

# Machine Learning

## Lecture 1: Introduction to Machine Learning (ML)

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# Course Teacher

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# Can You Classify?

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# Can You Guess House Price?

Area (Sqf)	Price (\$k)
2420	3300
4305	6680
5750	8800
7420	11410
7500	10215
7500	10850
8100	9870
8580	10150
8960	12250
9960	13250

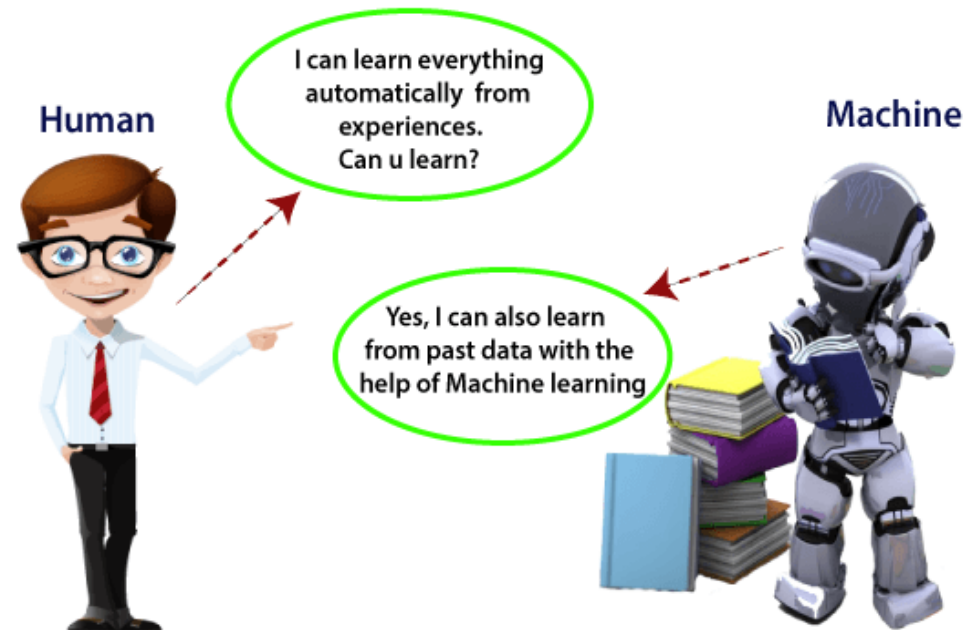


Area (Sqf)	Price (\$k)
6550	?

# What is Machine Learning (ML)

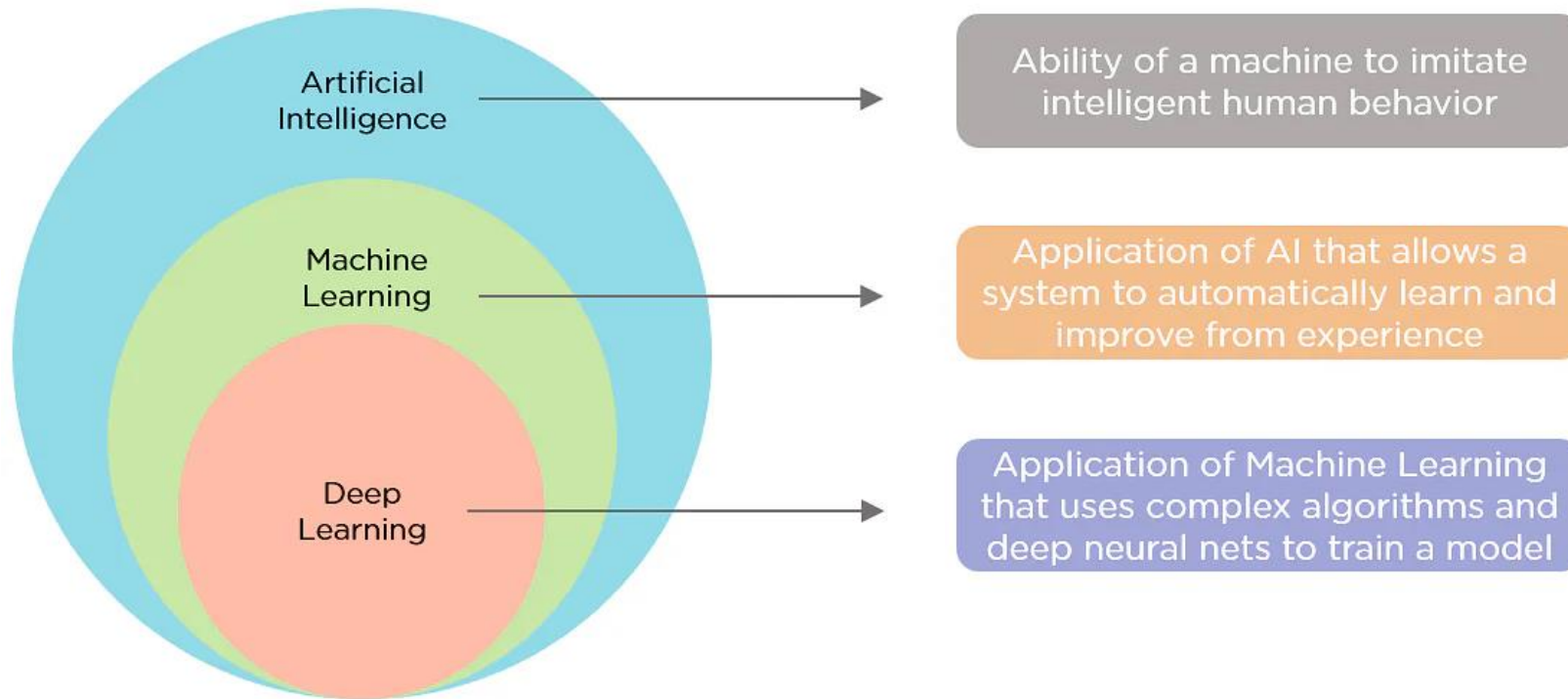
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- Machine learning is about extracting knowledge from data
- Machine Learning is the field of study that enables a system to learn from experience without being explicitly programmed (Arthur Samuel, 1959).



# What is AI? AI vs ML

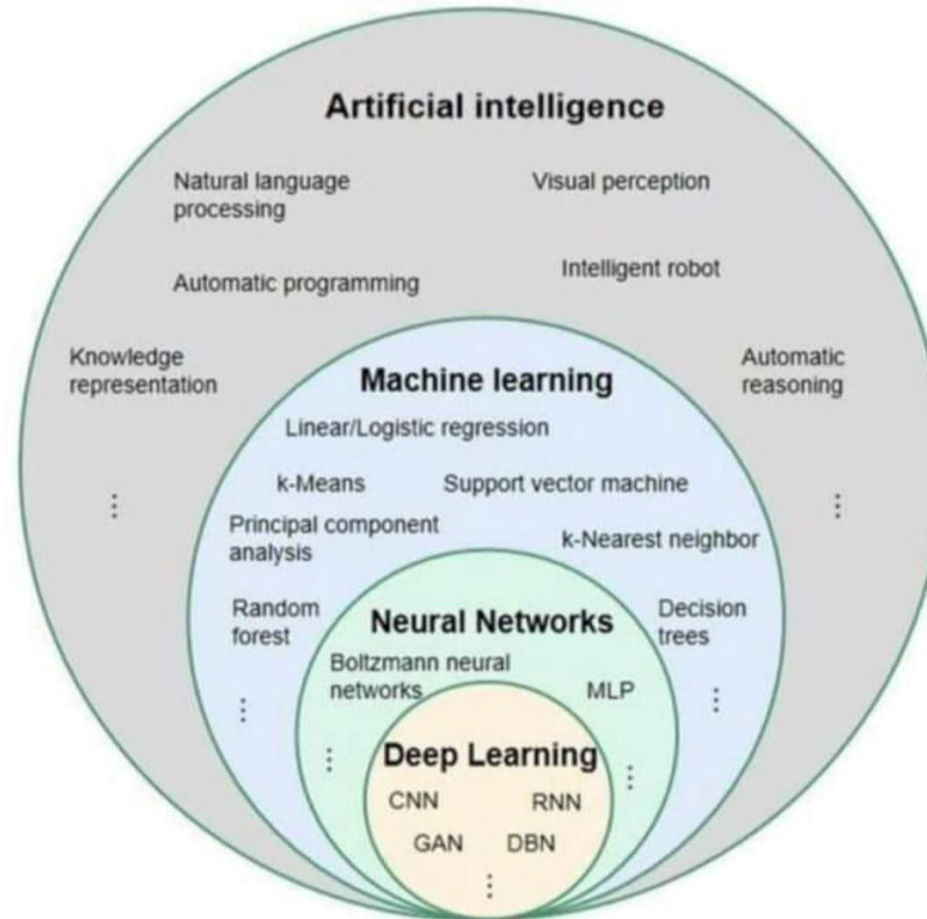
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AI vs ML [[Link](#)]

# Relationship between AI, ML, Neural Networks and DL

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# Machine Learning (ML) - A Formal Definition

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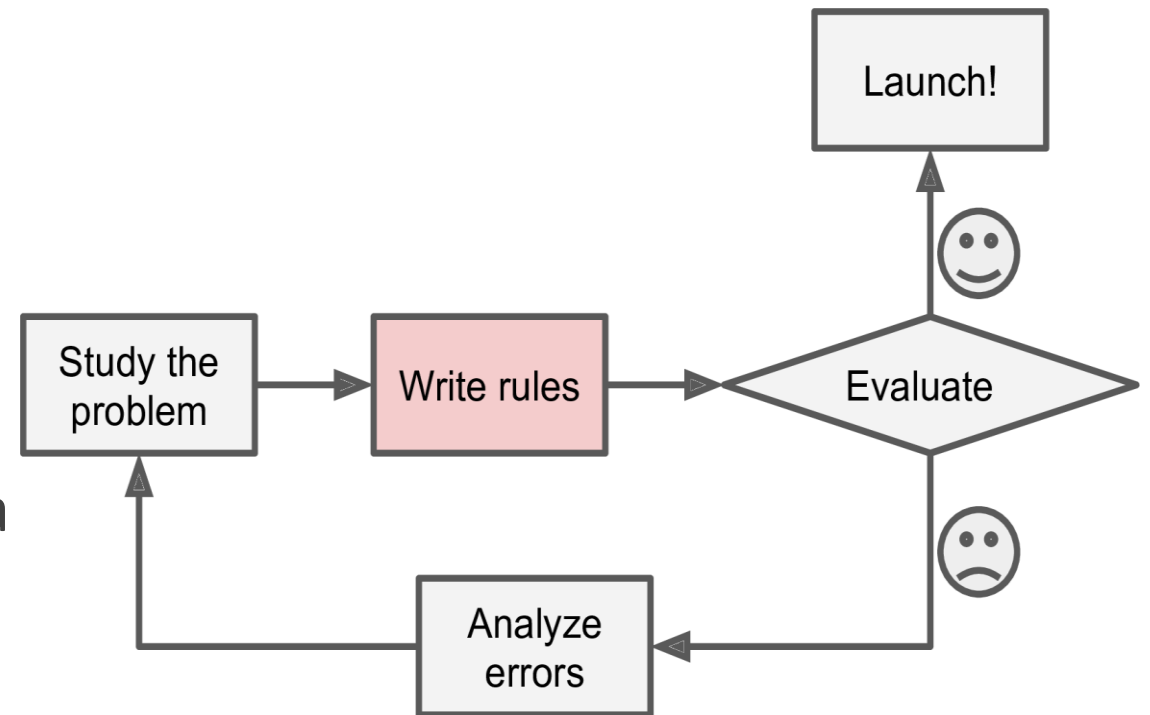
*A computer program is said to learn from experience  $E$  with respect to some task  $T$  and some performance measure  $P$ , if its performance on  $T$ , as measured by  $P$ , improves with experience  $E$  (Tom Mitchell, 1997)*

- **Example:** Given some examples of spam emails and some examples of regular emails which are called the **training set**. You need to do **spam filtering** for new emails based on the training set.
- In this case, the task  $T$  is to flag spam for new emails, the experience  $E$  is the training data, and the performance measure  $P$  needs to be defined; for example, you can use **accuracy** and it is often used in classification tasks.



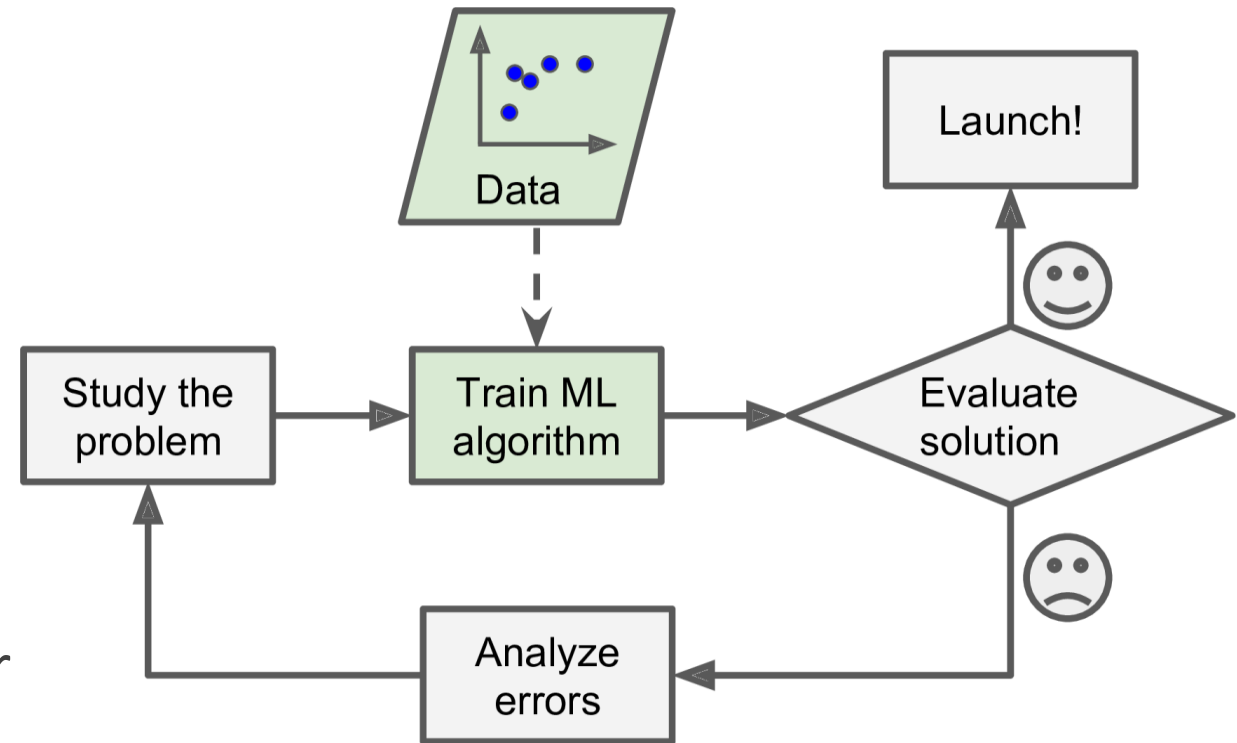
# Traditional/ Rule-based Programming

- A programmer code all the rules in consultation with an expert in the industry to solve the problem.
- When the system grows, more rules need to be written.
- Your program will likely become a long list of complex rules—pretty hard to maintain



# Machine Learning Approach

- A programmer choose a ML algorithm and train a model from data to solve the problem.
- The system learns how input and output data are correlated and automatically finds patterns or relationships in the data.
- The system adapts in response to new data and experiences to improve efficacy over time.
- The program is much shorter, easier to maintain, and most likely more accurate.



# Why and when to use Machine Learning

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- **Problems for which existing solutions require a lot of hand-tuning or long lists of rules:** a Machine Learning algorithm can often simplify code and perform better.
- **Complex problems for which there is no good solution at all using a traditional approach:** the best Machine Learning techniques can find a solution.
- **Fluctuating environments:** a Machine Learning system can adapt to new data.
- **Getting insights about complex problems and large amounts of data.**

# The Goal of Machine Learning

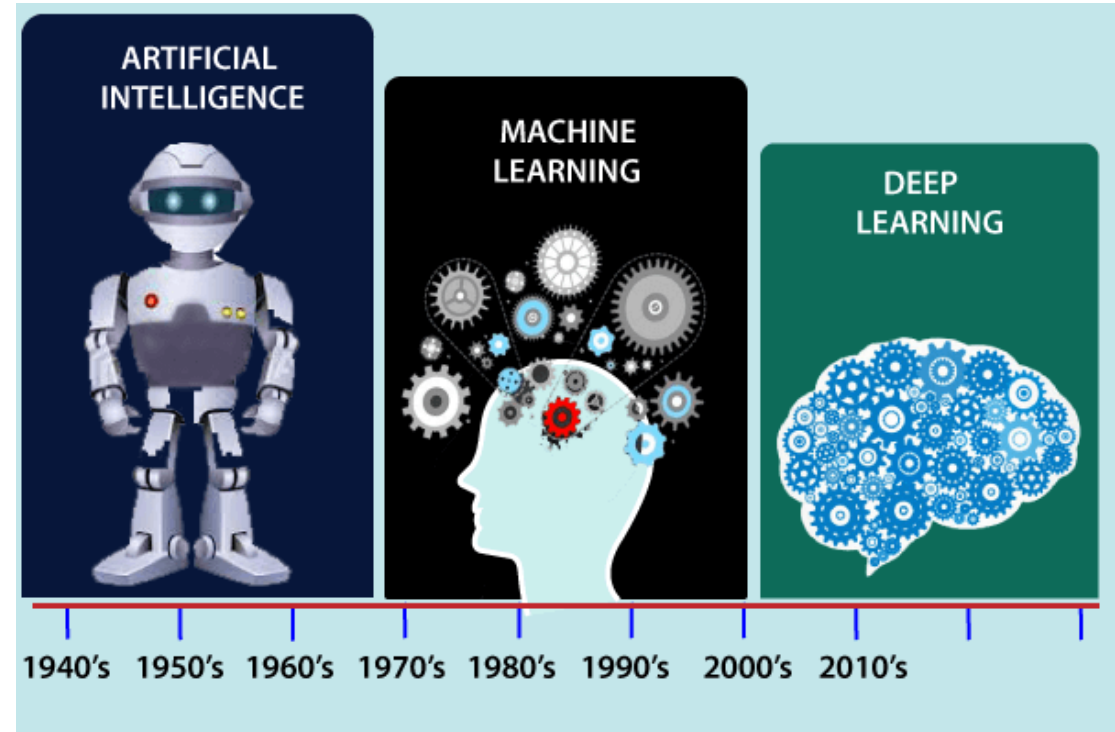
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*All models are wrong, but some are useful (by George E. P. Box, a British statistician)*

- The goal of ML is never to make “perfect” guesses.
- The goal of ML is to make guesses that are good enough to be useful.

# History of Machine Learning

- The idea of Machine Learning is not new.
- Machine Learning ideas and research have been around for decades.
- But recently there has been a lot of action and buzz of Machine Learning.



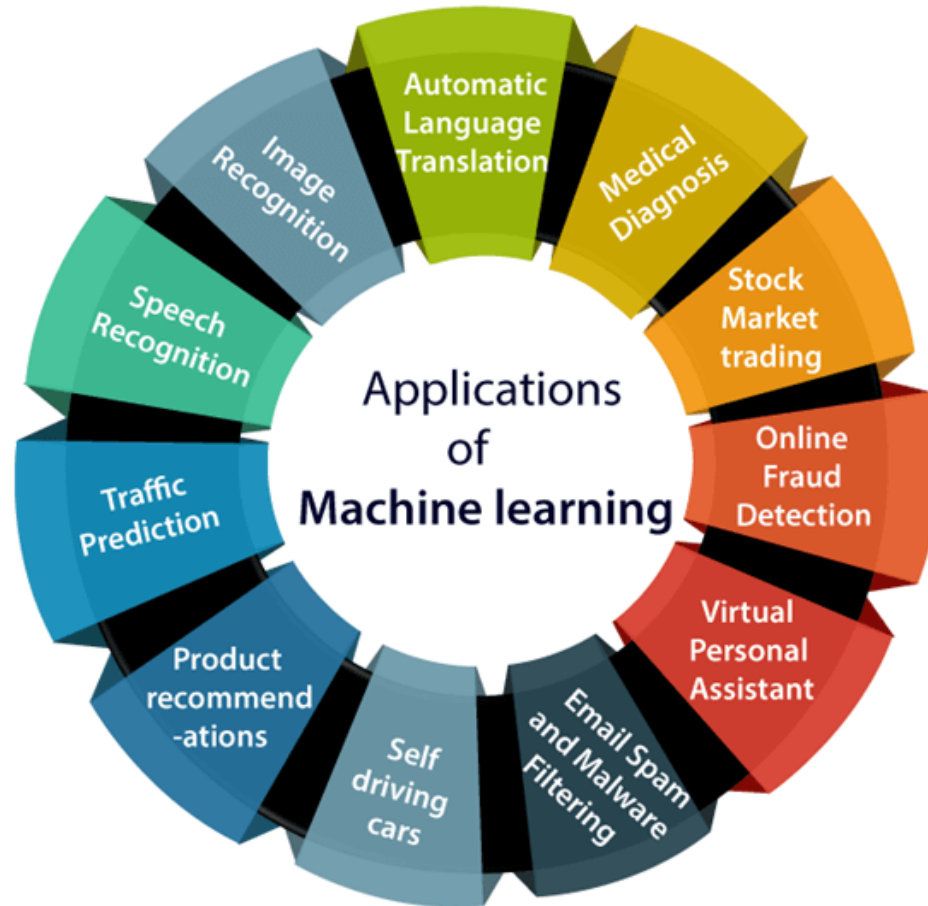
# Why is Machine Learning getting so much attention recently?

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- **The amount of data generation is increasing significantly with a reduction in the cost of sensors (Force 1)**
- **The cost of storing this data has reduced significantly (Force 2).**
- **The cost of computing has come down significantly (Force 3).**
- **Cloud has democratized compute for the masses (Force 4).**

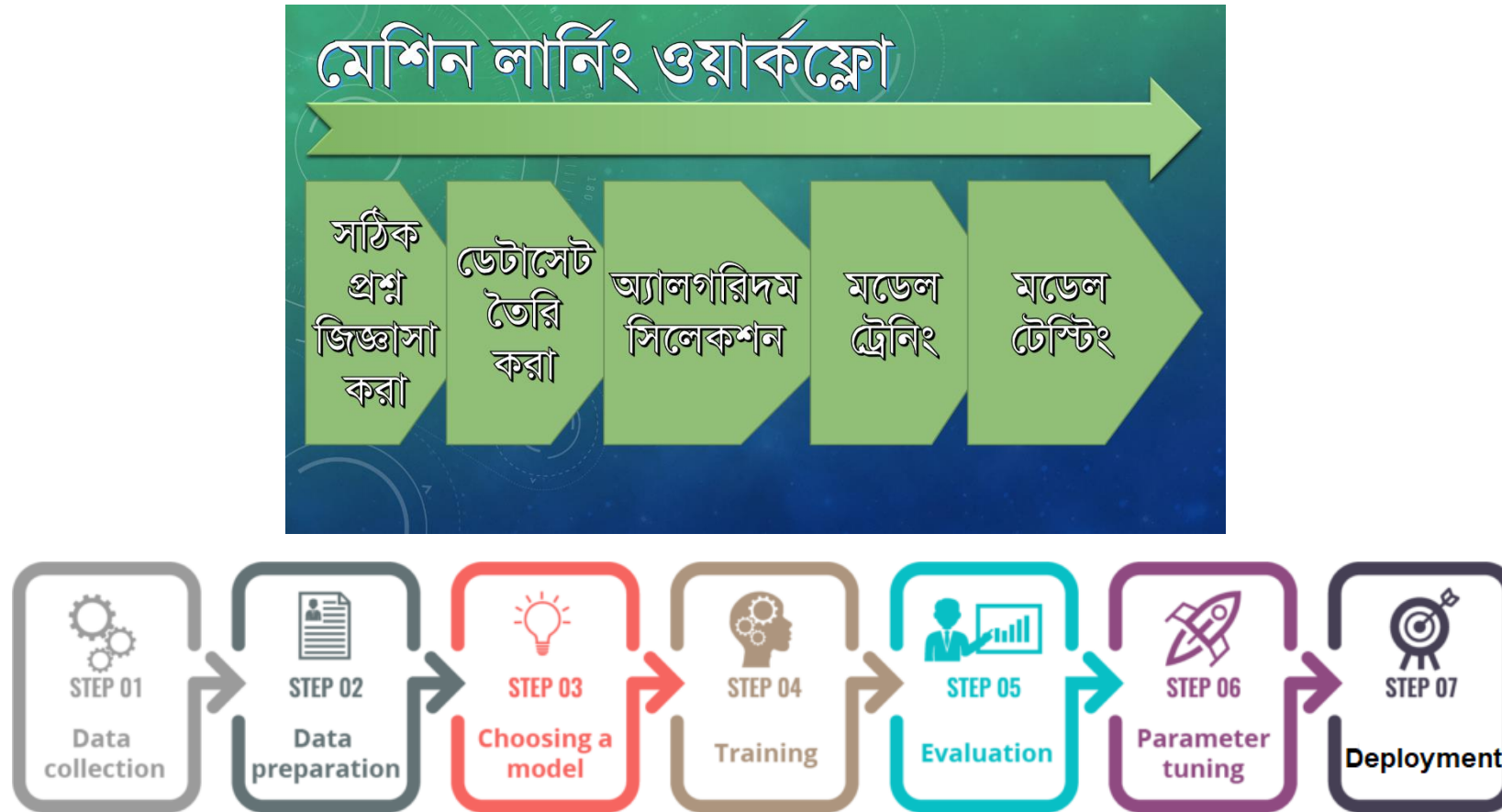
# Some Trending Real-world Applications of Machine Learning

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Source: javaTpoint [\[Link\]](#)

# Workflow/Steps of Machine Learning



Source: Manas [[Link](#)], Medium [[Link](#)]



# Comprehensive Learning Path of ML/Data Science in Python

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Step 1: Setting up your machine (install [Anaconda](#))

Step 2: Learn Python language

Step 3: Learn Regular Expressions in Python

Step 4: Learn Scientific libraries in Python – NumPy, SciPy, Matplotlib and Pandas

Step 5: Effective Data Visualization

Step 6: Learn Scikit-learn and Machine Learning

Step 7: Practice, practice and Practice

Source: AnalyticsVidhya [[Link](#)]

# Guide to Machine Learning in Python

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## **Step 1: Complete Python course by one week**

Introduction to Python by AnalyticsVidhya [\[Link\]](#)

## **Step 2: Complete another Python course for your hands on practice**

Introduction to Python by Datacamp [\[Link\]](#)

## **Step 3: Complete a basic Machine Learning course**

Machine Learning for Everyone by Datacamp [\[Link\]](#)

## **Step 4: Complete another Machine Learning course**

Machine Learning Certification Course for Beginners by AnalyticsVidhya [\[Link\]](#)

## **Step 5: Keep working on ML and learning**

# Some Learning Materials in Bangla

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1. বাংলায় পাইথন প্রোগ্রামিং বই: সুবীন [[Link](#)], মাটিন [[Link](#)], Nuhil Mehdy [[Link](#)]
2. শূন্য থেকে পাইথন মেশিন লার্নিং [[Link](#)], হাতে কলমে মেশিন লার্নিং [[Link](#)] by রকিবুল হাসান
3. বাংলায় মেশিন লার্নিং [[Link](#)] by মানস কুমার মণ্ডল
4. Python Bangla Tutorial & Data Science Full Course [[Link](#)] by STUDY MART at Youtube
5. Youtube, Coursera, Google

# Reference Books for ML Course

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1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems by Aurélien Géron, O'Reilly (2nd Edition)
2. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Müller, Sarah Guido
3. Introduction to Data Mining by Pang-Ning Tan , Michael Steinbach, Vipin Kumar (2nd Edition)
4. The Hundred-Page Machine Learning Book by Andriy Burkov

**End of  
Lecture-1**