**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 |  |  |
|  | Pipelines |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## 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

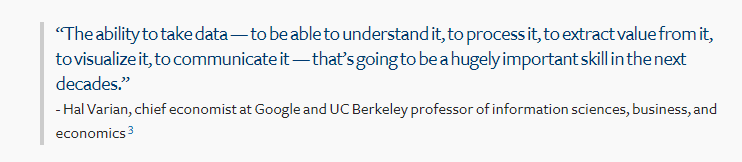
Deep learning is a subset of ML. It uses some ML techniques to solve real-world problems by tapping into neural networks that simulate human decision-making. **Deep learning can be expensive, and requires massive datasets to train itself on**. That's because there are a huge number of parameters that 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.



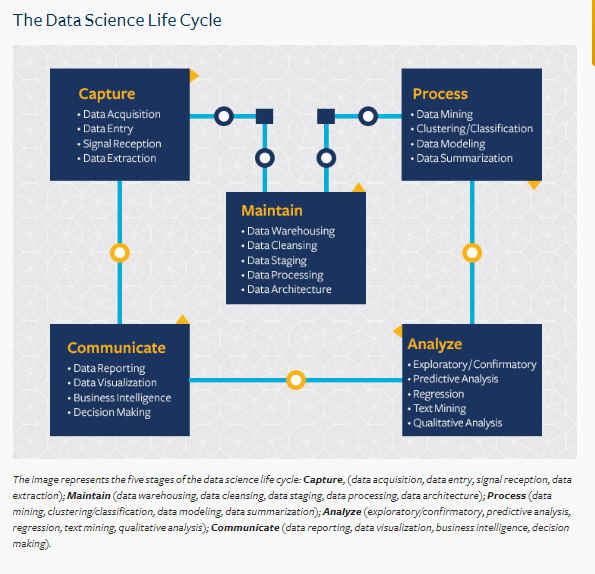


Figure – Source - <https://datascience.berkeley.edu/about/what-is-data-science/>

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 !.

## Avoid falling in the “PIT OF UTTER CONFUSION”

Everybody uses the word “AI”, so treat this as a generic all encompassing term used to describe how software/hardware is infused with advanced intelligence. Think twice before claiming to know AI !.

When learning about data sciences, remember that entities possess data and there are lots of benefits to be gained from analyzing this data to gain insights, make predictions.

Data science, without the frills, has been around from a long time. MS EXCEL itself can be used to perform basis analysis of data. PANDAS does data sciences as well.

A question often asked is – “Do I need BIG DATA for Data Sciences ?” . Actually, “No” . Depending upon the situation, having lots of data does help in better insights and analytics, but you can do data sciences even with small data sets.

Another question - “ML” creeps in as well, why ?. When doing data science, ML techniques can be used - REVISIT.

# 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 |  |  |

# DATA SCIENCES COURSE

| **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) |

## 

# MACHINE LEARNING COURSE

| **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) |