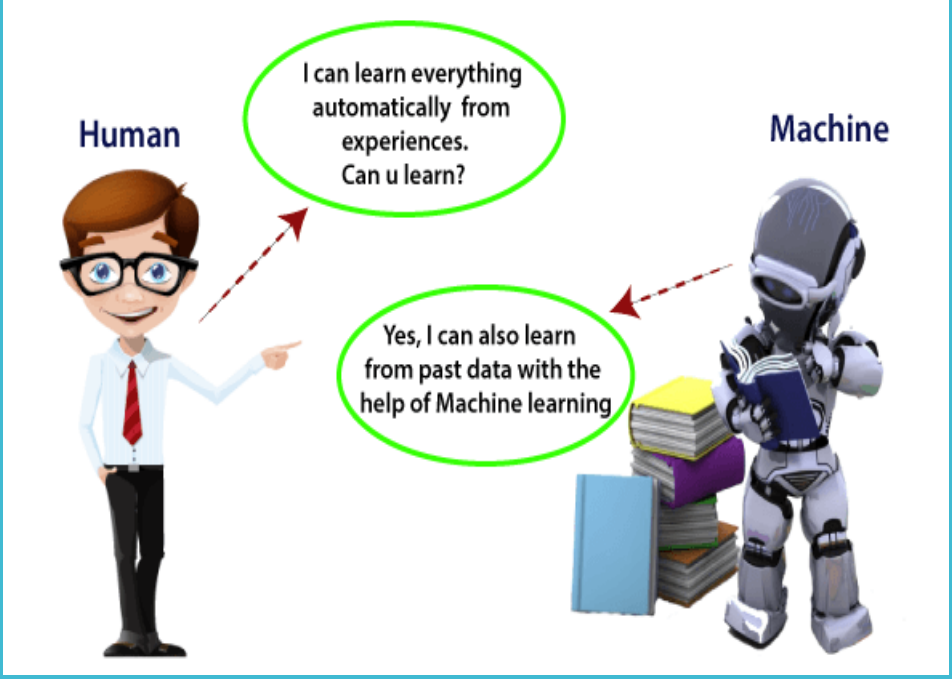
What is AI?



Marwadi University

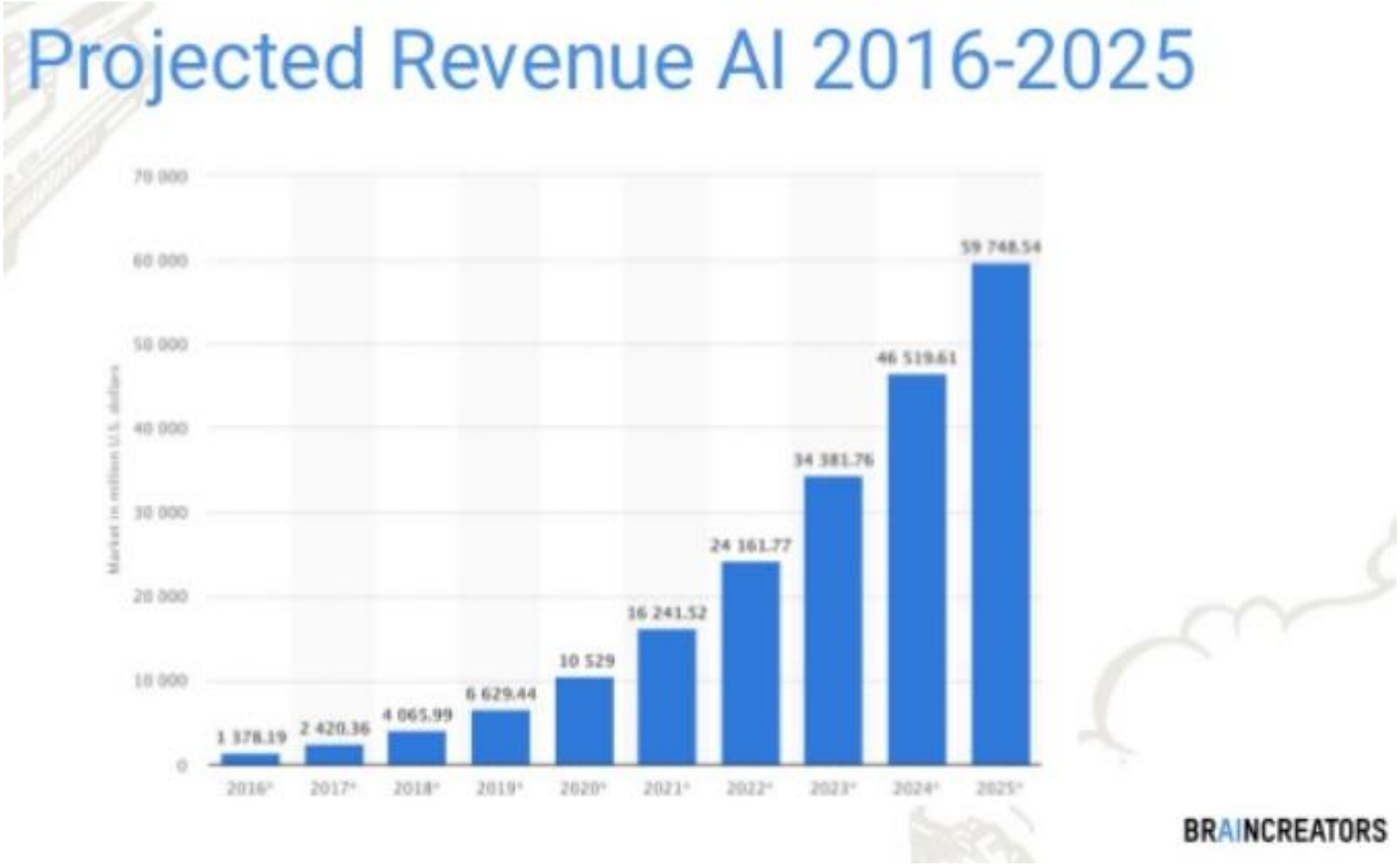
Department of Information and Communication Technology

Unit 1: Introduction to AI

Artificial Intelligence (01CT0703)

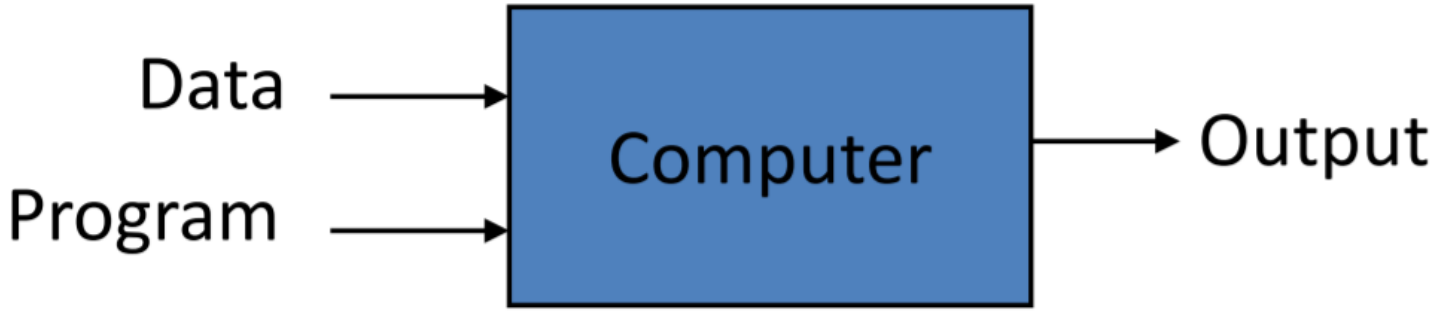
Prof. Nishith Kotak

Future of AI

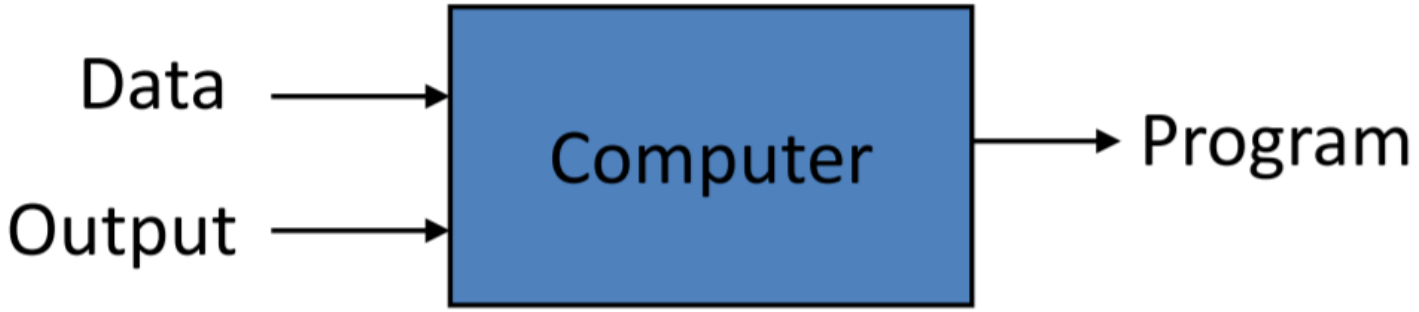

Projected Revenue AI 2016-2025
70 000
60 000
50 000
40 000
30 000
20 000
10 000
0
1 378.19
2 420.36
4 065.99
6 629.44
10 529
16 241.52
24 161.77
34 381.76
46 519.61
59 748.54
2016*
2017*
2018*
2019*
2020*
2021*
2022*
2023*
2024*
2025*
BRAINCREATORS

ML Vs Programming

Traditional Programming



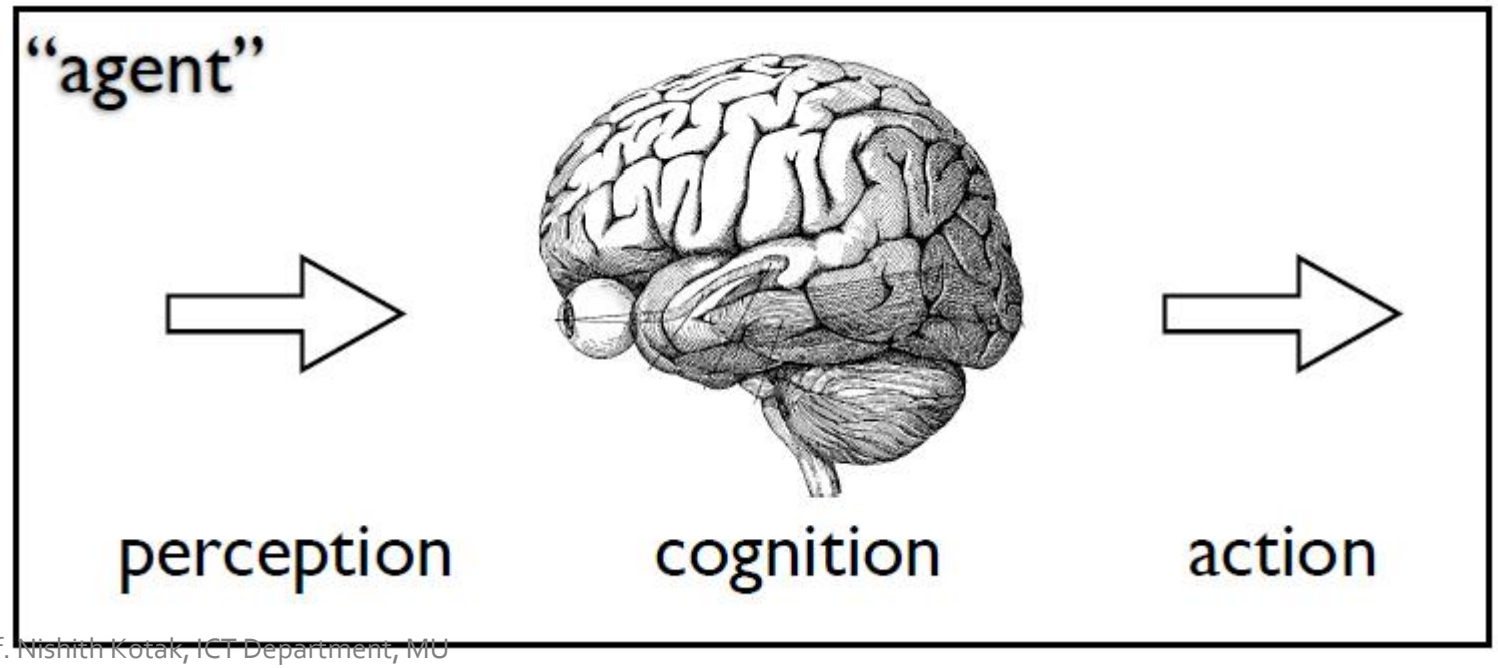
Machine Learning



Intelligent Systems

Three Steps for a knowledge based agents:

1. The stimulus must be translated into an internal representation
2. The representation is manipulated by cognitive processes to derive new internal representations
3. These in turn are translated into action

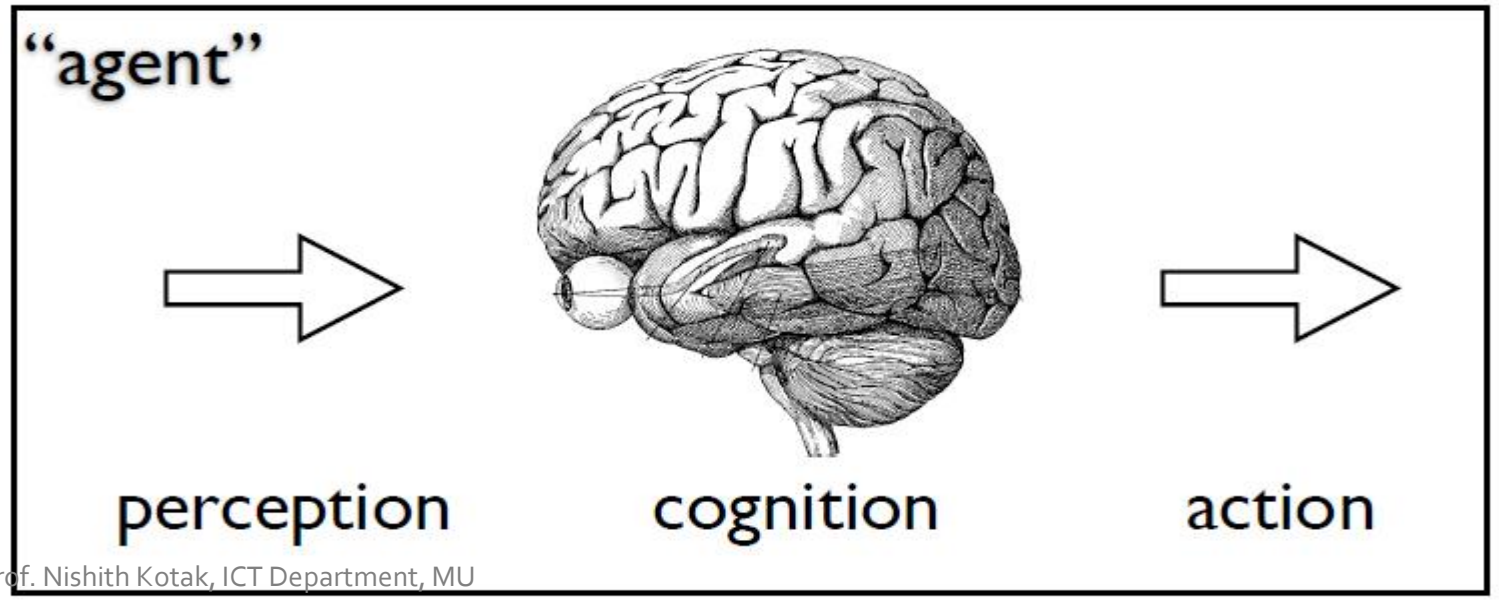


Representation

- All AI problems require some form of representation for perception.

Like Chess Board, Maze, Text, Object, Sound, Visual Scene

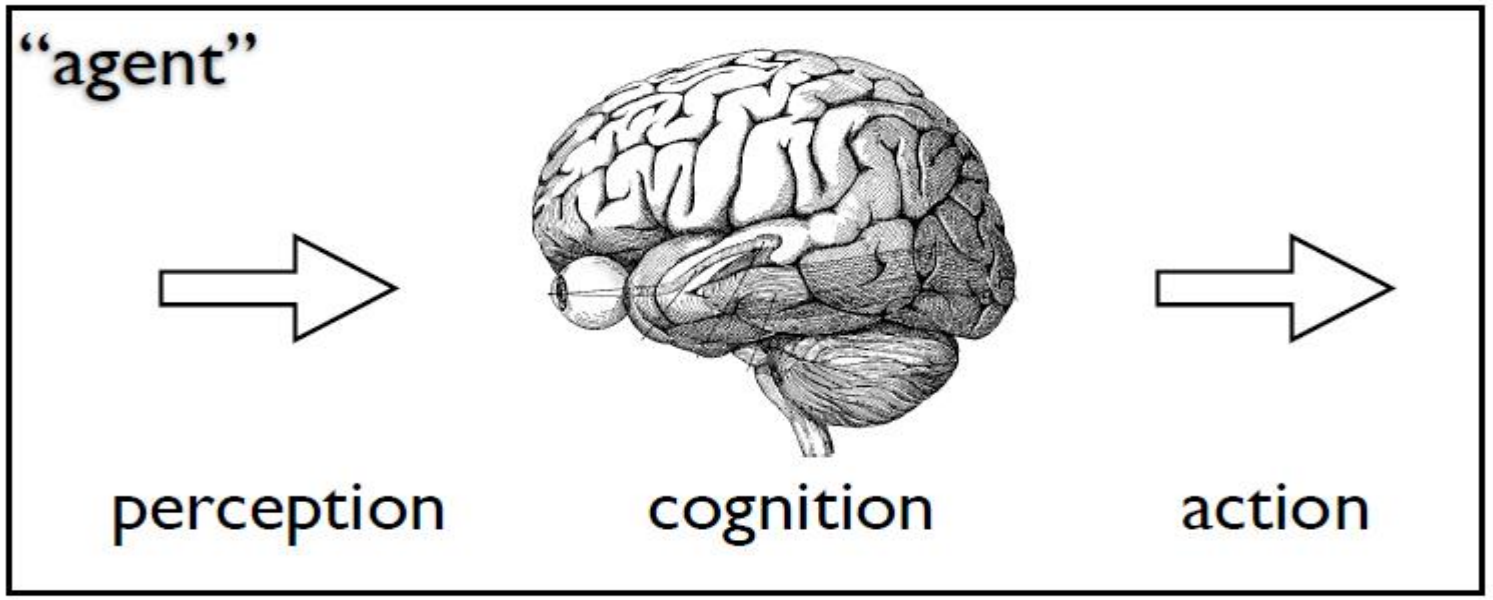
- A major part AI is representing the problem space so as to allow efficient search for the best solution(s).



Output

- The output action can also be complex.

Like Next Move, Text, Label, Actuator, Movement



Thinking

- What do you do once you have a representation? This requires a goal.
- Choose actions that maximize goal achievement given available information

Chess Board → Find Best Move
Maze → Shortest Path
Text → Semantic Parsing
Object → Recognition
Room → Object Localization
Sound → Speech Recognition
Visual Scene → Path Navigation

Strategy

- What if your world includes another agent?
- How do we choose moves/actions to win? Or guarantee fairest outcome?

Eg.

- strategic game play
- Auctions
- uncertainty: chance and future actions

Reasoning

- Reasoning can be thought of as constructing an accurate world model
- What can be logically inferred give available information?

Facts → Logical Consequences
Observations → inferences
"wet ground"? → "rained" or "sprinkler"

Reasoning with uncertain information

- Most facts are not concrete and are not known with certainty.
- How do we give the proper weight to each observation?
- What is ideal?

If “fever” → “swine flu” or “corona” or “malaria” or “dengue” or “viral infection”

Where AI??

Myths about AI

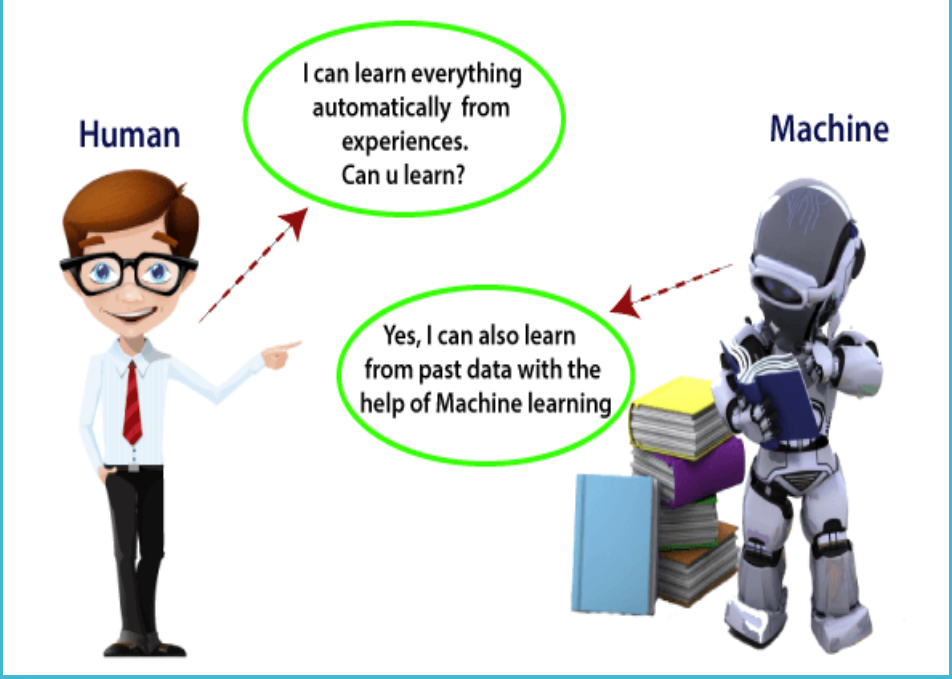
- AI is like "HUMAN INTELLIGENCE"
- We can buy AI to solve our problem
- AI learns on its own

Branches of AI

- Machine Learning
- Deep Learning
- Neural Networks
- Data Analytics
- Natural Language Processing
- Recommendation System
- Computer Vision
- Robotics
- Speech Recognition
- Cognitive Modelling
- Big Data Analytics

and so on .....

Basics of Machine Learning



Marwadi University

Department of Information and Communication Technology

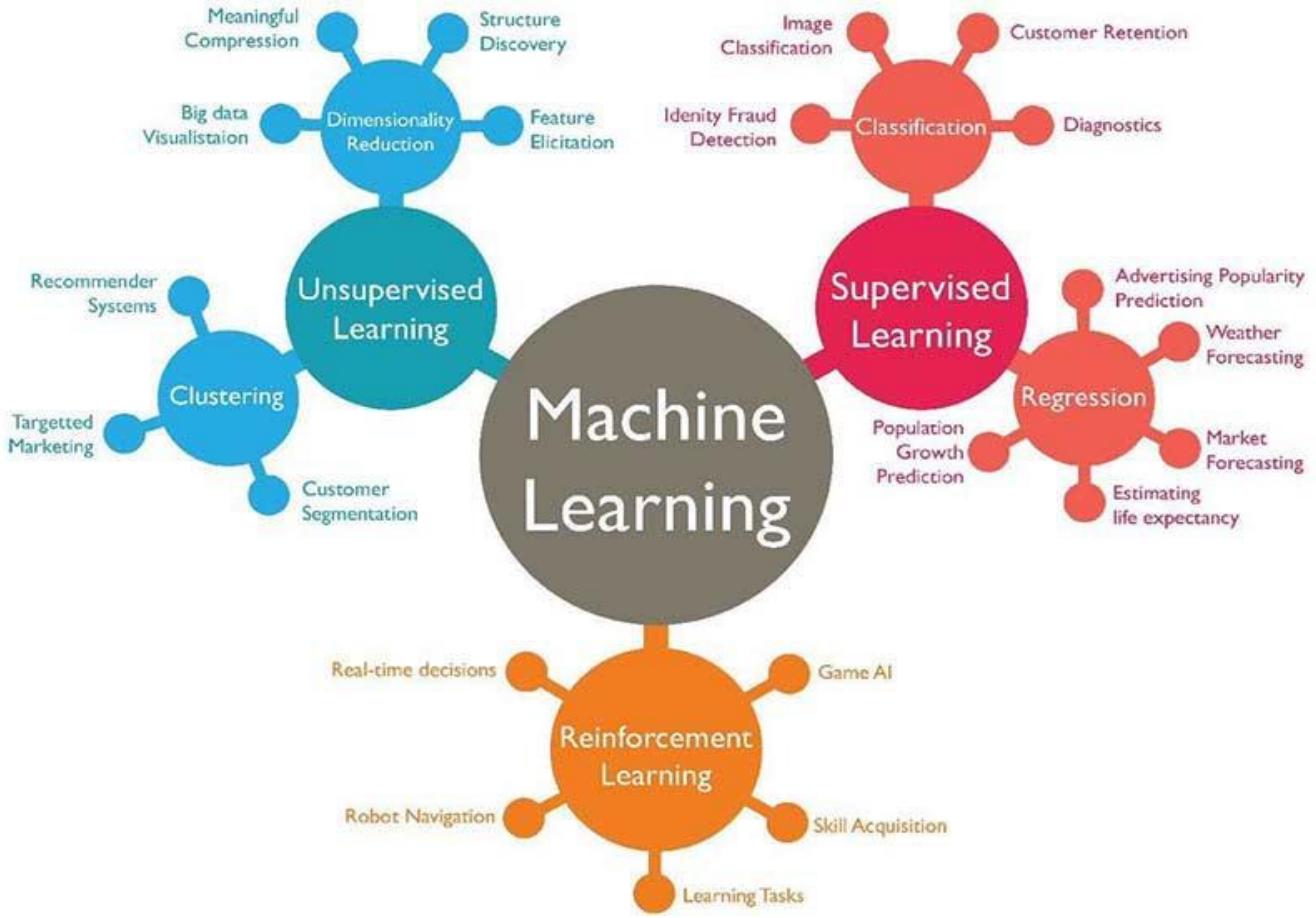
Unit 7:
Deep Learning

Artificial Intelligence (01CT0703)

Prof. Nishith Kotak

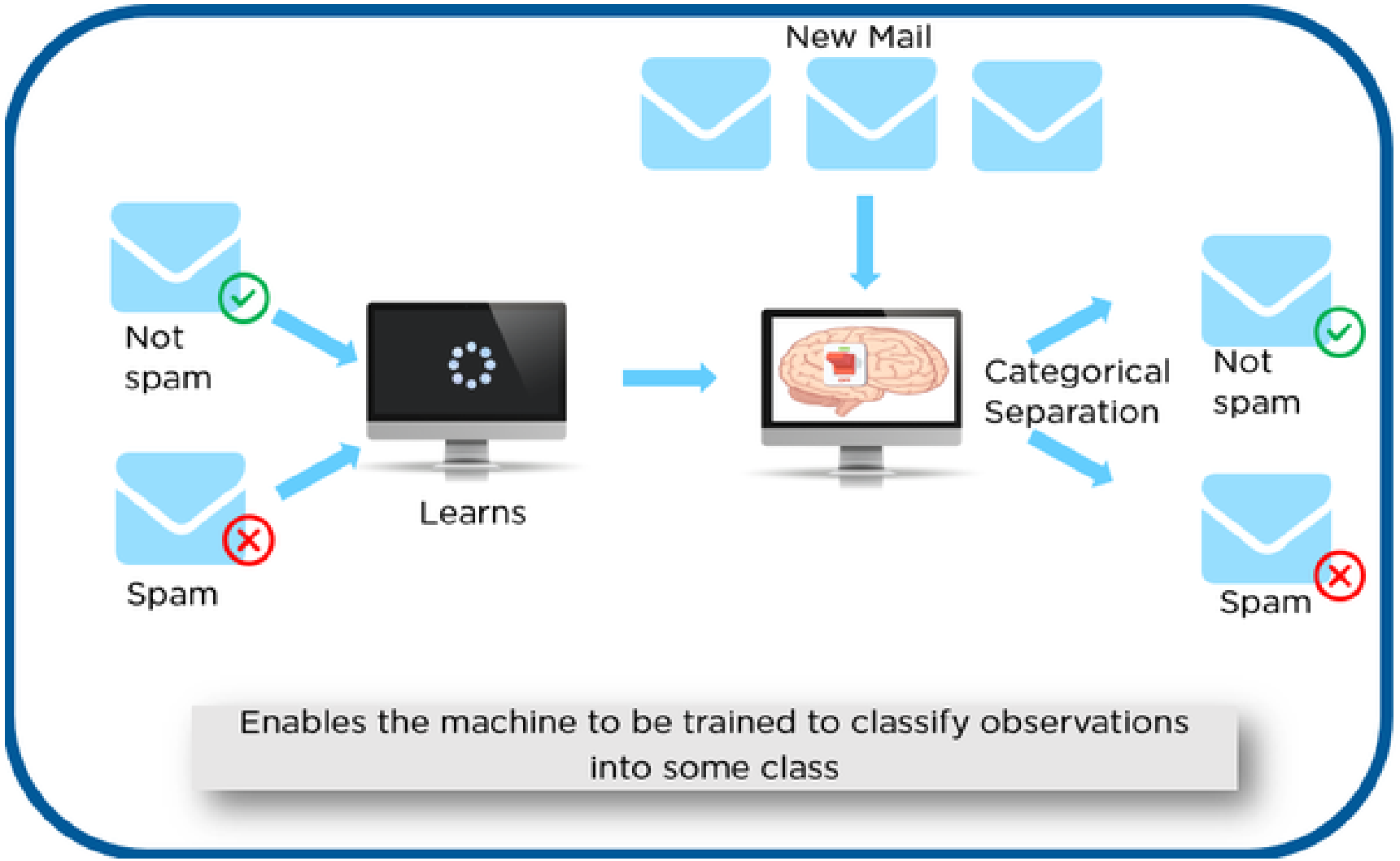
Machine Learning

- Machine Learning Algorithms enables the computers to learn from the data and even improve themselves without being programmed explicitly



https://towardsdatascience.com/introduction-to-machine-learning-for-beginners-eed6024fdb08

Supervised Learning-An Example



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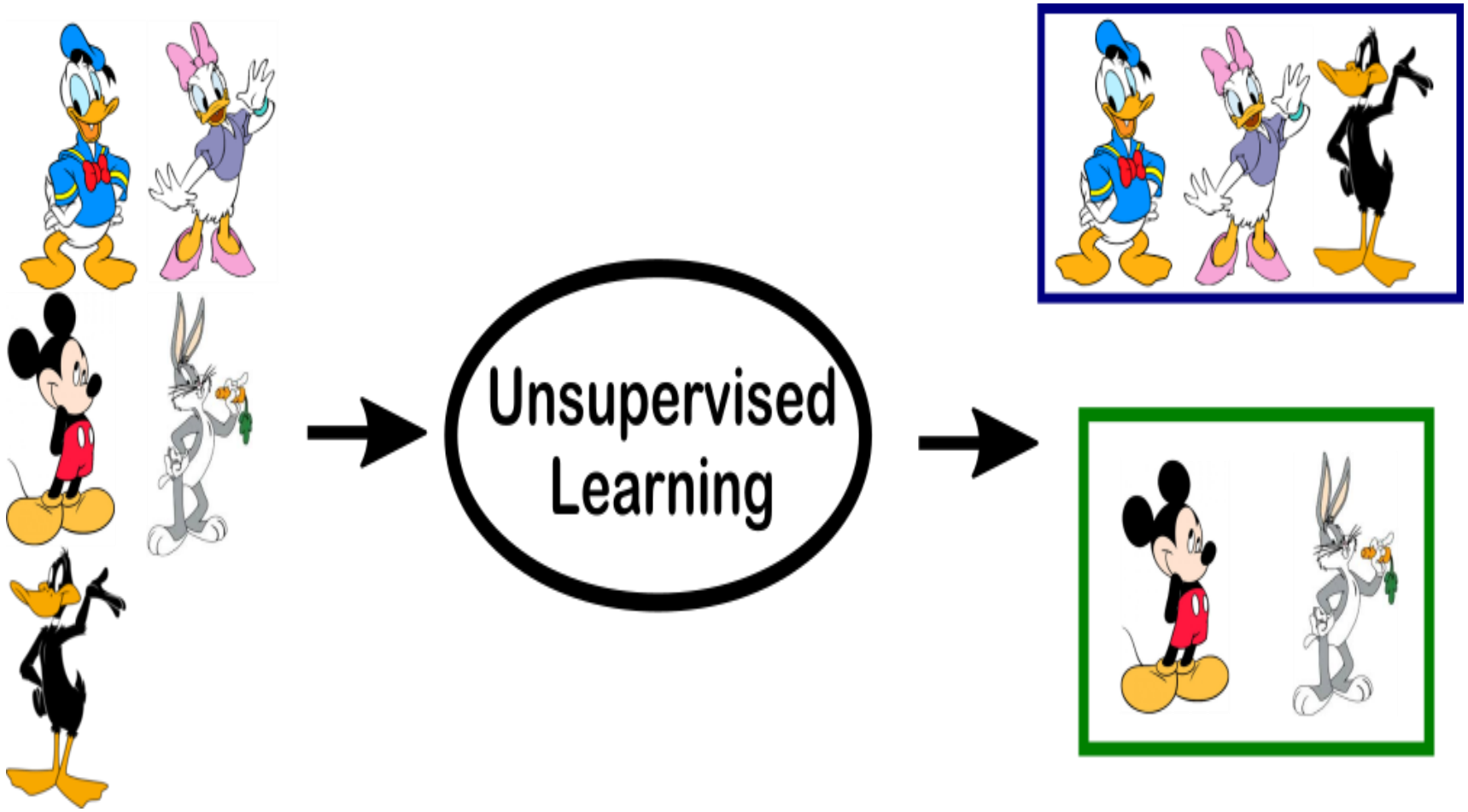
Unsupervised Learning-An Example



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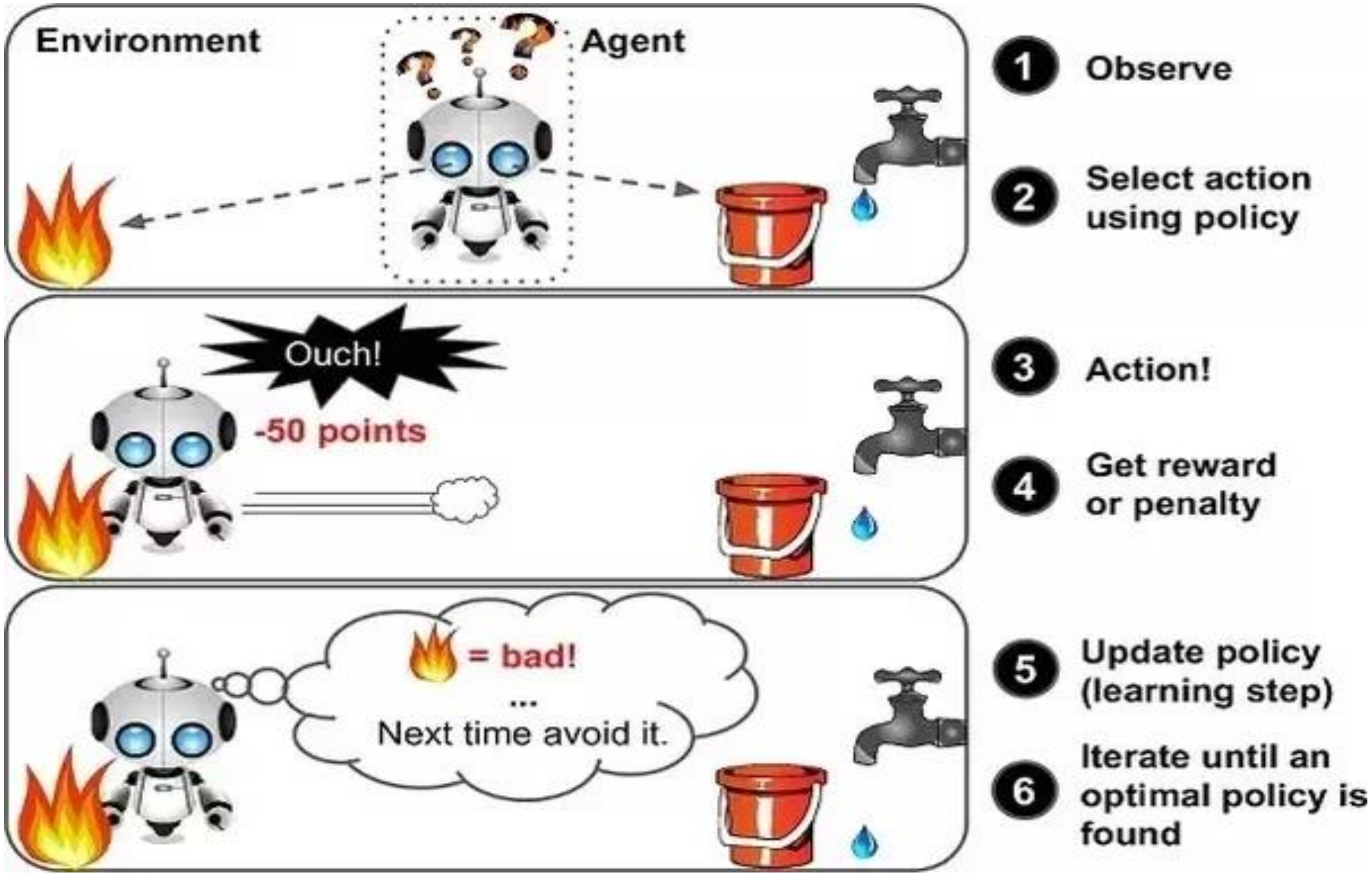
Reinforcement Learning : An Example



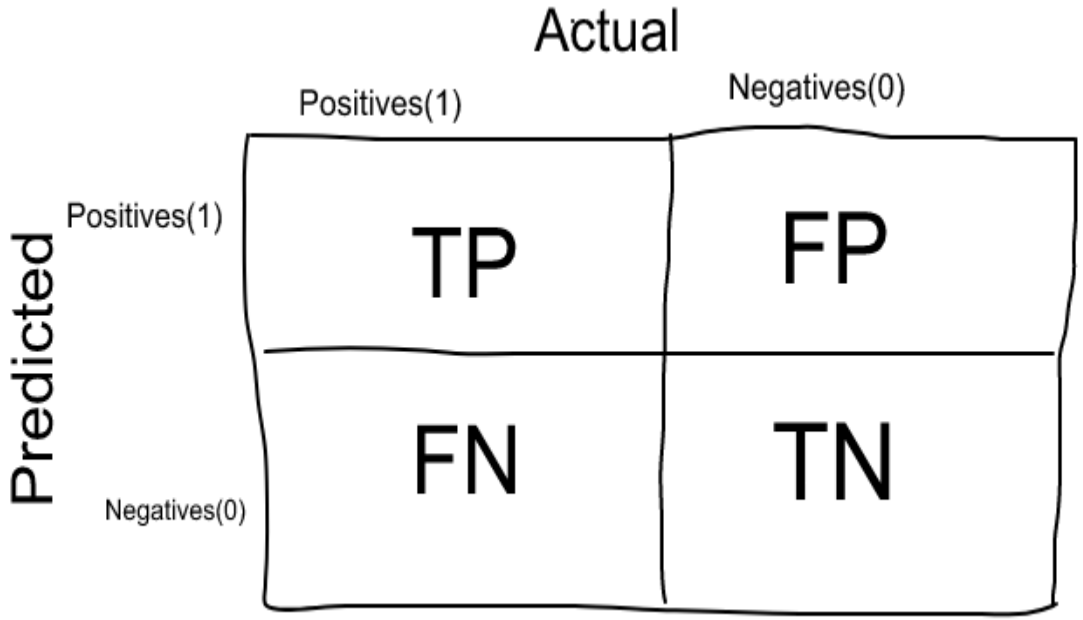
https://towardsdatascience.com/introduction-to-machine-learning-for-beginners-eed6024fdb08

Performance Measures (1/3)

- Confusion Matrix
- Accuracy
- Precision
- Recall
- Specificity
- F1 Score
- Precision-Recall Curve
- ROC Curve
- PR vs ROC curve

Performance Measures (2/3)

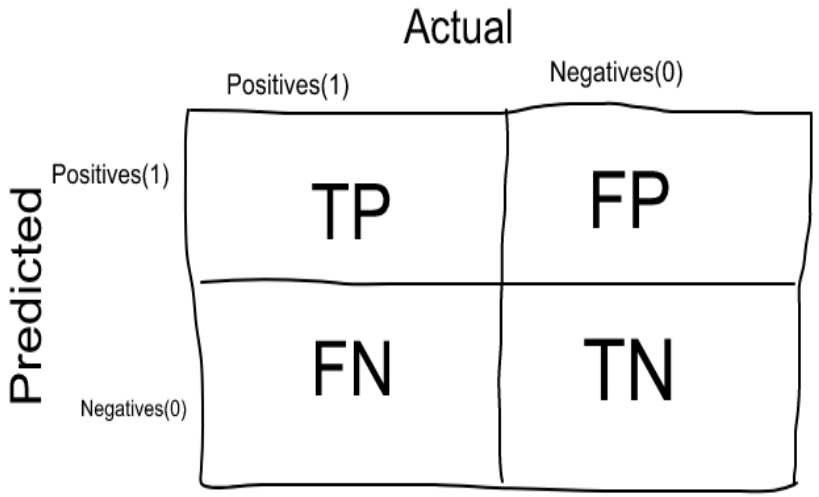
Confusion Matrix



https://medium.com/@MohammedS/performance-metrics-for-classification-problems-in-machine-learning-part-i-b085d432082b

Performance Measures (3/3)

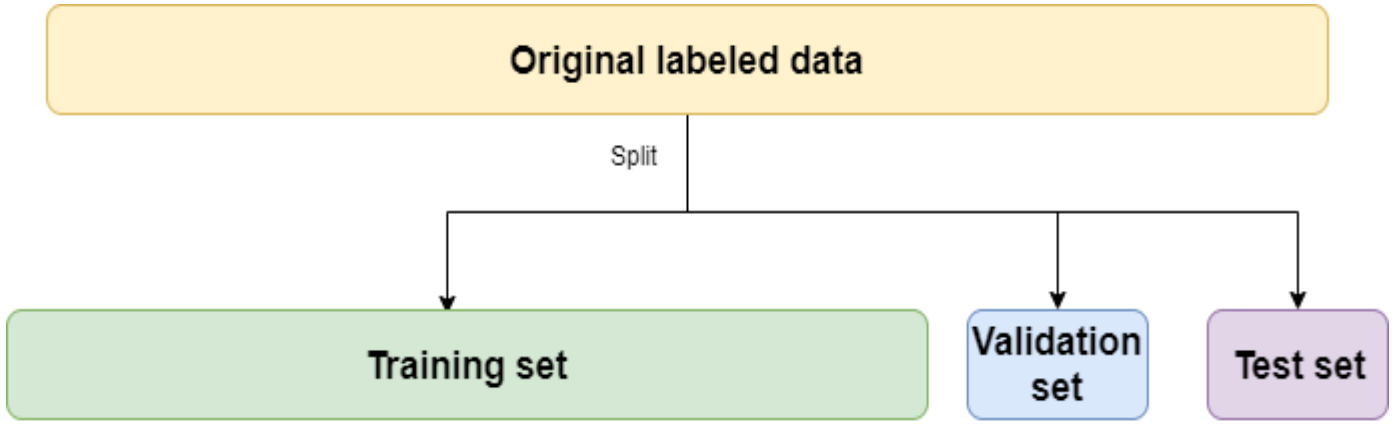
- Accuracy = (TP+TN)/Total
- Precision = TP/(TP+FP)
- Recall/ Sensitivity = TP/(TP+FN)
- Specificity = TN/(TN+FP)
- F1 Score = (2*Precision*Recall)/(Precision + Recall)



https://medium.com/@MohammedS/performance-metrics-for-classification-problems-in-machine-learning-part-i-b085d432082b

DataSets

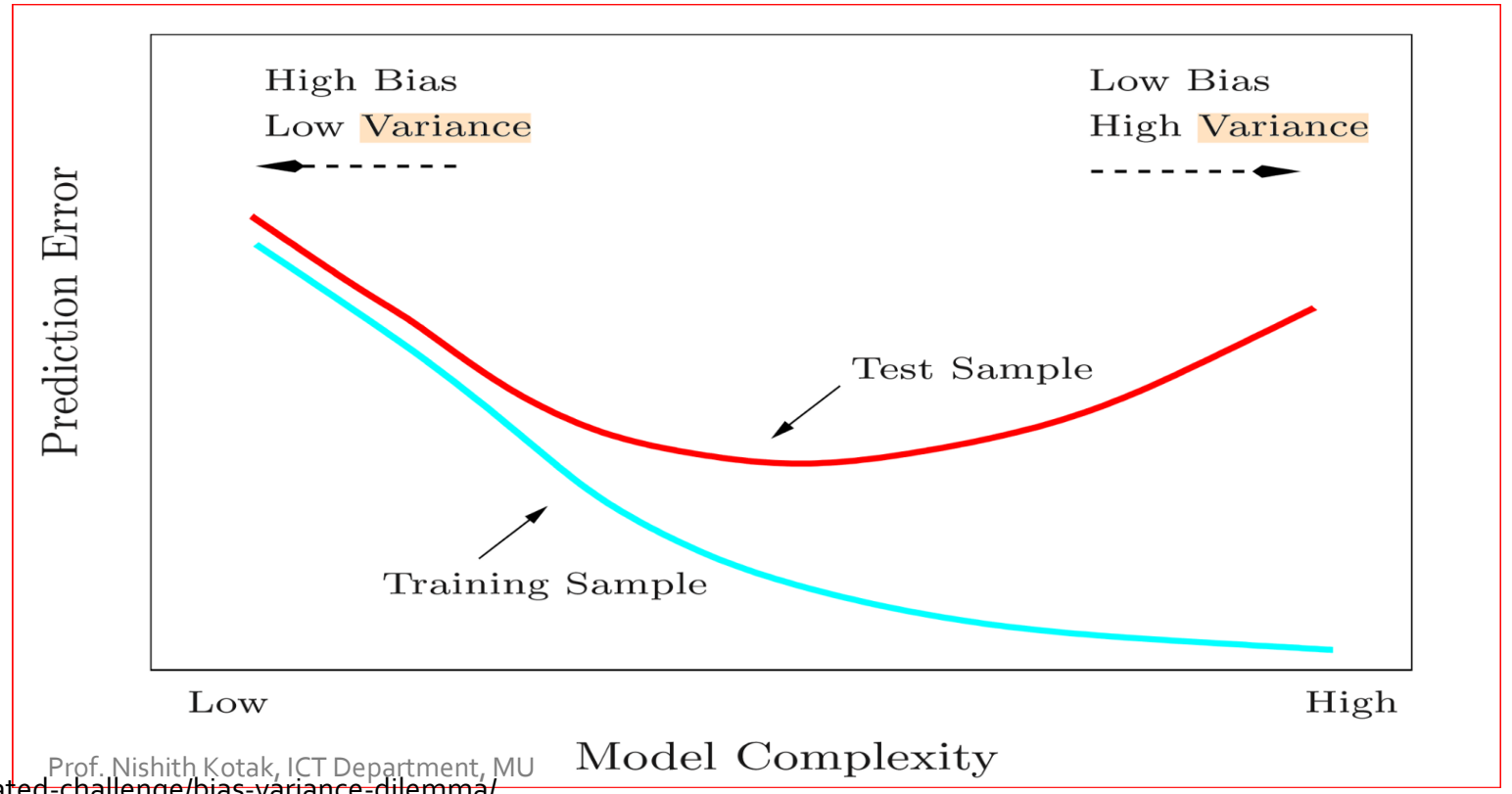
- **Training Dataset**: That we use to train the model. Model sees and learns from this data
- **Validation Dataset**: The sample of data that is used to provide an unbiased evaluation of a model to tune the hyperparameters to select the best model fit
- **Testing Dataset**: The sample of data that is used to provide an unbiased evaluation of a final model fit on the training dataset, that is evaluated using validation dataset



https://www.brainstobytes.com/test-training-and-validation-sets/

Bias Vs Variance

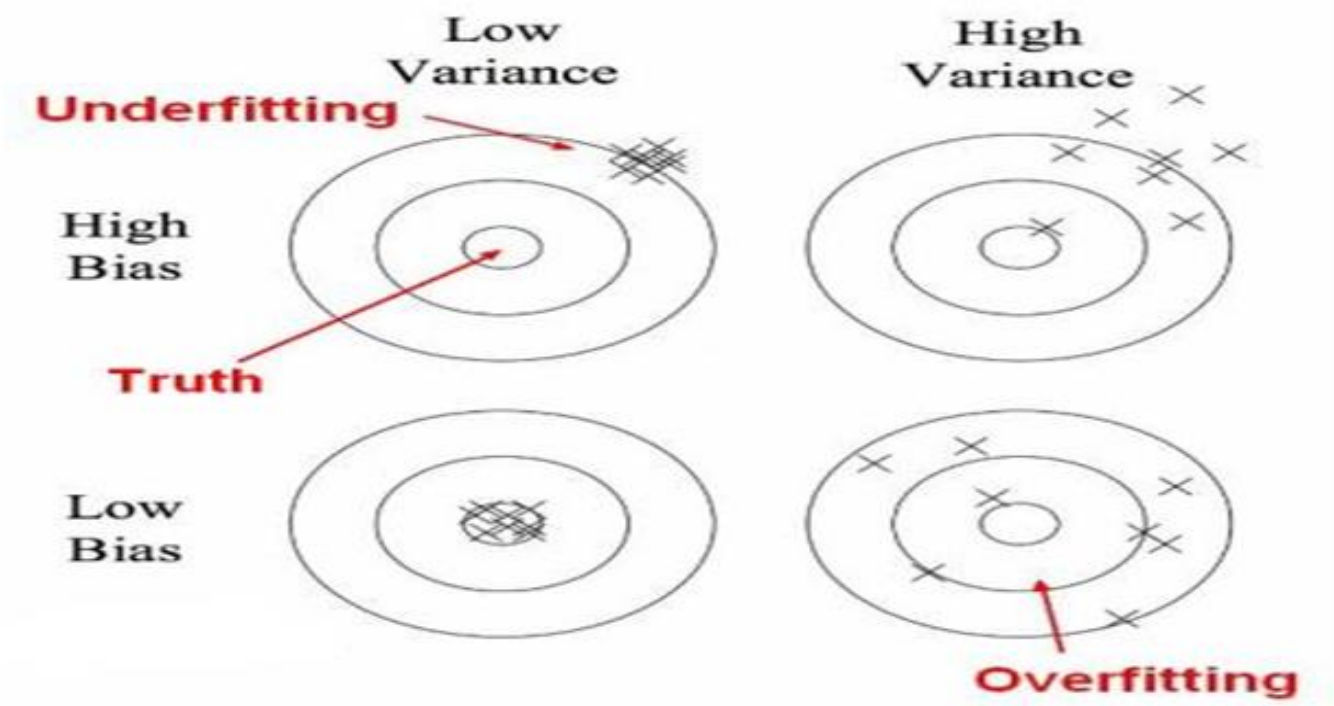
- **Bias** is the difference between the average prediction of our model and the correct value which we are trying to predict
- **Variance** is the variability of model prediction for a given data point or a value which tells us spread of our data

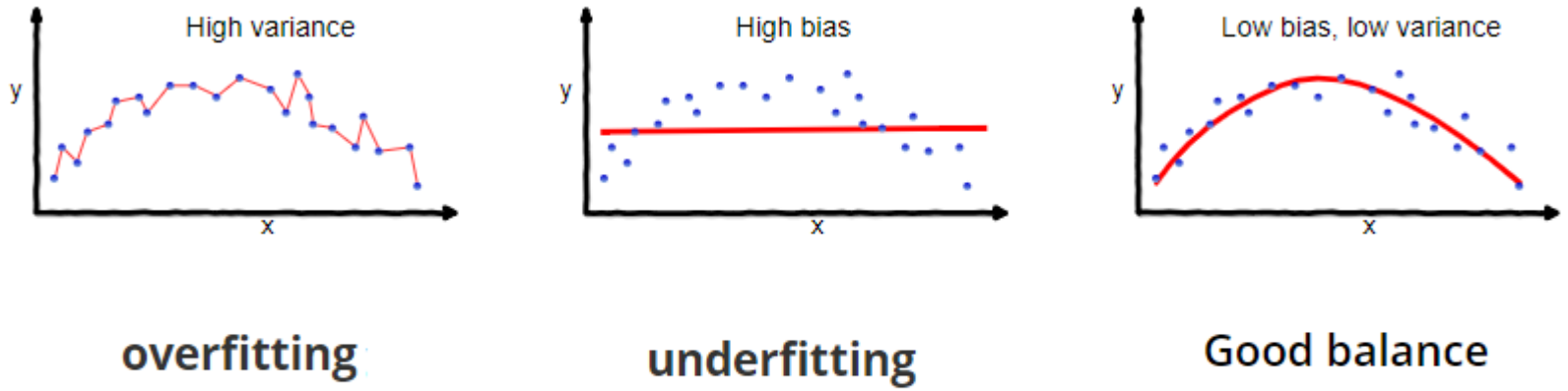


https://storybydata.com/datacated-challenge/bias-variance-dilemma/

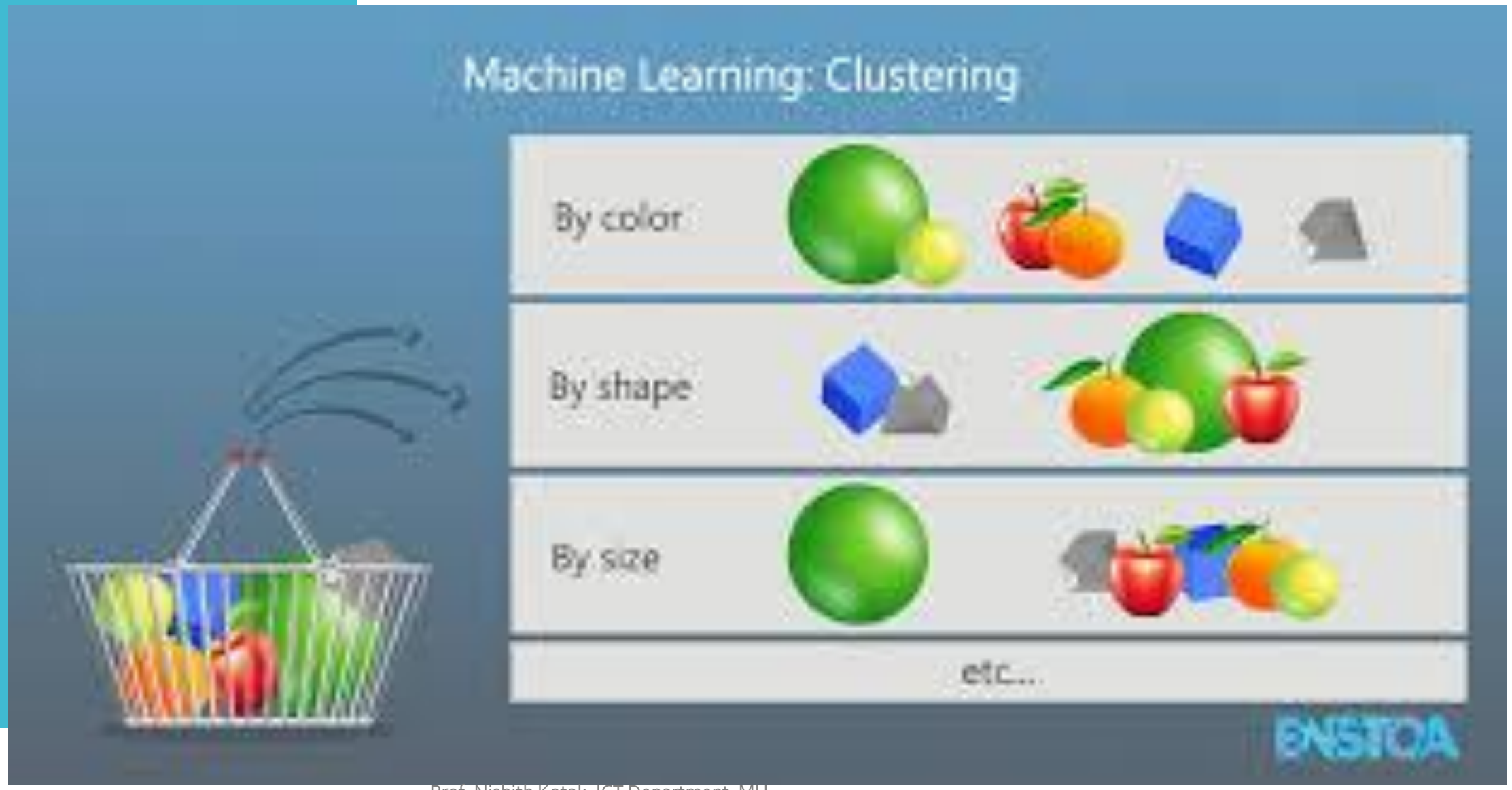
Overfitting Vs Underfitting

Overfitting Vs Underfitting

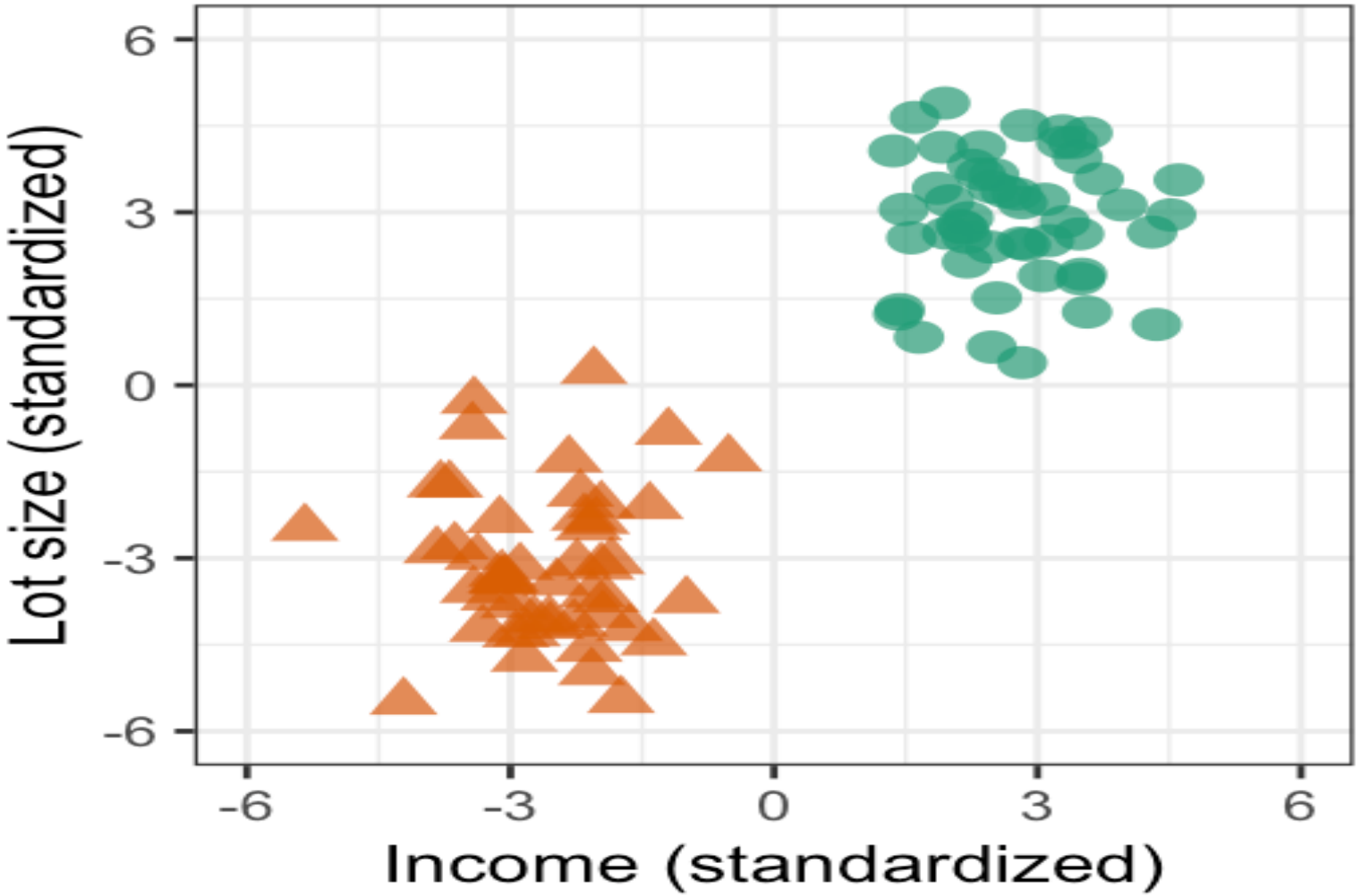


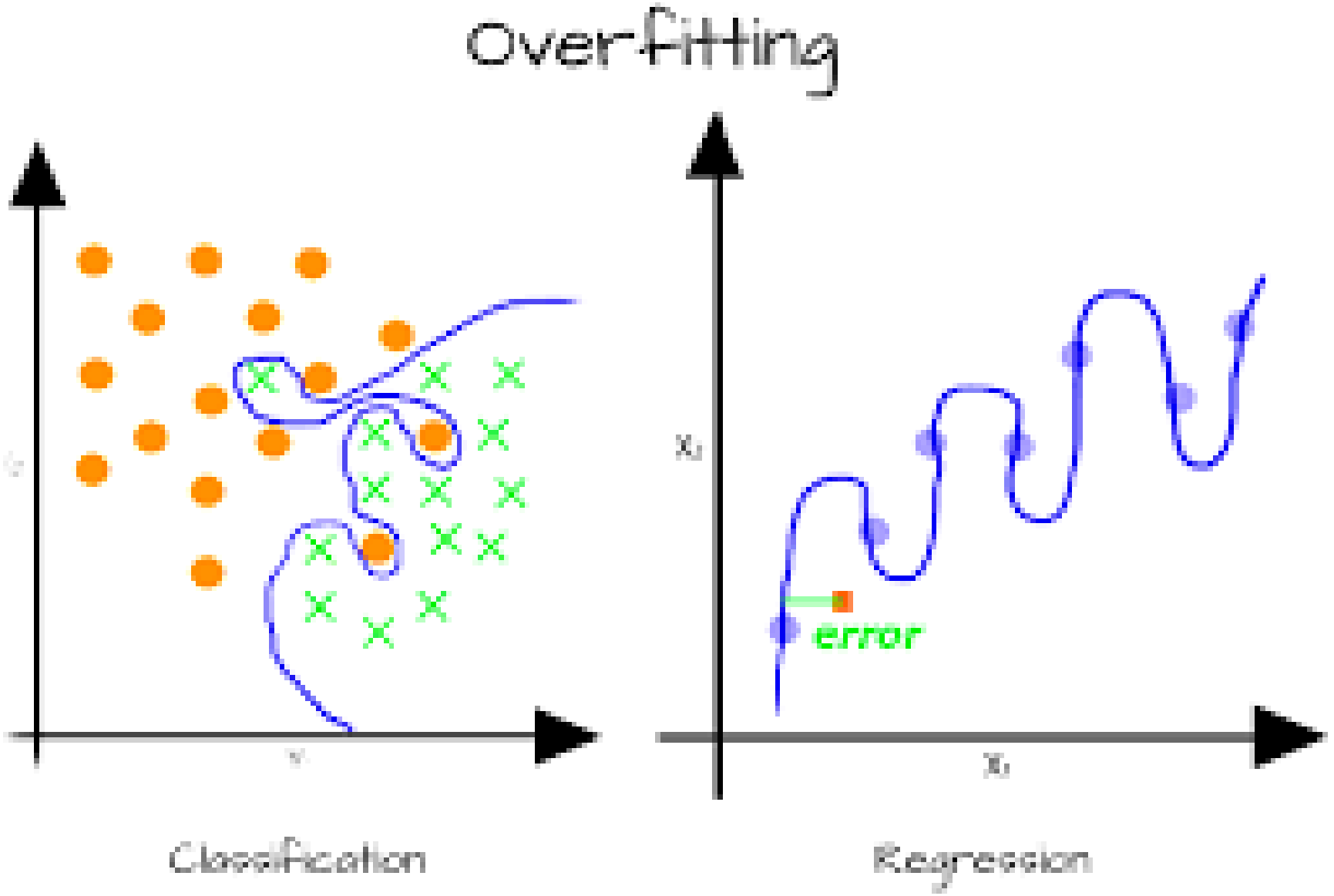


https://towardsdatascience.com/understanding-the-bias-variance-tradeoff-165e6942b229


Machine Learning: Clustering
By color
By shape
By size
etc...
ENSTOA

Classification




Overfitting
error
Classification
Regression