages that enables code reuse and program modularity.

To master machine learning in python is not an easy task, Its a like diverse space with an ever-changing landscape. But to become master you need to start from ground level.

Let's get started to how you can master machine learning in python

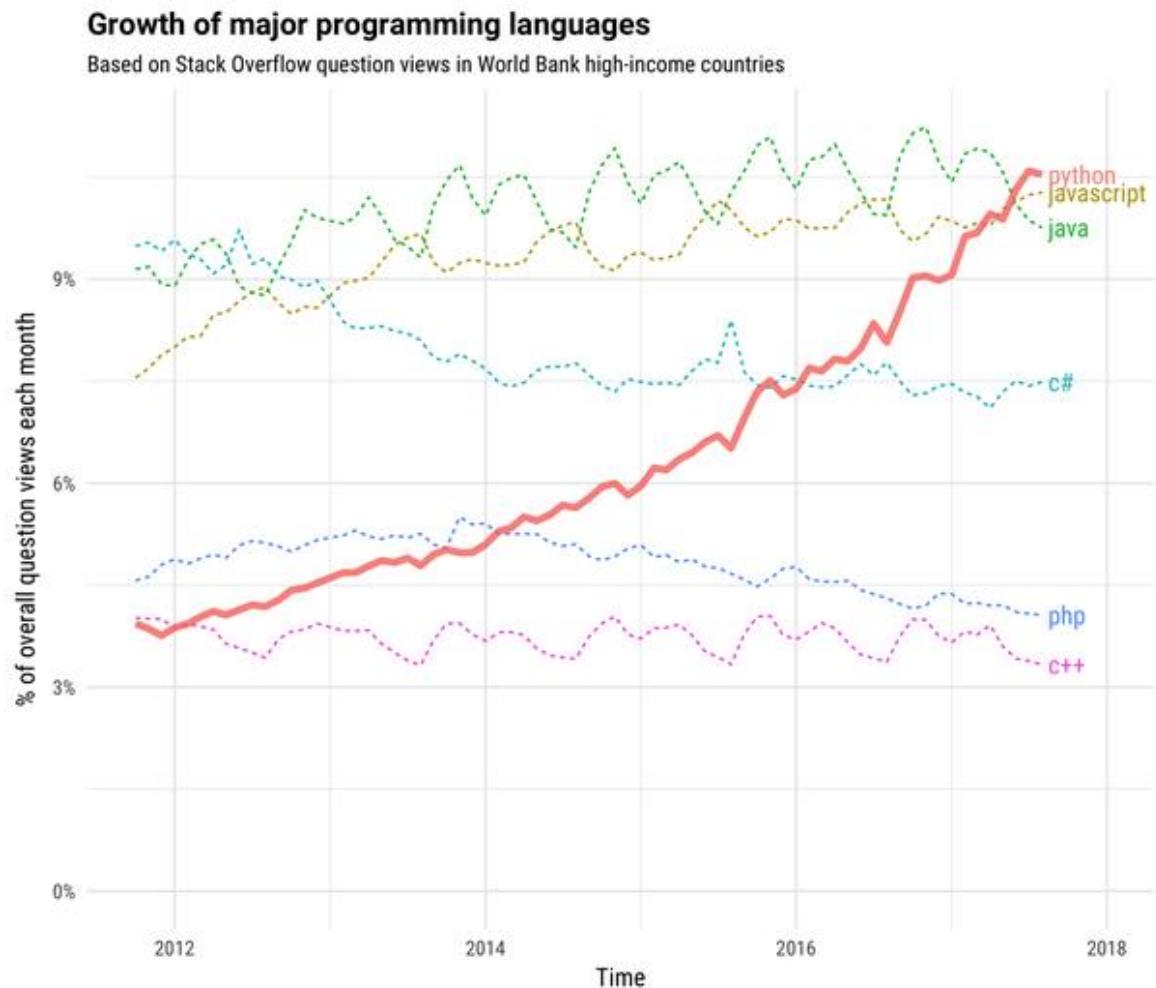
Step 1: Basic Python Skills

Before begins you should have an answer for why should I Learn python and how would be it useful.

Why python?

If you intend to master machine learning in python you need to know basic knowledge of python.

Python is the most popular programming language for machine learning expert.



A statement from stack overflow developer survey 2018

“Python is the most demanding language of this year”

This can be attributed to its rich feature-set that includes such features as:

- It is an object-oriented programming language and a very powerful scripting tool.
- Its syntax is very easy to understand.
- The interactive mode helps in testing short snippets of the code, even while developing the program.
- Python uses user-friendly data structures.
- The extensive standard library is available for Python.

Step 2: Foundation Machine Learning Skills

This is a very important step to get started as most of the activity done by data scientist involves some knowledge of machine learning. It's very important to gain hands-on theoretical as well as practical knowledge to become master, there is a lot of online courses available to one who wants to increase their knowledge in Machine learning.

-
- Andrew Ng's Machine Learning course
 - Tom Mitchell Machine Learning Lectures
 - Artificial Intelligence and Machine Learning E-Degree

Step 3: Scientific Python Packages Overview

So till now, you have basic skills of python and machine learning knowledge, so beyond python, there is a number of open source libraries generally used to facilitate machine learning.

The most popular used python libraries for machine learning projects are

1. numpy— This package is useful for its N-dimensional array objects
2. pandas—This data analysis library includes structures like data frames.
3. matplotlib—This is a 2D plotting library which is generally used for creating publication quality figures.
4. scikit-learn— This library is extensively used for data analysis and data mining tasks, needed for machine learning.

Step 4: Getting Started with Machine Learning in Python

- Python. *Check*.
- Machine learning fundamentals. *Check*.
- Numpy. *Check*.
- Pandas. *Check*.
- Matplotlib. *Check*.

Now its time to implement python in machine learning,

Following are some popular and curated online courses to master machine learning in python

1. Getting Started with Python for Data Science Practical Guide
2. Introduction to Machine Learning—Online Course
3. Machine Learning Crash Course | Google Developers

Specifically, you will learn along with python,

- Using Variables & Strings
- Using Booleans & Logical Operators
- Using Functions & Packages
- Using Lists, Tuples, and Dictionaries
- Using For & While Loops
- Using Panda & Data Frames
- Doing Data Visualization.

CODE AND OUTPUT

CODE:

```
# import random module
import random

# Print multiline instruction
# perform string concatenation of string
print("Winning Rules of the Rock paper scissor game as follows: \n"
      +"Rock vs paper->paper wins \n"
      +"Rock vs scissor->Rock wins \n"
      +"paper vs scissor->scissor wins \n")

while True:
    print("Enter choice \n 1. Rock \n 2. paper \n 3. scissor \n")

    # take the input from user
    choice = int(input("User turn: "))

    # OR is the short-circuit operator
    # if any one of the condition is true
    # then it return True value

    # looping until user enter invalid input
    while choice > 3 or choice < 1:
        choice = int(input("enter valid input: "))

    # initialize value of choice_name variable
    # corresponding to the choice value
    if choice == 1:
```

```
choice_name = 'Rock'

elif choice == 2:
    choice_name = 'paper'

else:
    choice_name = 'scissor'

# print user choice
print("user choice is: " + choice_name)
print("\nNow its computer turn.....")

# Computer chooses randomly any number
# among 1 , 2 and 3. Using randint method
# of random module
comp_choice = random.randint(1, 3)

# looping until comp_choice value
# is equal to the choice value
while comp_choice == choice:
    comp_choice = random.randint(1, 3)

# initialize value of comp_choice_name
# variable corresponding to the choice value
if comp_choice == 1:
    comp_choice_name = 'Rock'
elif comp_choice == 2:
    comp_choice_name = 'paper'
else:
    comp_choice_name = 'scissor'

print("Computer choice is: " + comp_choice_name)
```

```
print(choice_name + " V/s " + comp_choice_name)
```

```
# condition for winning
```

```
if((choice == 1 and comp_choice == 2) or  
(choice == 2 and comp_choice ==1 )):
```

```
    print("paper wins => ", end = "")
```

```
    result = "paper"
```

```
elif((choice == 1 and comp_choice == 3) or
```

```
    (choice == 3 and comp_choice == 1)):
```

```
    print("Rock wins =>", end = "")
```

```
    result = "Rock"
```

```
else:
```

```
    print("scissor wins =>", end = "")
```

```
    result = "scissor"
```

```
# Printing either user or computer wins
```

```
if result == choice_name:
```

```
    print("<== User wins ==>")
```

```
else:
```

```
    print("<== Computer wins ==>")
```

```
print("Do you want to play again? (Y/N)")
```

```
ans = input()
```

```
# if user input n or N then condition is True
```

```
if ans == 'n' or ans == 'N':
```

```
    break
```

```
# after coming out of the while loop  
# we print thanks for playing  
print("\nThanks for playing")
```

OUTPUT:

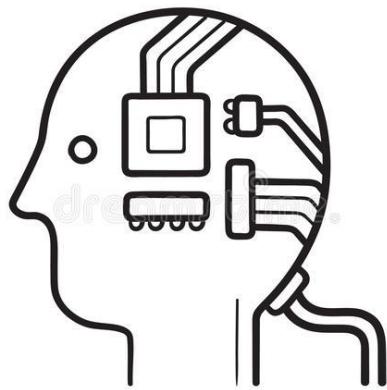
```
Winning Rules of the Rock paper scissor game as follows:  
Rock vs paper->paper wins  
Rock vs scissor->Rock wins  
paper vs scissor->scissor wins  
  
Enter choice  
1. Rock  
2. paper  
3. scissor  
  
User turn: 2  
user choice is: paper  
  
Now its computer turn.....  
Computer choice is: scissor  
paper V/s scissor  
scissor wins =><== Computer wins ==>  
Do you want to play again? (Y/N)  
Y  
Enter choice  
1. Rock  
2. paper  
3. scissor  
  
User turn: 1  
user choice is: Rock  
  
Now its computer turn.....  
Computer choice is: paper  
Rock V/s paper  
paper wins => <== Computer wins ==>  
Do you want to play again? (Y/N)  
Y  
Enter choice  
1. Rock  
2. paper  
  
Enter choice  
1. Rock  
2. paper  
3. scissor  
  
User turn: 3  
user choice is: scissor  
  
Now its computer turn.....  
Computer choice is: paper  
scissor V/s paper  
scissor wins =><== User wins ==>  
Do you want to play again? (Y/N)  
N  
  
Thanks for playing
```

CONCLUSION

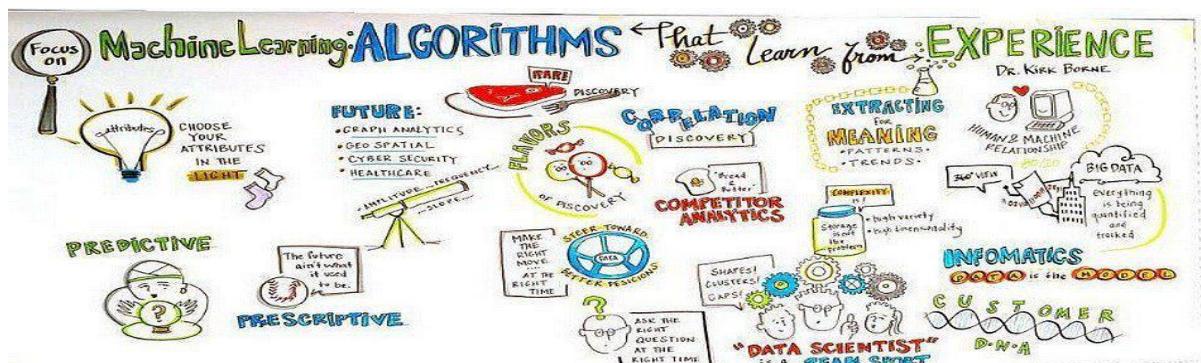
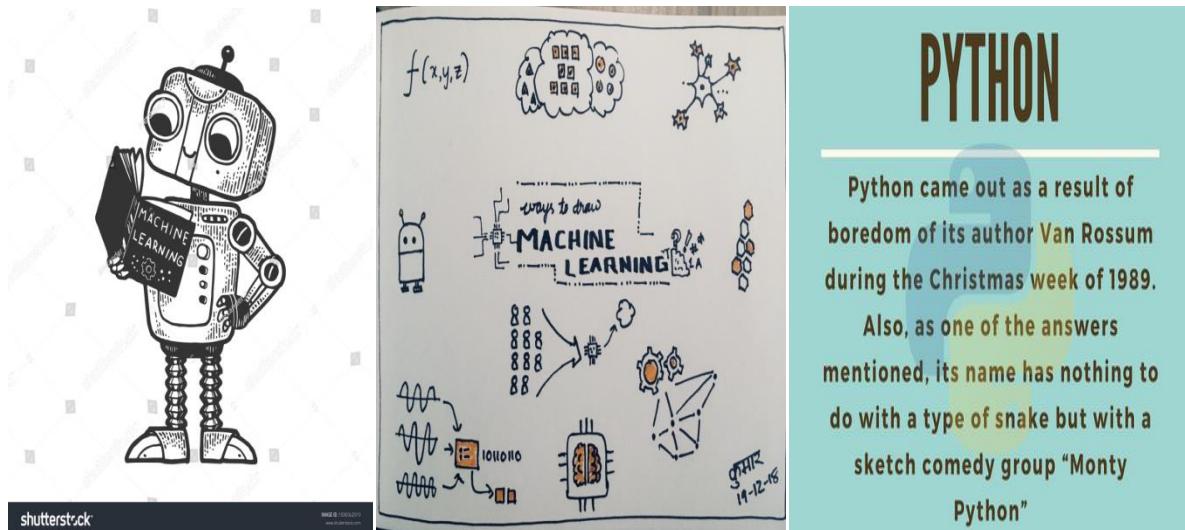
Machine Learning is a technique of training machines to perform the activities a human brain can do, albeit bit faster and better than an average human-being. Today we have seen that the machines can beat human champions in games such as Chess, AlphaGO, which are considered very complex. You have seen that machines can be trained to perform human activities in several areas and can aid humans in living better lives.

Machine Learning can be a Supervised or Unsupervised. If you have lesser amount of data and clearly labeled data for training, opt for Supervised Learning. Unsupervised Learning would generally give better performance and results for large data sets. If you have a huge data set easily available, go for deep learning techniques. You also have learned Reinforcement Learning and Deep Reinforcement Learning. You now know what Neural Networks are, their applications and limitations.

Finally, when it comes to the development of machine learning models of your own, you looked at the choices of various development languages, IDEs and Platforms. Next thing that you need to do is start learning and practicing each machine learning technique. The subject is vast, it means that there is width, but if you consider the depth, each topic can be learned in a few hours. Each topic is independent of each other. You need to take into consideration one topic at a time, learn it, practice it and implement the algorithm/s in it using a language choice of yours. This is the best way to start studying Machine Learning. Practicing one topic at a time, very soon you would acquire the width that is eventually required of a Machine Learning expert.



PICTURES



CERTIFICATION FROM INTERSHALA



Date of certification: 2020-08-01

Certificate no.: DACC1055-6DB6-74EC-C64F-31C1DA8798D8

For certificate authentication, please visit https://trainings.internshala.com/verify_certificate

THANK YOU