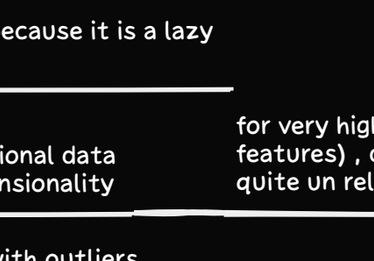
K Nearest Neighbors

- video
- github
- can be applicable for nd data
- intuition
  - Working
    - for a point P, get all the distance from p and rest of the point
    - get the k closest points from p
    - in the end do prediction on the basis of majority count (because we are using majority count -> we avoid even k values)
    - For example -> if majority of k points are 1 -> then the output will be 1
  - How to select k= the number of neighbors
    - approch 1
      - sqrt(n)
      - n= number of rows
      - Not very much suggested
    - approch 2
      - make a multiple knn model with different values of k(1,2..25,26,etc)
      - use cross validation and choose best accurate model
      - Better approach
- Note
  - It is adviced to standerdize your data if you are using knn
  - It is lazy learning technique
    - Because we just store points while training and most of work done while prediction
    - prediction become slow
- over fitting and under fitting in knn
  - for very high value of k lead to under fitting
  - for very low value of k lead to over fitting
- Limitation
  - Not good for large data because it is a lazy learning technique
  - Not good for high dimentional data because of curse of dimensionality
    - for very high dimensional data(like 500 features) , distance concept becomes quite un reliable
  - Not work good for data with outliers
  - Not work good for Imbalanced data set
    - in output column
      - 900 yes points
      - 100 no points
  - Not work good for data set that have features with very large scale difference
    - that's why standardization is suggested
- code
  - choosing the best model

```
for i in range(1,16):
    knn = KNeighborsClassifier(n_neighbors=i)
    knn.fit(X_train,y_train)
    y_pred = knn.predict(X_test)
    scores.append(accuracy_score(y_test, y_pred))
```




```
import matplotlib.pyplot as plt
plt.plot(range(1,16),scores)
```

  - single model

```
from sklearn.neighbors import KNeighborsClassifier
knn = KNeighborsClassifier(n_neighbors=3)
knn.fit(X_train,y_train)
y_pred = knn.predict(X_test)
```