Machine Learning and Artificial Intelligence with Python

Sowmya S Sundaram

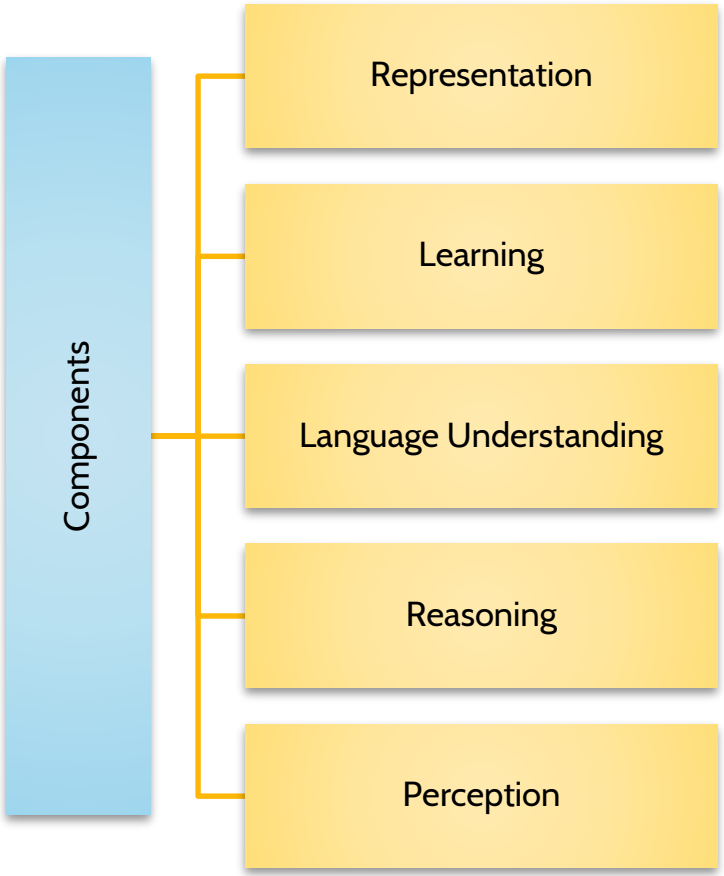
BASICS

What is Artificial Intelligence?

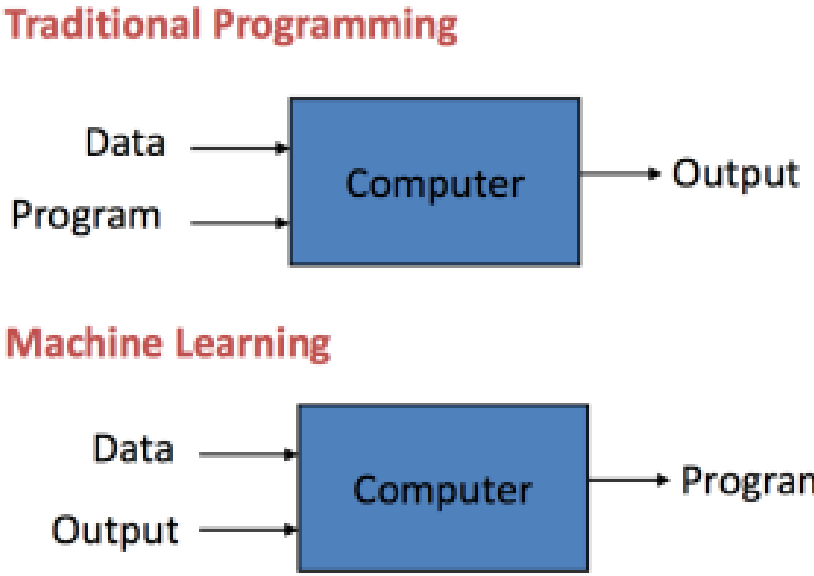
What is Artificial Intelligence?

Rational Thinking	Human Thinking
Rational Acting	Human Acting

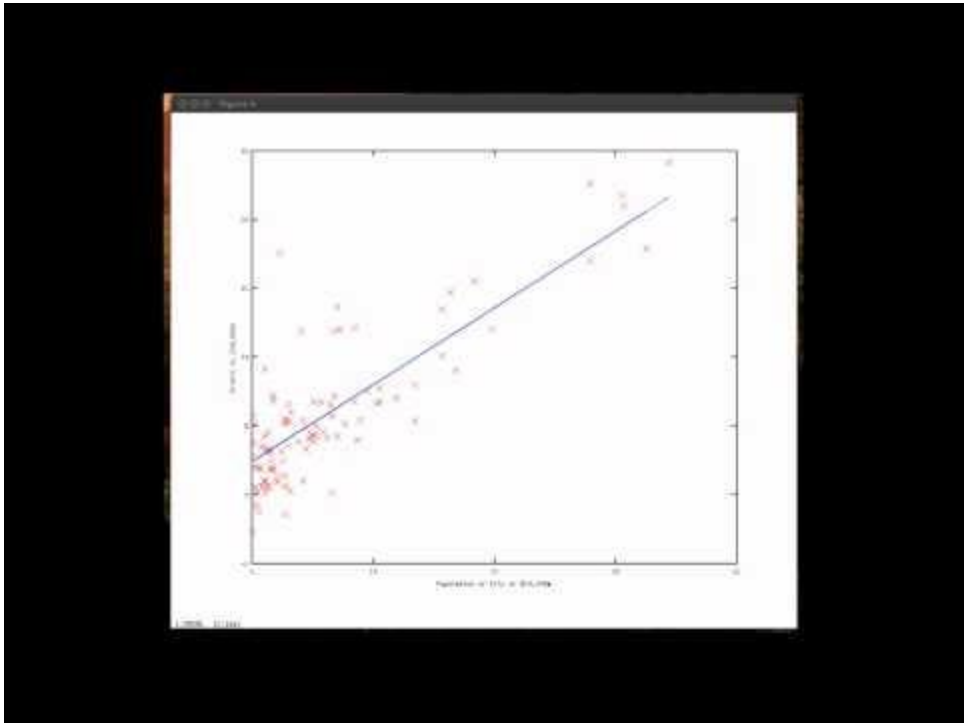
What is Artificial Intelligence?



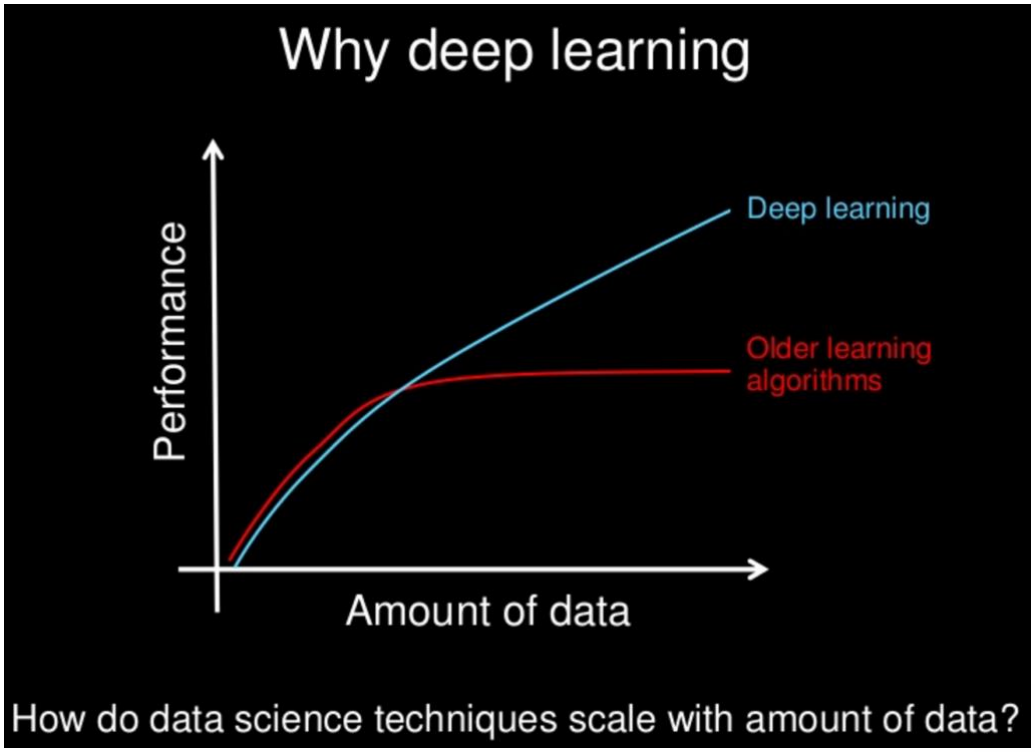
What is Machine Learning?

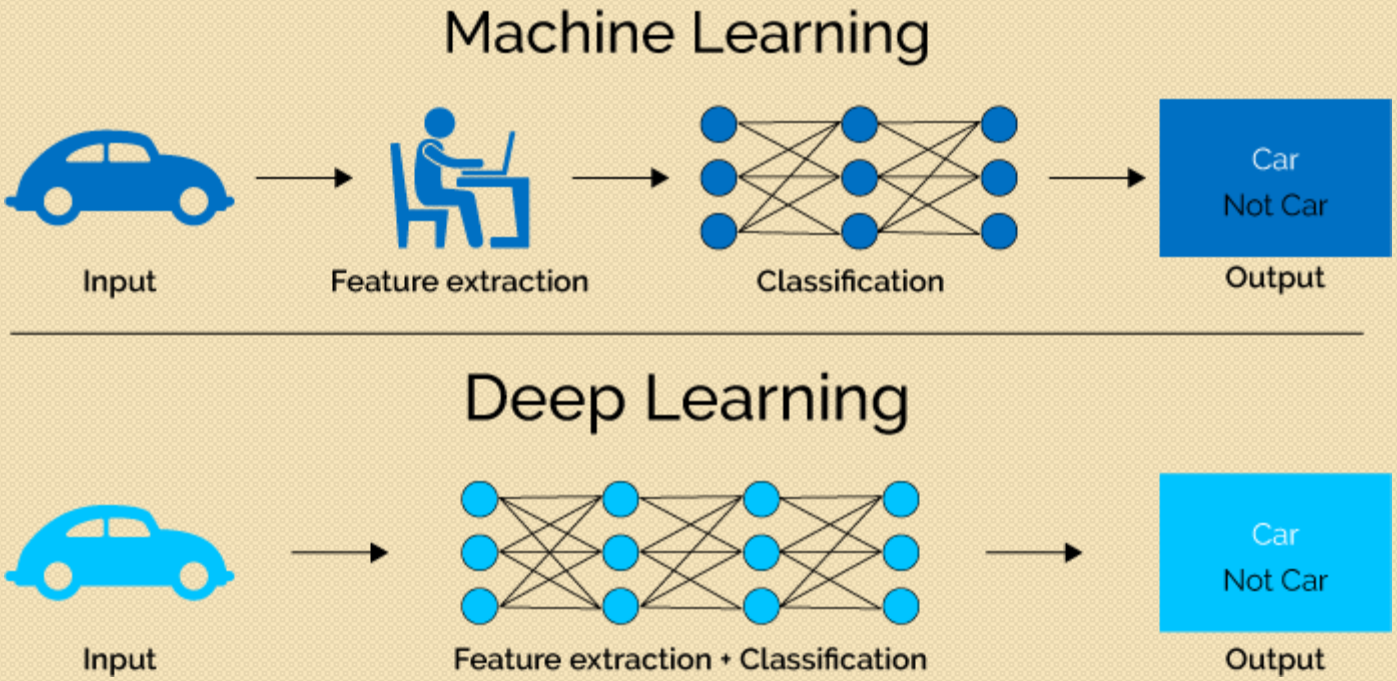


What is Machine Learning?



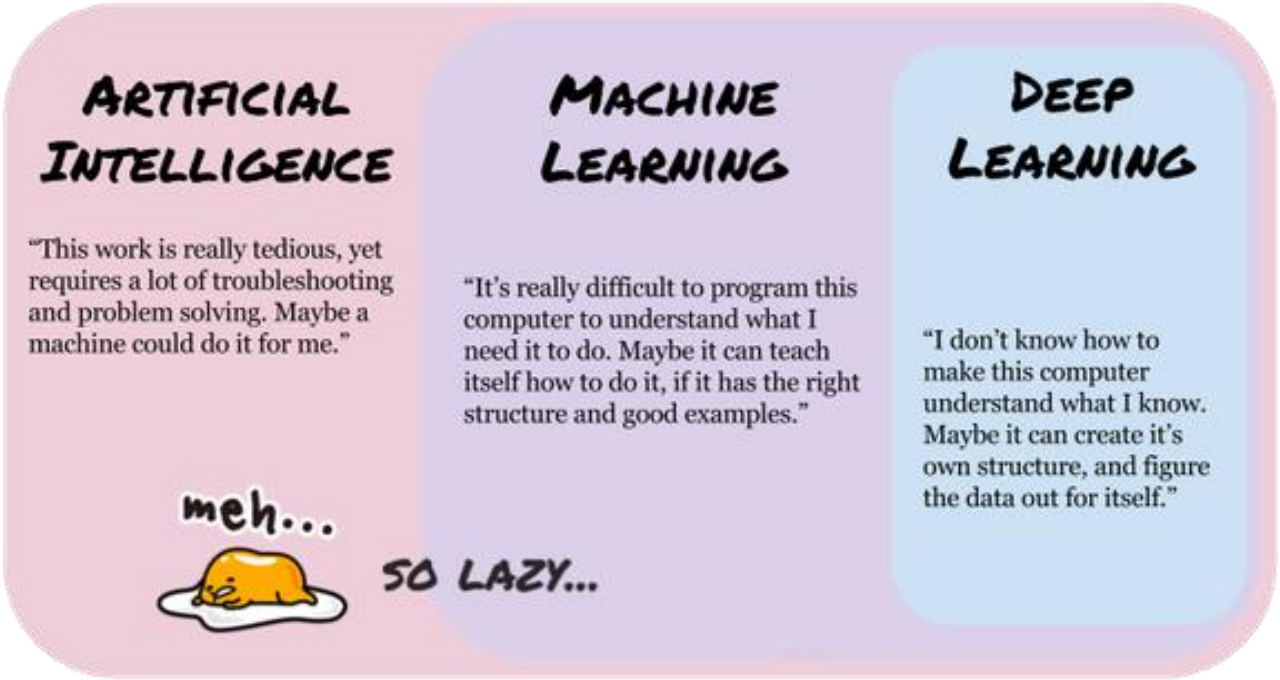
What is Deep Learning?





Machine Learning vs Deep Learning

Summary of Basics



PYTHON IN ML

IP[y]: IPython
Interactive Computing

NumPy

- It stands for 'Numerical Python'.
- It is a library consisting of multidimensional array objects and a collection of routines for processing of array.
- Functionalities
  - Mathematical and logical operations on arrays.
  - Operations related to linear algebra.
  - Random number generation

NumPy

```
import numpy as np

a = np.array([1, 2, 3])
print(a.shape)                    # Prints "(3,)"
```

NumPy

```
import numpy as np

x = np.array([[1,2],[3,4]], dtype=np.float64)
y = np.array([[5,6],[7,8]], dtype=np.float64)

print(np.multiply(x, y)) # Elementwise product
print(np.dot(x, y)) # Vector product
```

Matplotlib

- Visualization library
- It consists of several plots like line, bar, scatter, histogram etc.

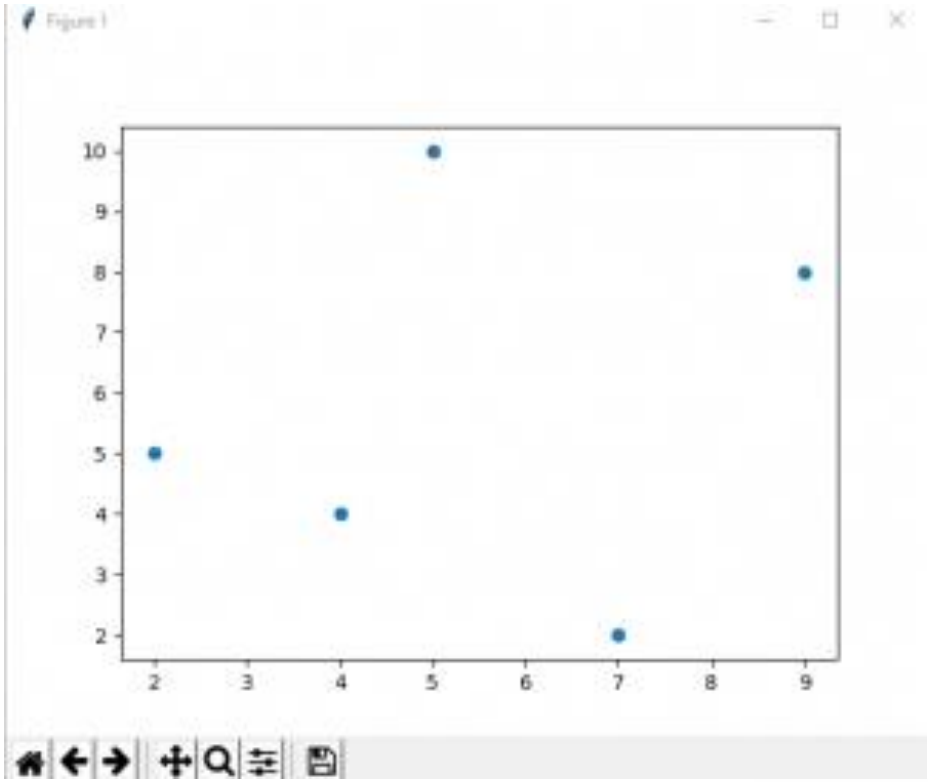
Matplotlib

```
from matplotlib import pyplot as plt

 x = [5, 2, 9, 4, 7]     # x-axis values
 y = [10, 5, 8, 4, 2]  # Y-axis values

 plt.scatter(x, y)  #scatterplot
 plt.show() # function to show the plot
```

Matplotlib



Matplotlib

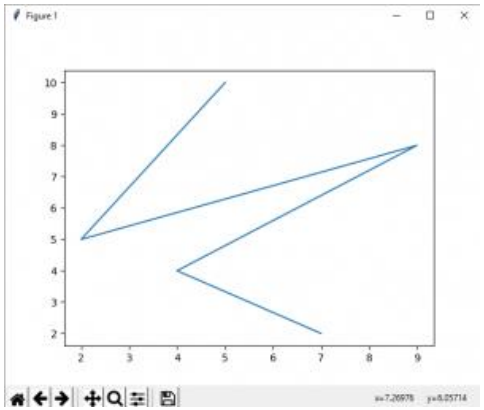


Figure 1
10
9
8
7
6
5
4
3
2
2
3
4
5
6
7
8
9

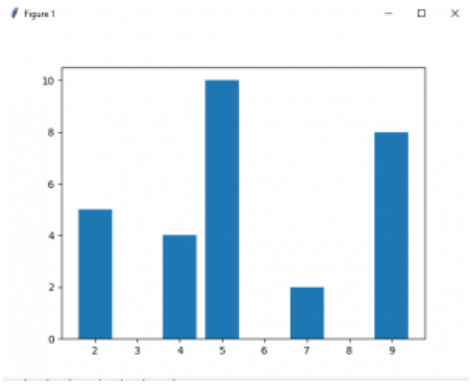


Figure 1
10
8
6
4
2
0
2
3
4
5
6
7
8
9

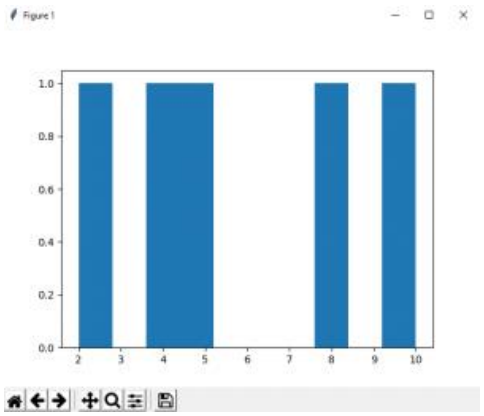


Figure 1
1.0
0.8
0.6
0.4
0.2
0.0
2
3
4
5
6
7
8
9
10

Sklearn

- Implements machine learning algorithms
- Vast resource

Sklearn

```
# Sample Decision Tree Classifier
from sklearn import datasets
from sklearn import metrics
from sklearn.tree import DecisionTreeClassifier

# load the iris datasets
dataset = datasets.load_iris()
```

Sklearn

```
# fit a model to the data
model = DecisionTreeClassifier()
model.fit(dataset.data, dataset.target)
print(model)

# make predictions
expected = dataset.target
predicted = model.predict(dataset.data)
```

Sklearn

```
# summarize the fit of the model
print(metrics.classification_report(expected,
  predicted))

print(metrics.confusion_matrix(expected, predicted))
```

SciPy

- SciPy is a scientific python package

SciPy

```
from scipy.special import comb
#find combinations of 5, 2 values using comb(N, k)
com = comb(5, 2, exact = False, repetition=True)
print(com)
```

output: 15.0

PYTHON IN DL


ANACONDA®


jupyter


TensorFlow


K
Keras

Anaconda

- Anaconda® is a package manager, an environment manager, a Python/R data science distribution, and a collection of over 1,500+ open source packages.

- Anaconda is free and easy to install, and it offers free community support.

Jupyter

- Great tool for creating python projects

jupyter notebook
jupyter notebook test.ipynb

Jupyter

Files New Log Find Settings anaconda.ipynb

File Edit View Insert Cell Kernel Help Trusted | Python 3 (Anaconda)

Code Save TimeTravel

In [7]:
```
import pandas as pd
```
less than a minute ago 0.003 seconds

In [8]:
```
pd.DataFrame.from_dict({'a': [1,2,3]})
```
less than a minute ago 0.159 seconds

Out[8]:

	a
0	1
1	2
2	3

In [9]:
```
import tensorflow as tf
tf
```
now 0.071 seconds

Out[9]:
```
<module 'tensorflow' from '/projects/anaconda3/lib/python3.5/site-packages/tensorflow/__init__.py'>
```

In [10]:
```
hello = tf.constant('Hello, TensorFlow!')
sess = tf.Session()
print(sess.run(hello))
a = tf.constant(15)
b = tf.constant(33)
print(sess.run(a + b))
```
less than a minute ago 0.491 seconds

```
b'Hello, TensorFlow!'
48
```

Tensorflow

- **TensorFlow** is an open-source software library for dataflow and differentiable programming across a range of tasks.

- TensorFlow provides stable Python APIs

Keras

- **Keras** is an open-source neural-network library written in Python.
- It is capable of running on top of TensorFlow, Microsoft Cognitive Toolkit, Theano, or PlaidML.
- Designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible.

Keras

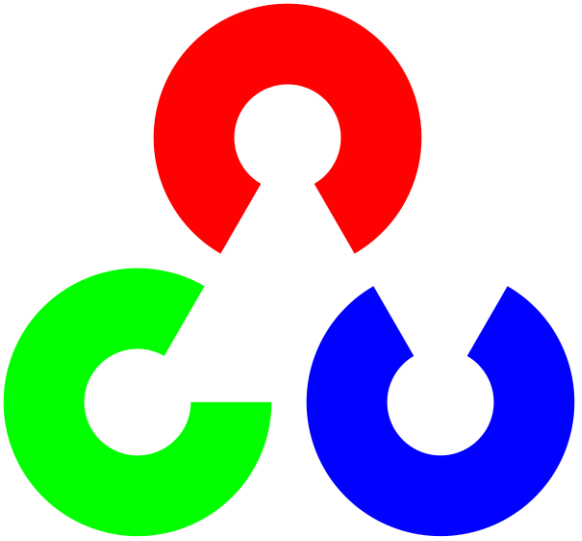
- Keras contains numerous implementations of commonly used neural-network building blocks such as layers, objectives, activation functions, optimizers.

- It also has a host of tools to make working with image and text data easier.

APPLICATIONS OF AI

Computer Vision

scikit-image
image processing in python



OpenCV

SimpleCV

Natural Language Processing

Stanford University
S
NLP
Natural Language Processing

spaCy

gensim

NLTK

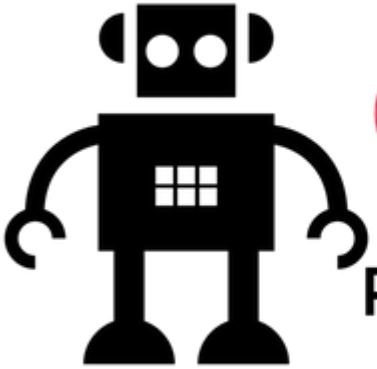
Natural Language Toolkit

Chatbots

Robotics

ROS

GAZEBO



GoPiGo

Raspberry Pi Robots

Speech

pyAudio Analysis

librosa

HANDS ON

Resources

- **Analytics Vindhya**

- Coursera
- Udacity
- EdX

- Linear Algebra
- Probability
- Calculus


LITAS For Girls
Introduction to ML
for Beginners
CSE dept, IIT Madras
11 am - 6pm, 10th March, '19
Sign up! https://bit.ly/2XkFg8Y
Sowmya : 9543144446
Jahnvi : 9978907446
For more details visit www.litas4girls.org

Questions?