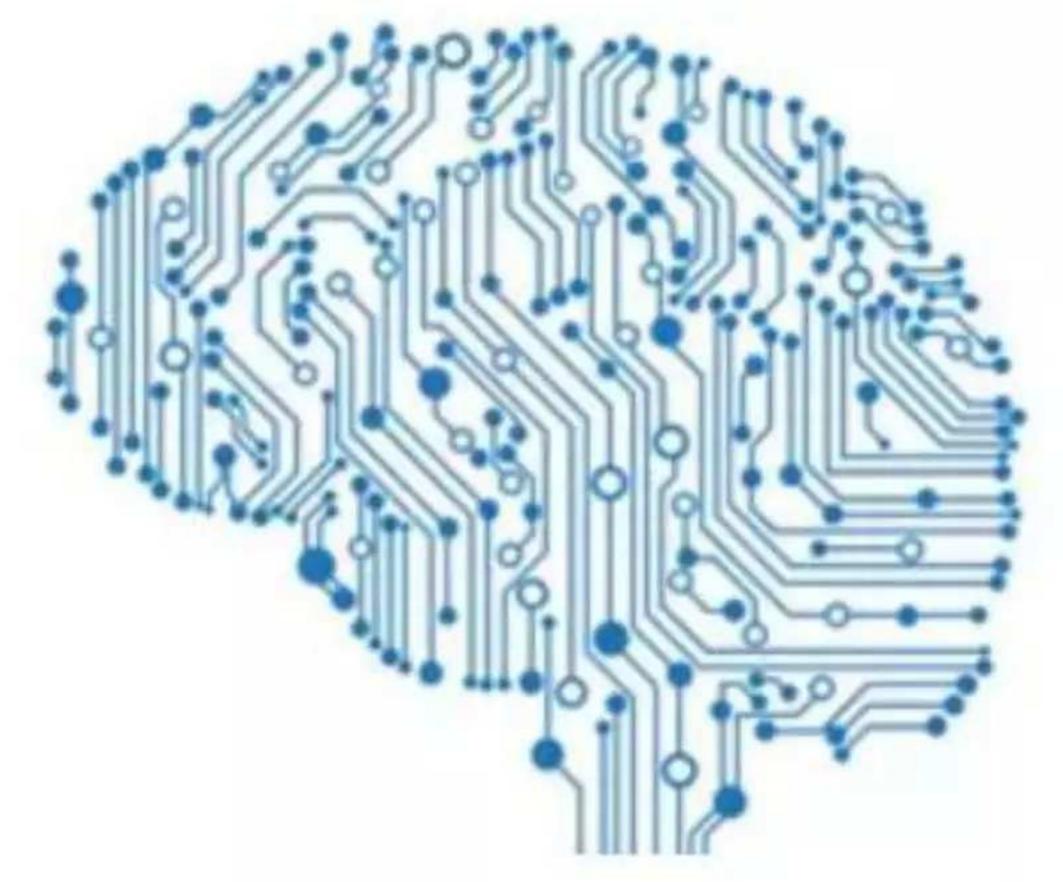
Machine Learning

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What is Machine Learning (M.L.)?

Machine learning is an application of artificial intelligence (AI) which gives devices the ability to learn from their experiences and improve their self without doing any coding

Traditional Programming



Machine Learning





Machine learning refers to a class of computer algorithms that <u>learn from examples</u> rather than being explicitly programmed to perform a task.

Machine learning is a field which focuses on the use of data and algorithms to <u>imitate the way that humans learn</u>, gradually improving its accuracy.

Machine learning is a field of study that looks at using computational algorithms to turn empirical data into usable models.

Want to detect spam?
Want to forecast stocks?
Want to find out user
preferences?
Want your computer to
recognize you in group photos?

All the answers can be obtained by using the power of ML.

Supervised

Unsupervised

Types of Machine Learning

Semi-supervised

Reinforcement

Supervised

- In Supervised learning, you train the machine using data which is well "labeled."
- It means data is already tagged with the correct answer.
- It can be compared to learning which takes place in the presence of a supervisor or a teacher.
- A supervised learning algorithm learns from labeled training data, helps you to predict outcomes for unforeseen data.
- One disadvantage of this learning method is that the dataset has to be hand-labeled either by a Machine Learning Engineer or a Data Scientist. This is a very costly process, especially when dealing with large volumes of data.

Unsupervised

- Unsupervised Learning is a machine learning technique in which the users do not need to supervise the model.
- Instead, it allows the model to work on its own to discover patterns and information that was previously undetected.
- It mainly deals with the unlabeled data.
- Unsupervised learning problems are grouped into clustering and association problems.
- The most basic disadvantage of any Unsupervised Learning is that it's application spectrum is limited.

Semi-supervised

 Semi-supervised learning is the type of machine learning that uses a combination of a small amount of labeled data and a large amount of unlabeled data to train models.

Intuitively, one may imagine the three types of learning algorithms as:

- Supervised learning where a student is under the supervision of a teacher at both home and school.
- Unsupervised learning where a student has to figure out a concept himself.
- Semi-Supervised learning where a teacher teaches a few concepts in class and gives questions as homework which are based on similar concepts.

Reinforcement

- Reinforcement learning is the training of machine learning models to make a sequence of decisions.
- In this approach, machine learning models are trained to make a series of decisions based on the rewards and feedback they receive for their actions.
- The machine learns to achieve a goal in complex and uncertain situations and is rewarded each time it achieves it during the learning period.
- Reinforcement learning is different from supervised learning in the sense that there is no answer available, so the reinforcement agent decides the steps to perform a task.
- The machine learns from its own experiences when there
 is no training data set present.

	Supervised machine learning	Unsupervised machine learning
	trained using labeled data.	Algorithms are used against data which is not labelled
Computational Complexity	learning is a simpler method.	Unsupervised learning is computationally complex
	and trustworthy	Less accurate and trustworthy method.

The goal of machine learning is to develop methods that can automatically detect patterns in data, and then to use the uncovered patterns to predict future data or other outcomes of interest.

-- Kevin P. Murphy



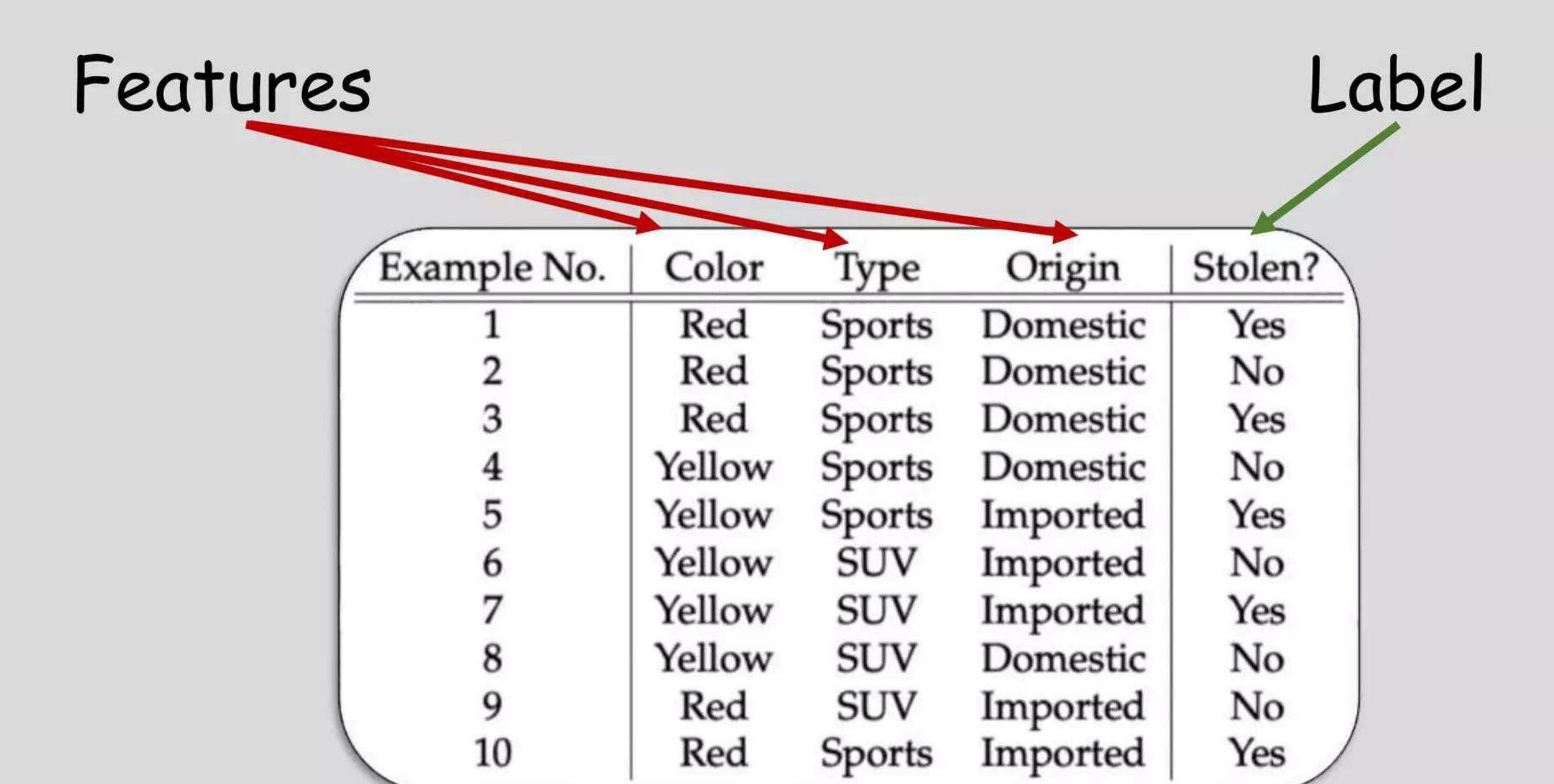
Features

- · Features are the fields used as input.
- A feature is one column of the data in your input set.
- For instance, if you're trying to predict the type of pet someone will choose, your input features might include age, home region, family income, etc.
- · Feature means property of your training data.
- A feature is the input you have fed to the model or system.
- The value of x variable in simple linear regression are the features.

Label

- The output you get from your model after training is called a label.
- A label is the thing we're predicting.
- For example the value of y variable in simple linear regression model is the label.
- Suppose you give your model data like a person's age, height, hair length and then your model predicts whether the person is male or female. Then male or female is called the label.

Tabular data to predict whether car is stolen or not?

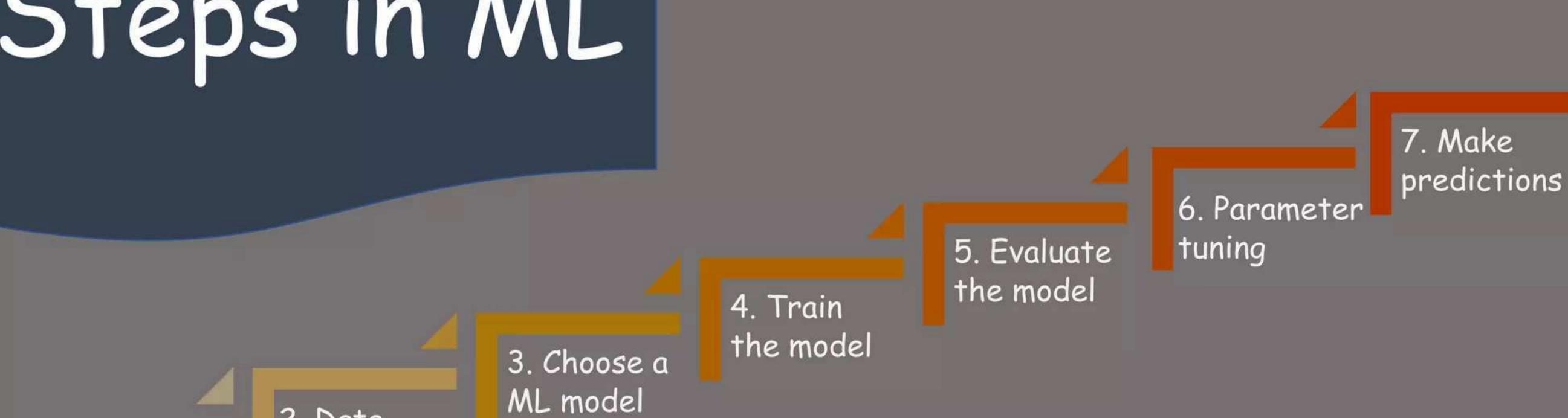


Model

- A model is the relationship between features and the label.
- An ML model is a mathematical model that generates predictions by finding patterns in your data.
- ML Models generate predictions using the patterns extracted from the input data.
- A model represents what was learned by a machine learning algorithm.
- The model is the "thing" that is saved after running a machine learning algorithm on training data and represents the rules, numbers, and any other algorithm-specific data structures required to make predictions.



Steps in ML



1. Data collection 2. Data preparation

1. Data collection

Data collection is the process of gathering and measuring information from countless different sources.

This is a critical first step that involves gathering data from various sources such as databases, files, and external repositories.

Before starting the data collection process, it's important to articulate the problem you want to solve with an ML model.

2. Data Preparation

Data preparation/pre-processing techniques generally refer to the addition, deletion, or transformation of training set data.

Since the collected data may be in an undesired format, unorganized, or extremely large, further steps are needed to enhance its quality. The three common steps for preprocessing data are formatting, cleaning, and sampling.

Data preparation (also referred to as "data preprocessing") is the process of transforming raw data so that data scientists and analysts can run it through machine learning algorithms to uncover insights or make predictions.

3. Choose a ML model

For different purpose, different ML models are available. So it depends on the need that which ML model must be selected.

The choice of ML model to be selected depends on many factors like the problem statement and the kind of output you want, type and size of the data, the available computational time, number of features, and observations in the data, etc.

4. Train the model

The process of training an ML model involves providing an ML algorithm (that is, the learning algorithm) with training data to learn from.

Let's say that you want to train an ML model to predict if an email is spam or not spam.

You would provide ML model with training data that contains emails for which you know the target (that is, a label that tells whether an email is spam or not spam). Then the model should be trained by using this data, resulting in a model that attempts to predict whether new email will be spam or not spam.

5. Evaluate the model

Model evaluation is a method of assessing the correctness of models on test data. The test data consists of data points that have not been seen by the model before.

There are two methods of evaluating models in data science, Hold-Out and Cross-Validation.

To avoid overfitting, both methods use a test set (not seen by the model) to evaluate model performance.

6. Parameter Tuning

Each model has its own sets of parameters that need to be tuned to get optimal output.

For every model, our goal is to minimize the error or say to have predictions as close as possible to actual values. This is one of the cores or say the major objective of hyperparameter tuning.

There are following three approaches to Hyperparameter tuning:

- ·Manual Search
- ·Random Search
- ·Grid Search

7. Make predictions

"Prediction" refers to the output of an algorithm after it has been trained on a historical dataset.

Machine learning has two main goals: prediction and inference.

After you have a model, you can use that model to generate predictions which means to give your model the inputs it has never seen before and obtain the answer the model has predicted.

In addition to making predictions on new data, you can use machine-learning models to better understand the relationships between the input features and the output target which is known as inference.

Applications Of ML

- •Traffic Alerts
- ·Social Media
- Transportation and Commuting
- ·Products Recommendations
- ·Virtual Personal Assistants
- ·Self Driving Cars
- ·Dynamic Pricing
- ·Google Translate
- Online Video Streaming
- ·Fraud Detection

Thank you for reading till end! Hope the ppt was helpful.

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