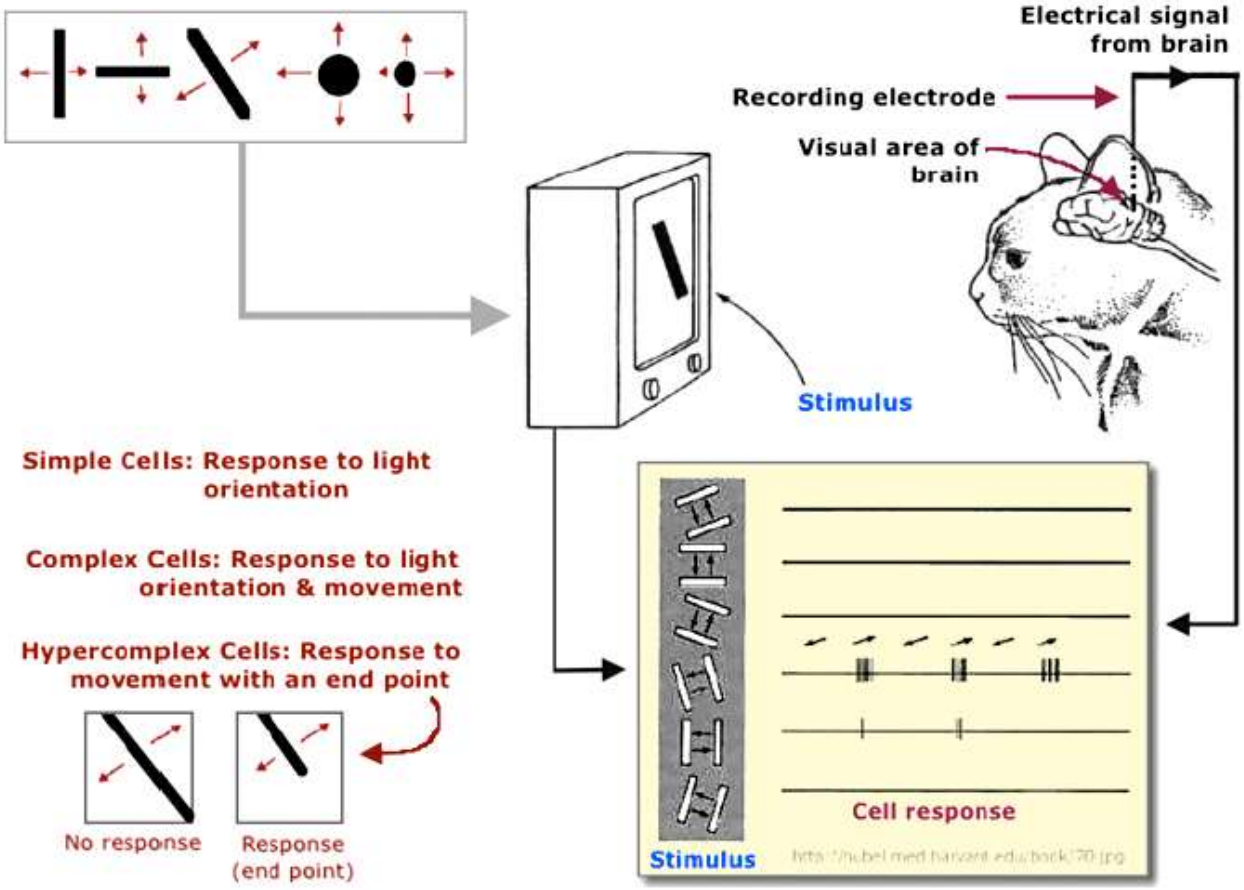
Introduction

Machine Learning Fundamentals

Some slides were adapted/taken from various sources, including Prof. Andrew Ng's Coursera Lectures, Stanford University, Prof. Kilian Q. Weinberger's lectures on Machine Learning, Cornell University, Prof. Sudeshna Sarkar's Lecture on Machine Learning, IIT Kharagpur, Prof. Bing Liu's lecture, University of Illinois at Chicago (UIC), CS231n: Convolutional Neural Networks for Visual Recognition lectures, Stanford University and many more. We thankfully acknowledge them. Students are requested to use this material for their study only and **NOT** to distribute it.



Hubel & Wiesel, 1959

Machine Learning

Field of study that gives computers the ability to learn without being explicitly programmed.

By: Arthur Samuel (1959)

Applications

- Database mining:
  - Web click data, medical records, biology, engineering etc.
- Application that can't be programmed by hand
  - Autonomous helicopter, handwriting recognition, NLP, computer vision
- Self Customizing Programs Recommendation
  - Amazon, Netflix
- Understanding human learning
  - Brain, real AI

Learning Problem

- Well-posed learning problem:

  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.

- By Tome Mitchell (1998)

Example

Your Email program watches which emails you do or do not mark as a spam and based on that learns how to better filter spam.

- Task (T): Classifying the emails as spam or not
- Experience (E): Watching you label emails as spam or not spam
- Performance (P): The number of emails correctly classified as spam / not spam

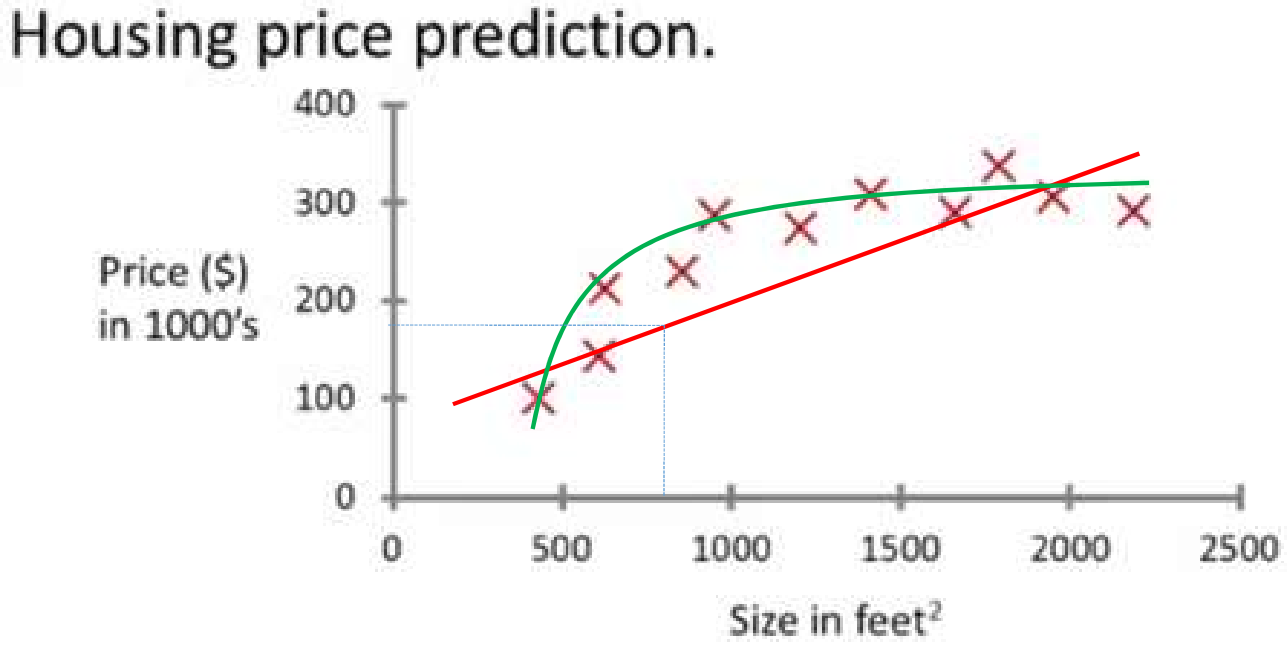
Machine Learning Algorithms

- Supervised Learning
- Un-supervised Learning

- Others: Reinforcement learning, recommender system

- Where to apply which algorithms

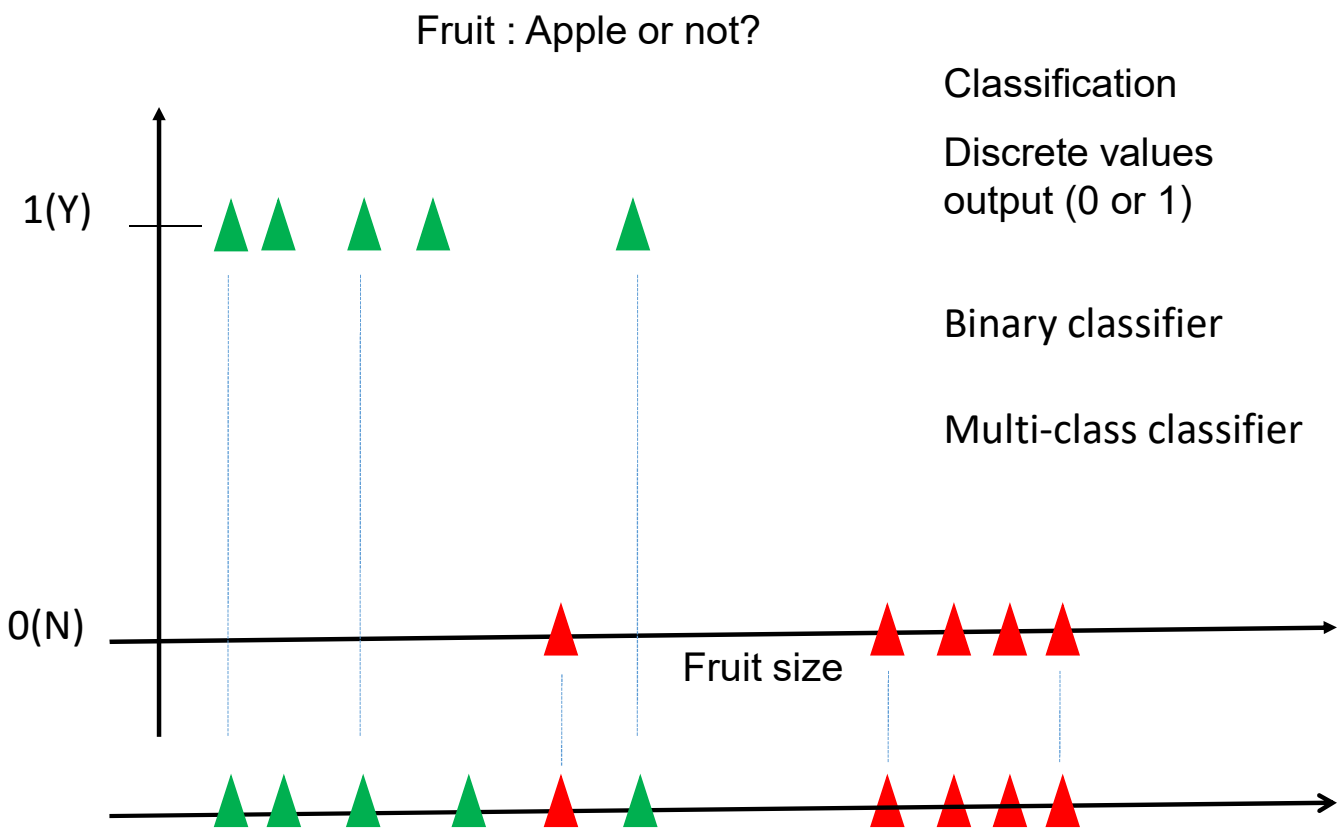
Supervised Learning



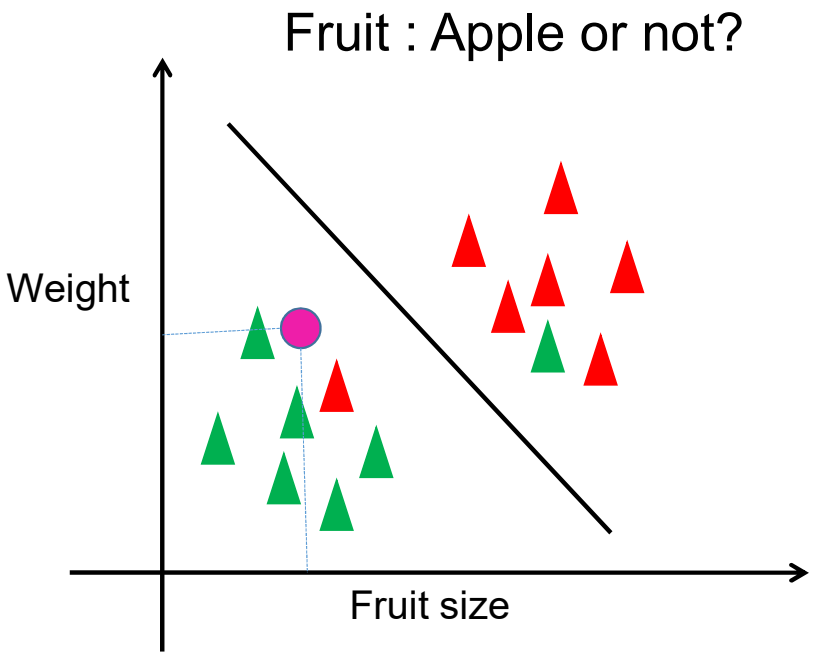
Supervised Learning:
Right answer given

Regression:
Predict continuous valued output

Supervised Learning



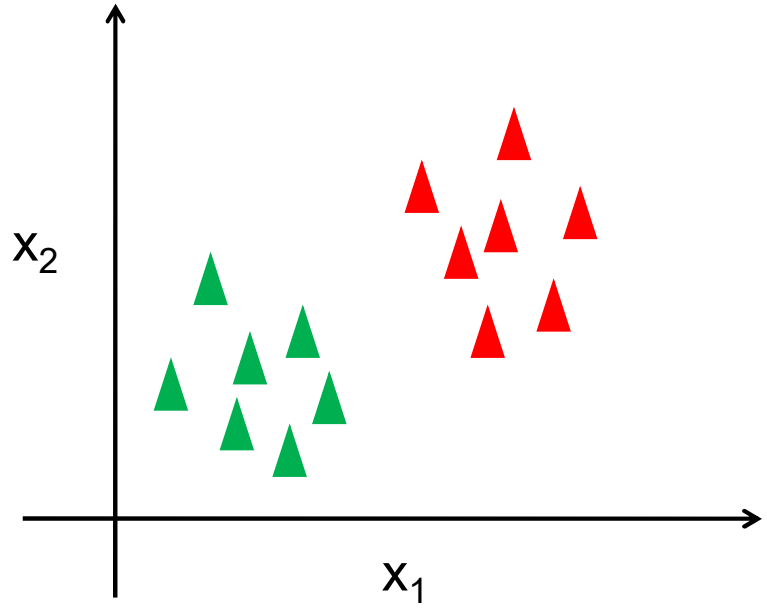
Supervised Learning



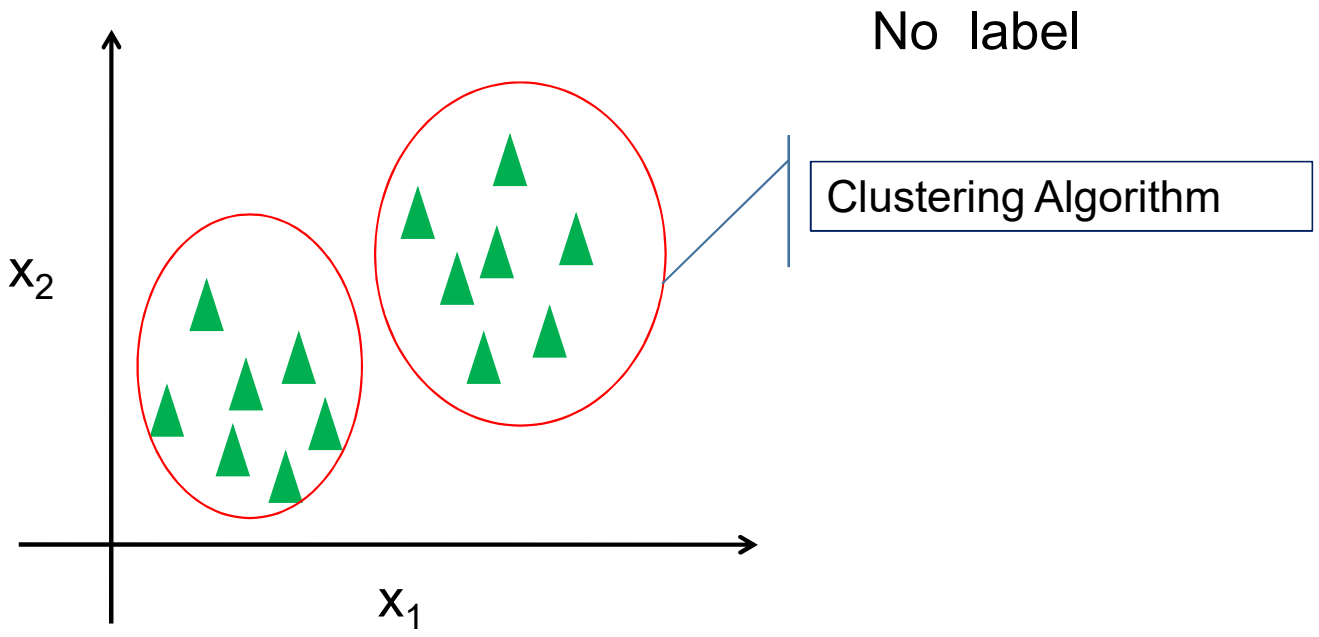
Two features examples

- Features:
  - color
  - texture
  - cost
  - …..

Supervised Learning



Un-supervised Learning

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Chennai Super Kings (CSK) players celebrate their win over Royal Challengers Bangalore (RCB) during their IPL 2015 match at MA Chidambaram Stadium in Chepauk, Chennai. (PTI Photo)


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Application of Clustering Algorithms

- Organizing computer clusters
- Social network analysis
- Market segmentation
- Astronomical image/data analysis
- Speaker recognition and many more…

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