

## 1 12

## 2 test

### 2.1 wq

## 3 Week1: What is Machine Learning?

### 3.1 Introduction

[Machine Learning] Field of study that gives computers the ability to learn without being explicitly programmed. (older, informal)

Improve performance from task experience. (more modern)

- A **task**
- Some **experience**
- Some way to **measure**

Two broad type of ML algorithms:

- Supervised Learning
- Unsupervised Learning

Others:

- Reinforcement Learning
- Recommender Systems

#### 3.1.1 Supervised Learning

Supervised learning has some known relationship between input and output.

Supervised learning problems are categorized into **regression** and **classification** problems.

Fitting a straight line or quadratic or 2nd-order curve to a function is a regression. The main idea is to give a continuous solution based on data we have.

Estimate weekly income of a company.

Estimating some possibility to be certain type or classification is also a supervised learning.

Classify tumor type based on its size.

When the scale of classes turns to infinity, we need **Support Vector Machine**.

### 3.1.2 Unsupervised Learning

Unsupervised learning has no specific relationship between input and output. Data has no labels, but the data could be divided into several clusters.

Unsupervised learning allows us to approach problems with little or no idea what our results should look like. We can derive structure from data where we don't necessarily know the effect of the variables.

Two recordings of audio are mixed, and computer should get them separated.

## 3.2 Linear Regression with One Variable

### 3.2.1 Model and Cost Function

For a training set, Notation:

- $m$ : number of training example
- $x$ : input variable / features
- $y$ : output variable / target variable

Learning algorithm applies to training set to find a **hypothesis** that could give back an estimated answer.

The goal of supervised learning is to learn a function (hypothesis) from the training set.

### 3.2.2 Cost Function

In a univariate problems, we have:

$$h_{\theta}(x) = \theta_0 + \theta_1 x$$

And the  $\theta_i$  is so called **Parameters**.

### 3.3 Parameter Learning

### 3.4 Linear Algebra Review