Machine Learning in Medical Science

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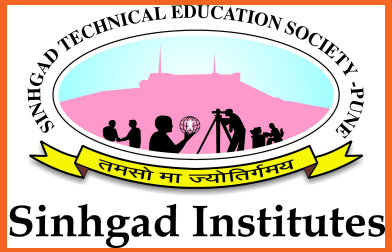


Motivation

- Study and discuss the development of machine learning in medical field
- Enable use of machine learning in medical diagnosis in disease identification and detection
- Enable use of AI in medical treatment.

2. Objectives

- **Introduction**
  Discuss the basic types and usage of Machine Learning Algorithms
- **Methodology**
  Discuss the main machine learning methods used in medical field with examples
- **Discussion**
  Discuss issues and key challenges. Also. future trends and where it's heading.
- **Conclusion**

1. Introduction

Machine learning (ML) is the scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on patterns and inference instead.

➔ **Unsupervised**

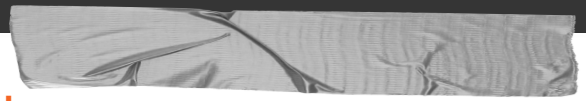
Principal component analysis, Clustering algorithms.

➔ **Supervised**

Naive Bayes Classifier, Decision Tree Classifier, Neural Networks, Support Vector machines, Ensemble methods, Nearest Neighbors, Linear Regression.

Terminologies:

- Models
- Training
- Accuracy
- Black Box
- Overfitting



Sample Code

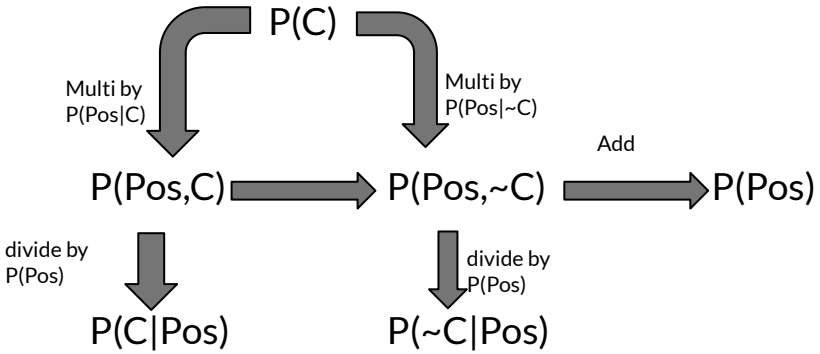
```
>>> from sklearn import tree
    from sklearn.metrics import accuracy_score
>>> clf = tree.DecisionTreeClassifier(min_samples_split = 40)
>>> clf.fit(features_train,labels_train)
>>> pred = clf.predict(features_test)
>>> accuracy = accuracy_score(labels_test, pred)
```

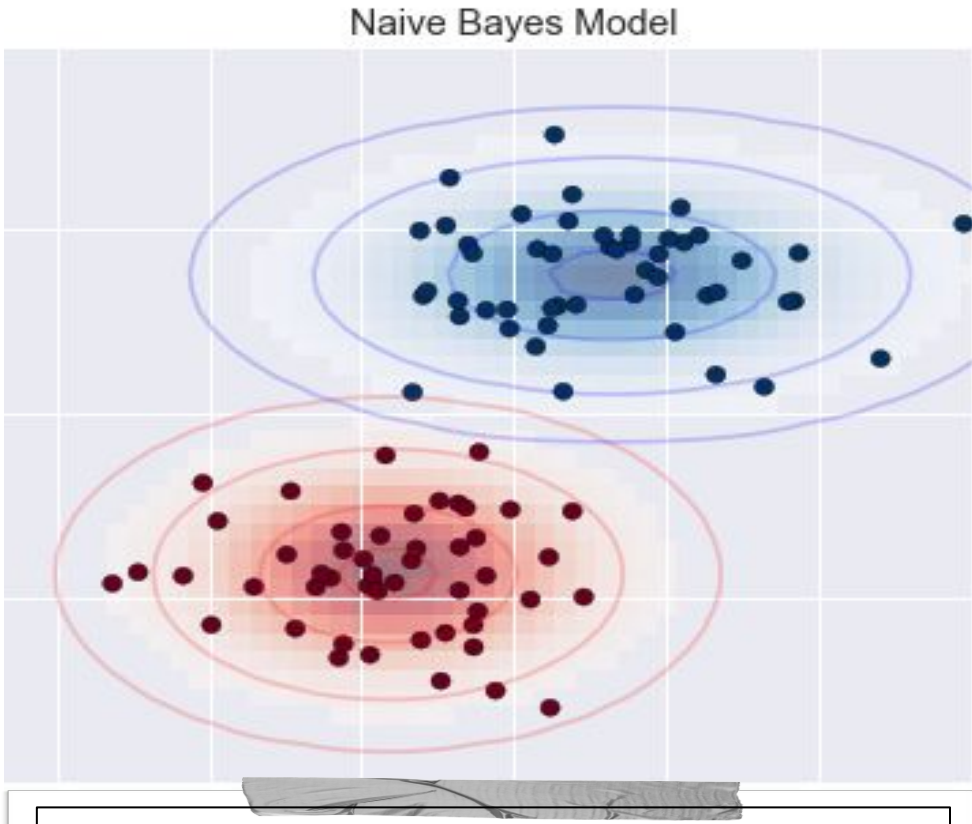
Specific Requirements for Machine Learning Systems:

- Good performance
- Dealing with missing data
- Dealing with noisy data
- Explanation ability
- Reduction of the number of tests

NAIVE BAYES CLASSIFIER

P(C) -prior probability
P(Positive|C)) - sensitivity
P(Negative|~C) - specificity





Formula

$$P(C|V_1, \ldots, V_n) = P(C) \prod_i \frac{P(C|V_i)}{P(C)}.$$

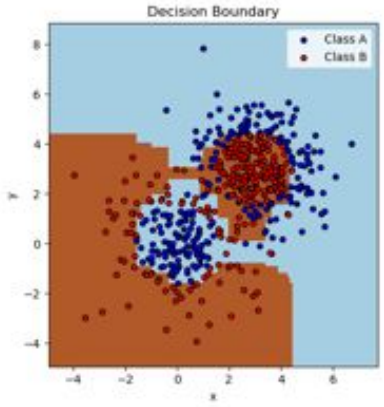
Advantages of Naive Bayes:

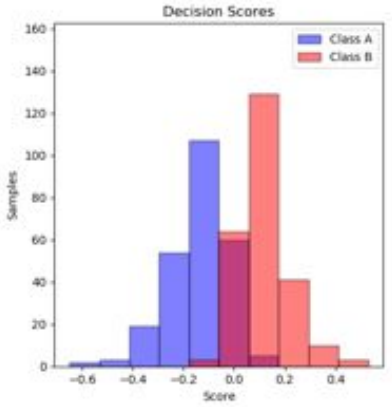
- Fast to implement
- Less model dependency

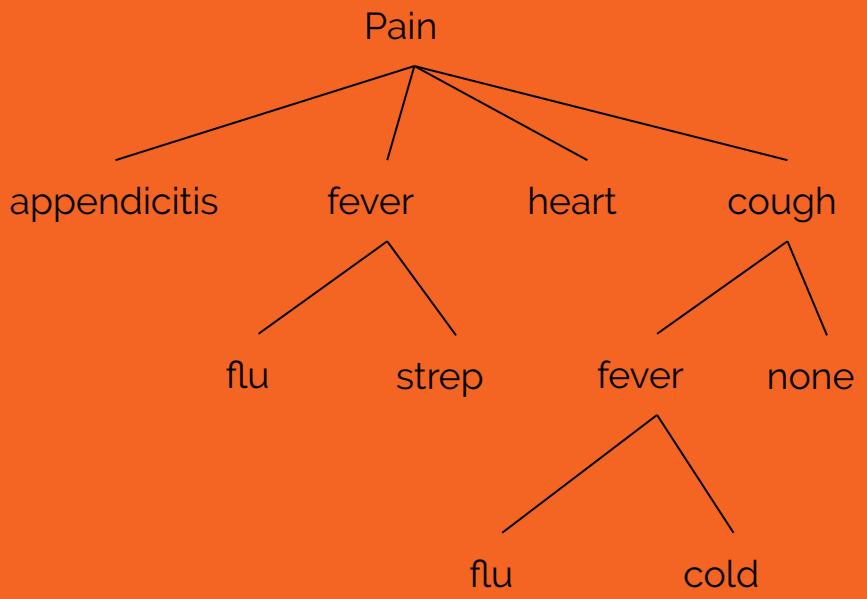
Disadvantages of Naive Bayes:

- No variable
- Ignores underlying geometry of data

DECISION TREE CLASSIFIER







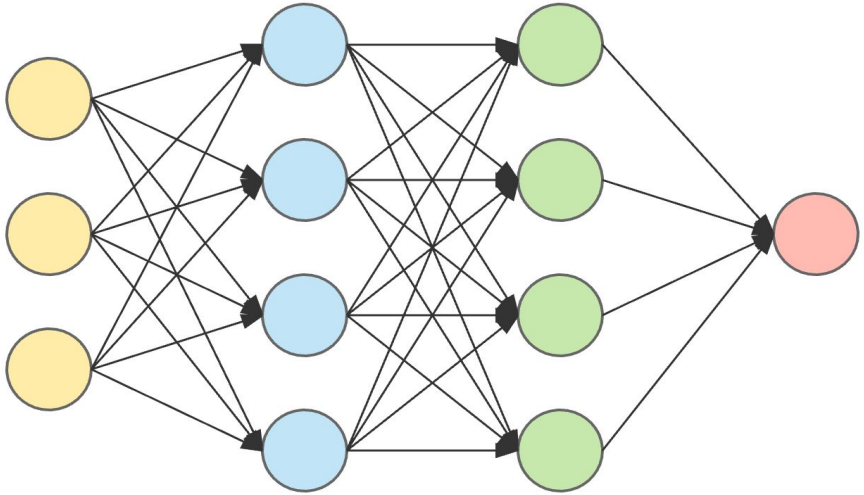
Advantages of Decision Tree:

- Handle large number of features
- Easily interpretable

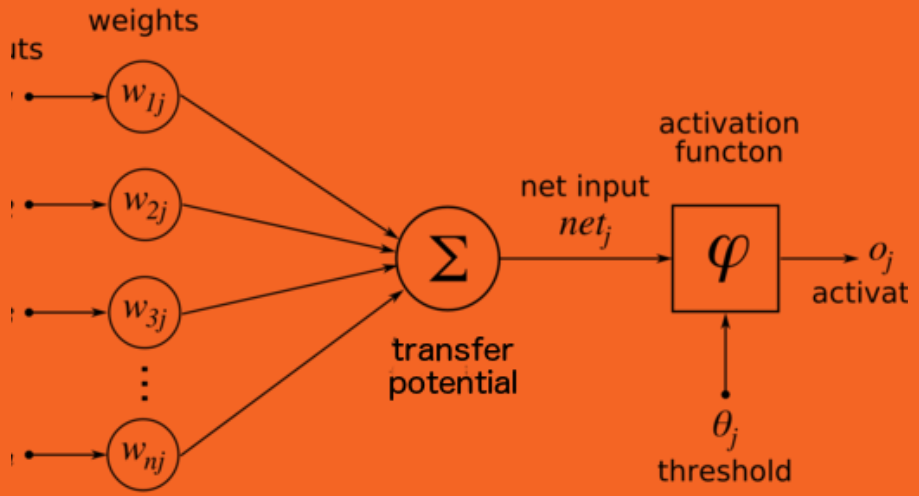
Disadvantages of Decision Tree:

- Tend to over fit
- Little training data for lower nodes

NEURAL NETWORKS



input layer hidden layer 1 hidden layer 2 output layer



Advantages of Neural Networks:

- Handle Noisy data
- Detect non-linear and complex relations

Disadvantages of Neural Networks:

- Slow training relation
- Hard to interpret

KEY ISSUES AND CHALLENGES:

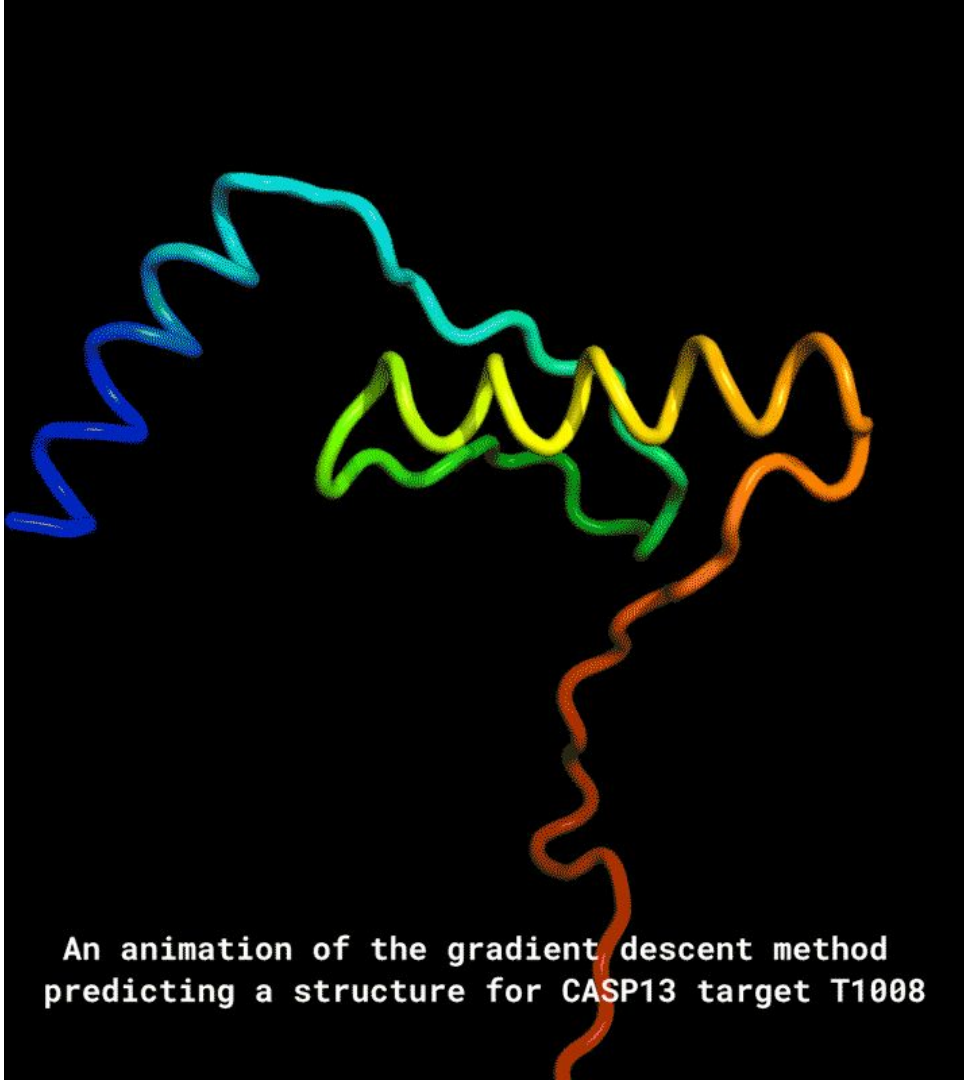
- Datasets
- Data security
- Data inaccuracies
- Accountability
- System implementation
- Threat to jobs

Emotiv

Is a privately held bio-informatics and technology company developing and manufacturing wearable electroencephalography(EEG) products

Aplhafold

Deepmind’s Aplhafold system correctly predicts 25/43 protein folding structures



What people are saying

AI can help doctors predict medical events

Sundar PIchai, Google CEO

Deep neural networks has totally changed the game around medical imaging

Anthony Goldbloom, Kaggle CEO

AI will be the best or the worst thing for humanity

Elon Musk

Quotes by famous people

Conclusion

Machine Learning is very useful for medical diagnosis and curing diseases.


Questions?