**Machine Learning**

**Using**

**Python**

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# Introduction

Today, everyone is feverishly talking about AI, ML and Data Sciences. This document is a very basic introduction to Machine Learning (ML) and Data Science.

Both these are complex and exhaustive. Readers are advised to carefully go through articles, books and various literature to get a grasp of these topics.

# Glossary

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | image classification |  |  |
|  | Unsupervised learning, |  |  |
|  | Reinforcement learning |  |  |
|  | Machine translation |  |  |
|  | Neural Network |  |  |
|  | Tensors |  |  |
|  | Named Tensors |  |  |
|  | Inference |  |  |
|  | Models |  |  |
|  | Trained |  |  |
|  | Untrained |  |  |
|  | Computer Vision |  |  |
|  | NLP |  |  |
|  | CPU |  |  |
|  | GPU |  |  |
|  | Bayesian Optimization |  |  |
|  | Gradient |  |  |
|  | Forward Pass |  |  |
|  | Backward Pass |  |  |
|  | Big Data |  |  |
|  | Analytics |  |  |
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## Artificial Intelligence

AI is simply the broadest way to think about advanced, computer intelligence. The reader is advised to treat ML and Data sciences as specific sub fields of AI.

## Machine Learning

Machine learning is one subfield of AI. The core principle here is that machines take data and "learn" for themselves. It's currently the most promising tool in the AI kit for businesses. ML systems can quickly apply knowledge and training from large data sets to excel at facial recognition, speech recognition, object recognition, translation, and many other tasks. Unlike hand-coding a software program with specific instructions to complete a task, ML allows a system to learn to recognize patterns on its own and make predictions.

## Deep Learning

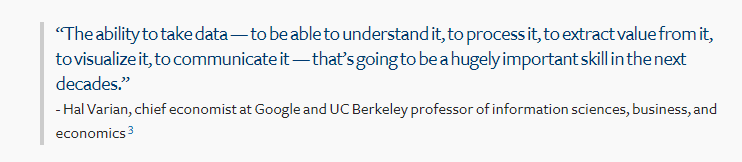
Deep learning is a subset of ML. It uses some ML techniques to solve real-world problems by tapping into neural networks that simulate human decision-making. Deep learning can be expensive, and requires massive datasets to train itself on. That's because there are a huge number of parameters that need to be understood by a learning algorithm, which can initially produce a lot of false-positives. For instance, a deep learning algorithm could be instructed to "learn" what a cat looks like. It would take a very massive data set of images for it to understand the very minor details that distinguish a cat from, say, a cheetah or a panther or a fox.

## Data Science

At its core, data science is a field of study that aims to use a scientific approach to extract meaning and insights from data. Dr. Thomas Miller of Northwestern University describes data science as “a combination of information technology, modeling, and business management”.

Note the focus on data. This brings Big Data into the picture. Big Data, which can mean many things, is not really covered in this introductory document.

Machine learning, on the other hand, refers to a group of techniques that allow computers to learn from data.



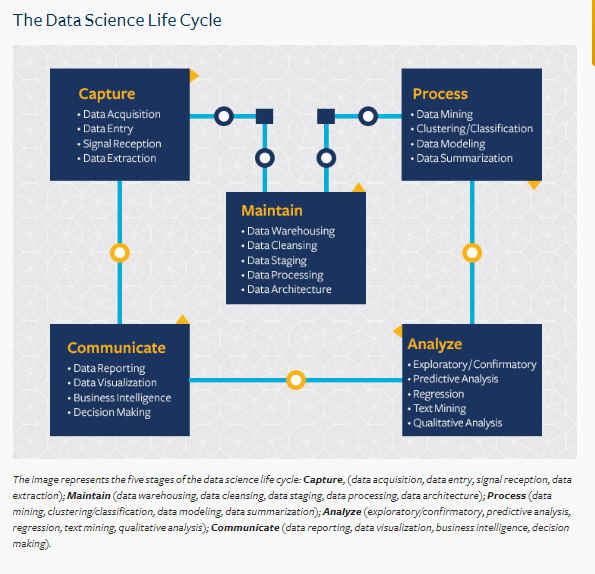


Figure – Source - <https://datascience.berkeley.edu/about/what-is-data-science/>

To be an expert in Data Sciences is no easy task.

<https://www.kdnuggets.com/2018/05/simplilearn-9-must-have-skills-data-scientist.html> - will give you an indication of what one needs to be good at. Please note that this article goes a bit overboard, but does emphasize that the skills are not trivial.

Plain Python programming knowledge will not be enough !.

# Actual Uses Cases of ML

# Python’s ML Ecosystem

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 1 | Numpy |  |  |
| 2 | Pandas |  |  |
| 3 | Scikit-learn |  |  |
| 4 | Pytorch |  |  |
| 5 | Keras |  |  |
| 6 | Scikit-image |  |  |
| 7 | Tensorflow |  |  |
| 8 | Caffe |  |  |
| 9 | StatsModels |  |  |
| 10 | Pybrain |  |  |
| 11 | Skorch |  |  |
| 12 | Scipy |  |  |

| **MAIN TOPIC** | **SUB TOPIC** | **DETAILS**  **/**  **(LINKS FOR FURTHER STUDY)**  **/**  **(FEEDBACK)**  **/**  **(SAMPLE PROGRAMS)** | **(CLASSROOM EXERCISES)**  **/**  **(ASSIGNMENTS)** | **TRACKING DATA** |
| --- | --- | --- | --- | --- |
| **OVERALL CONTEXT** | WHAT ARE YOU EXPECTING ? | <Update after feedback from the students> | **N/A** | DAY 1  (<=15 mins) |
|  | MY EXPECTATIONS FROM THE STUDENTS/YOU | * Be aware of the course content (*Have all of you gone through the course details [separate doc] ?)* * Do the class room exercises * Complete your assignments * Make notes *(I do it and it helps me)* * Don’t just nod your head to what I say. Digest it slowly. Stop me if I am going too fast | **N/A** | DAY 1  (<= 15 mins) |

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