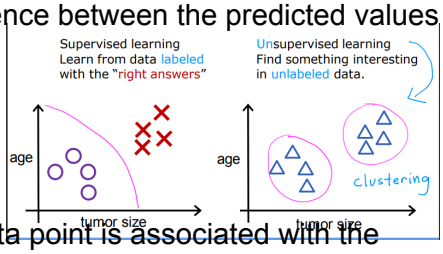
Notes about course Machine Learning Week 1

Regression Model:

- A regression model is a type of machine learning algorithm used for predicting a continuous outcome variable based on one or more input features.
- It is used when the target variable is numeric and has a continuous range, such as predicting prices, temperatures, or scores.
- The goal of regression is to find the best-fitting line or curve that minimizes the difference between the predicted values and the actual values.



Supervised vs. Unsupervised Machine Learning:

- Supervised Learning:
  - In supervised learning, the algorithm is trained on a labeled dataset, where each data point is associated with the correct output.
  - The goal is to learn a mapping from inputs to outputs, so the algorithm can make predictions on new, unseen data.
  - Examples include classification (assigning labels to data points) and regression (predicting numeric values).

- Unsupervised Learning:
  - Unsupervised learning deals with unlabeled data, where the algorithm aims to discover patterns or structures in the data.
  - Common tasks include clustering (grouping similar data points) and dimensionality reduction (reducing the number of features while retaining important information).

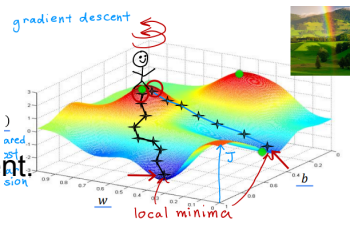
  - Unsupervised learning is exploratory in nature and is often used for data analysis and understanding.

Cost Function

$$J(w,b) = \frac{1}{2m}\sum_{i=1}^{m}(f_{w,b}(x^{(i)}) - y^{(i)})^2$$

Gradient Descent:

- **Optimization Algorithm:** Gradient Descent is an iterative optimization algorithm used to minimize a function, typically a loss function, by adjusting the parameters of a model.
- **Goal:** The primary objective of Gradient Descent is to find the set of parameter values that minimize a given cost or loss function. In the context of machine learning, this results in a model that fits the data well.
- **Local Minima:** Gradient Descent can get stuck in local minima, where the algorithm converges to a suboptimal solution. Techniques like momentum and adaptive learning rates can help alleviate this issue.



Learning Rate:

- The learning rate determines the size of the steps taken during each iteration of Gradient Descent.
- If the learning rate is too small, the algorithm may converge slowly.
- If the learning rate is too large, the algorithm might overshoot the minimum and fail to converge.

Remember, while this overview provides a general idea of the Gradient Descent process, there are variations and enhancements, such as stochastic gradient descent, mini-batch gradient descent, and various optimizers, that are used to improve convergence speed and stability during training.