ML Part-3

Shiva Reddy

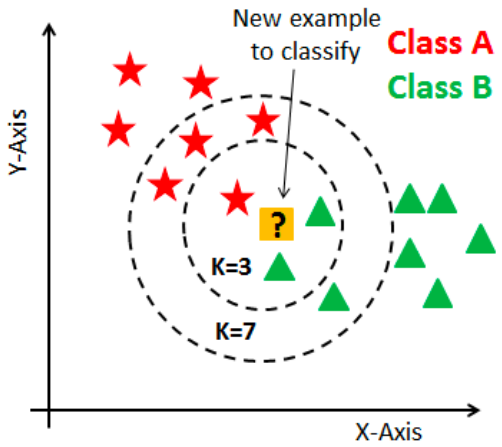
Imp criteria while choosing best ML Model ?

Scalability

Performance

Interpretability

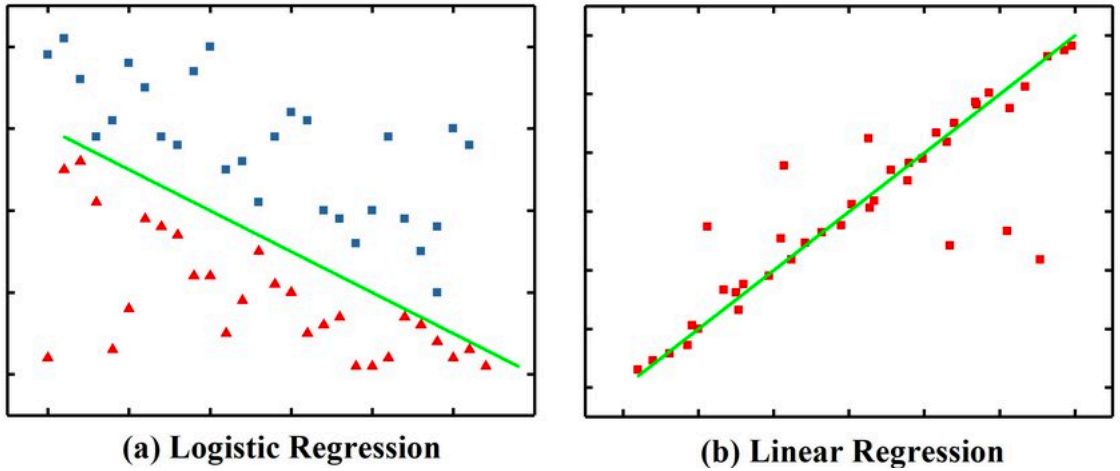
K-Nearest Neighbor



Imp Pointers on KNN :

Not Scalable

Linear Models



Imp Pointers on Linear Models :

Decision boundary : Linear

Highly Interpretable models

E.g. Sales = W1 * Digital Media + W2 * TV + W3 * Offline Adv

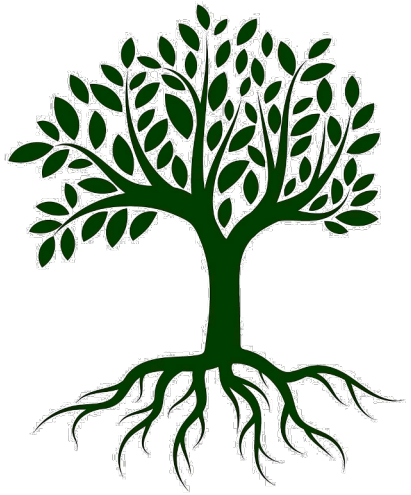
Decision Tree

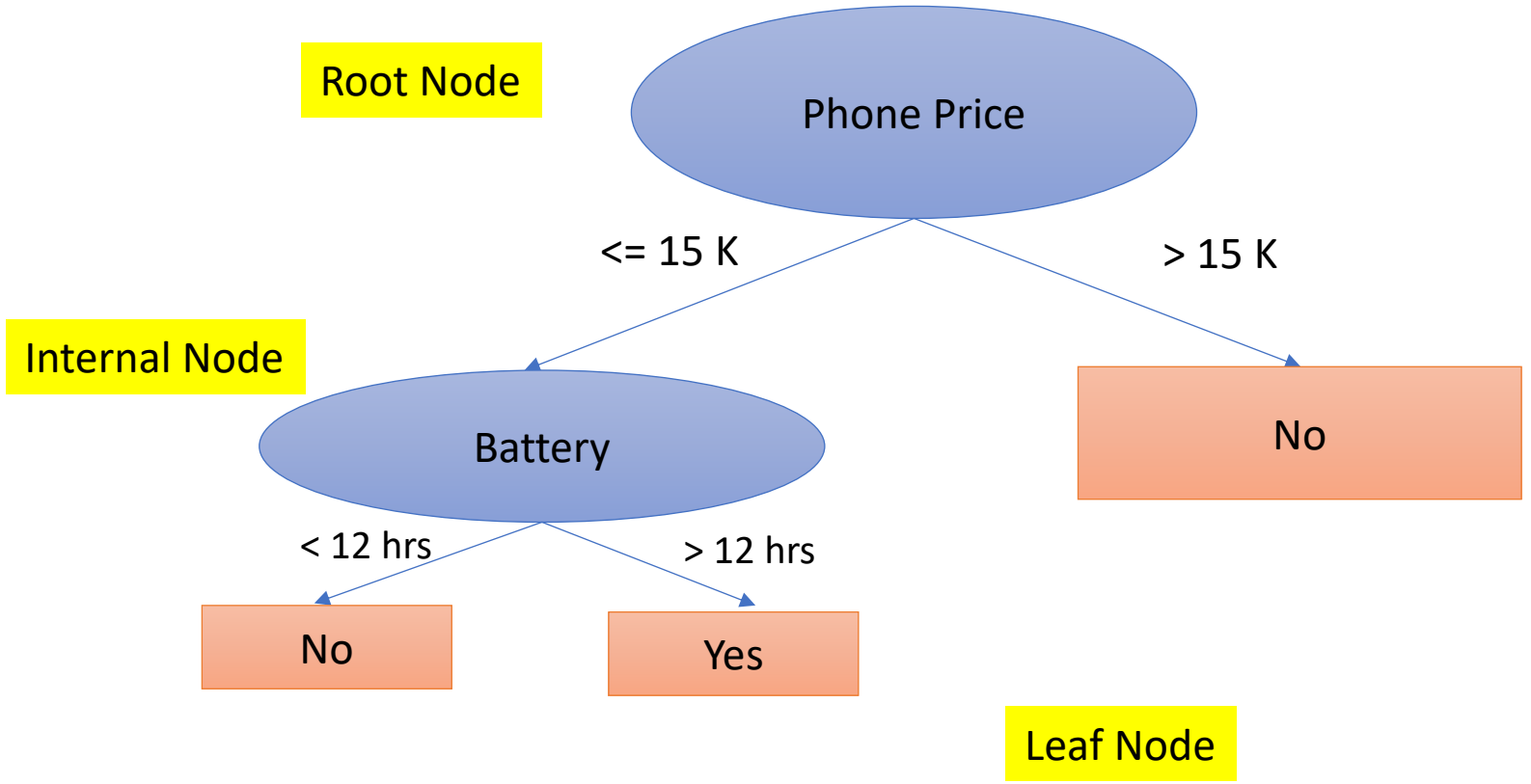
- How to take a decision of which phone to buy ?

Each path from the root of the DT to a leaf can be interpreted as a decision rule

Imp criteria:

1. Budget Phone : 15 K
2. Battery : atleast 12 hrs





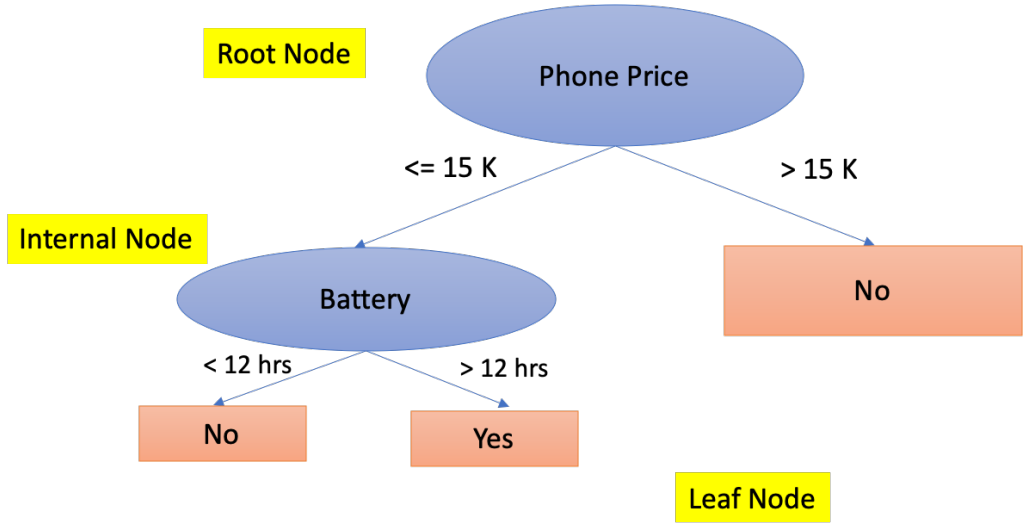
DT Terminology

- **Root Node :** This is first node while building a DT ,where all data is considered.
- **Internal Node** : All nodes after root node & before leaf node are internal Nodes

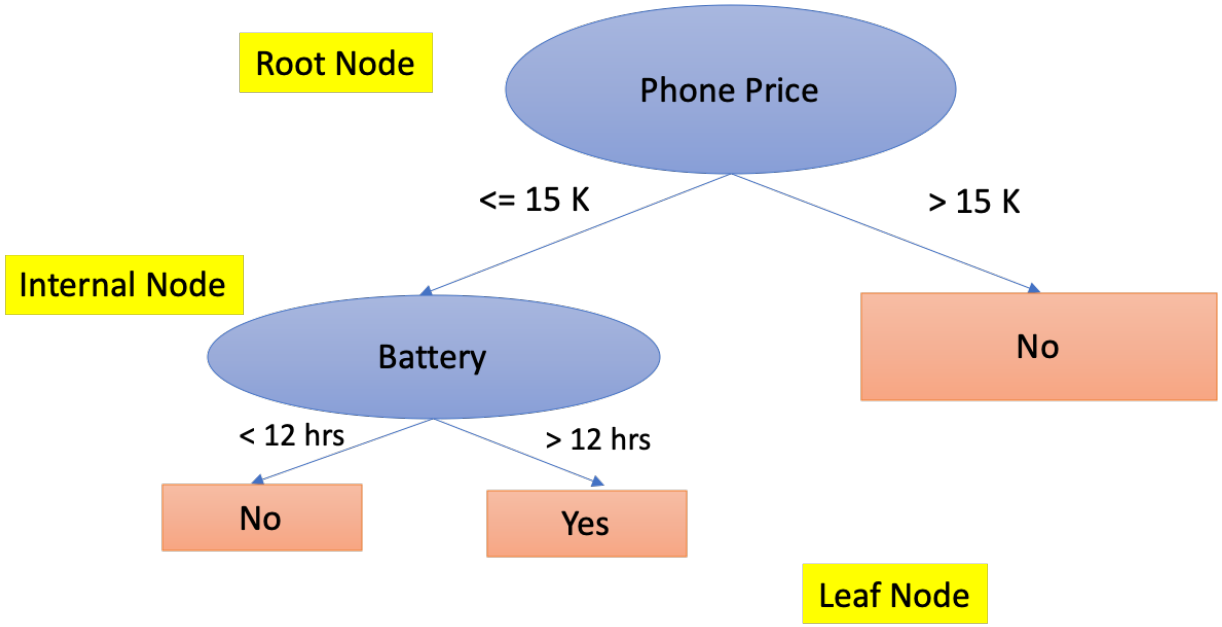
  Root Node & Internal nodes are known as '**Decision Node'.**

- **Leaf Node** : Last node is Leaf node/Terminal node.

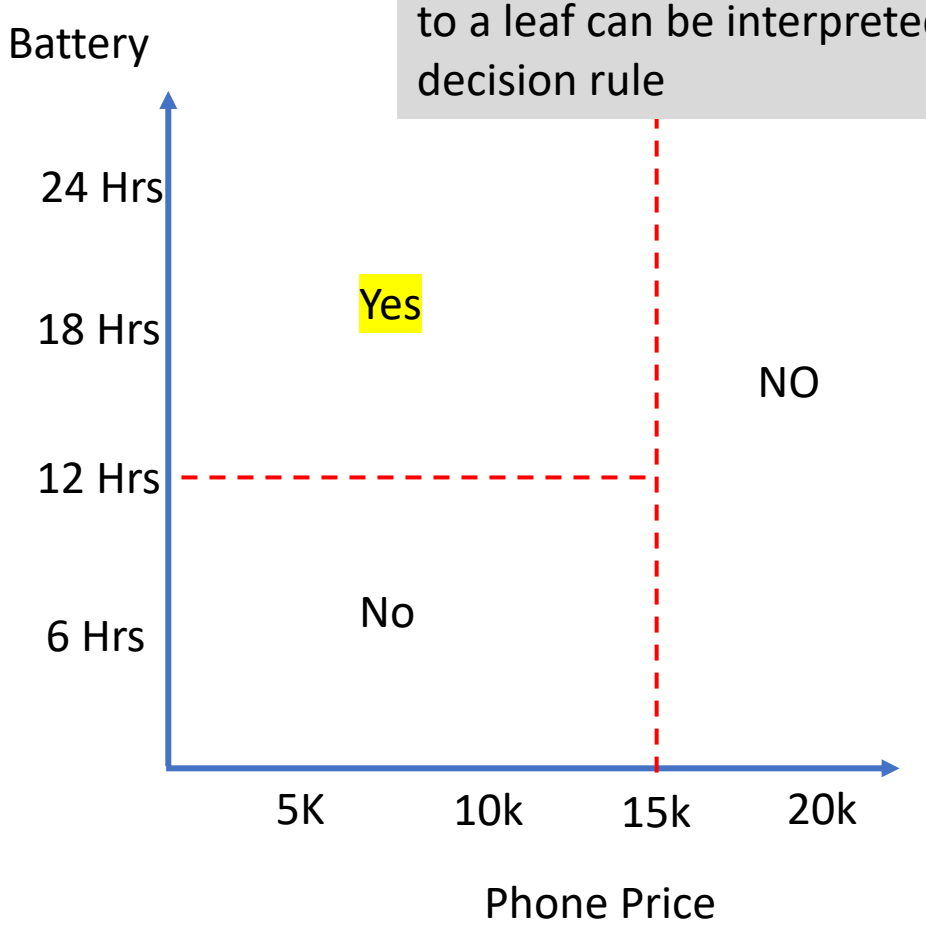
  At leaf node ,we take final decision /labelling.



Graphical representation of DT



Each path from the root of the DT to a leaf can be interpreted as a decision rule



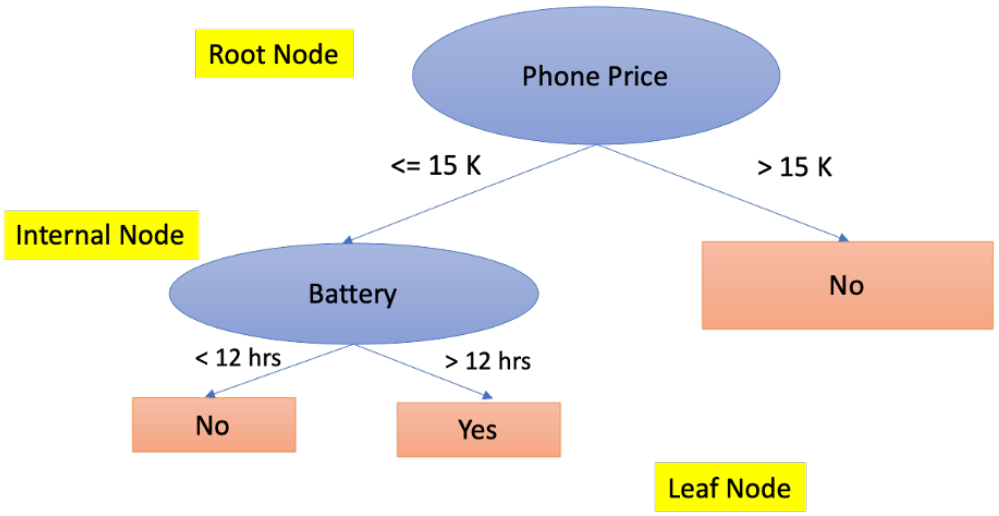
Decision Boundary :

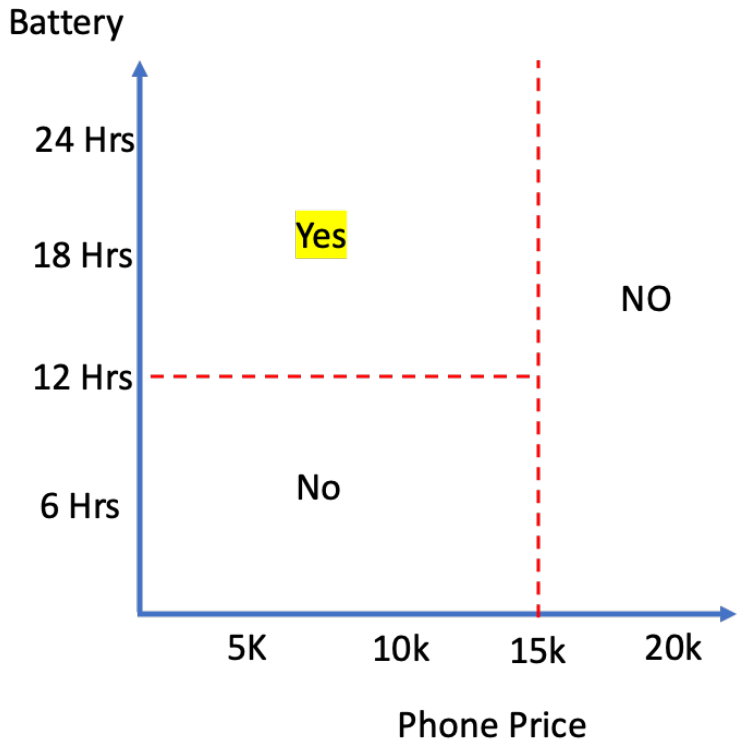
Axis Parallel (Non-linear)

Geometric: set of axis parallel hyperplane that divides your whole region into cubes ,cuboid, hypercube.

Decision Tree

- Decision tree is a tree based method that partition the feature space into a set of rectangles & then assign a constant value (mean/mode) to every region.





How to built a Decision tree ?

- To built a decision tree, we start at the tree root and split the data on the feature that results in the largest information gain (IG).

  i.e Select the feature at root node which gives Max IG

- Information Gain : is a way to measure expected reduction in Entropy

Entropy

- Entropy is a way to measure impurity/uncertainty in data.
- Low Entropy --- > Good
  - The higher the entropy, the harder it is to draw any conclusions from that information.

$$I_H = -\sum_{j=1}^{c} p_j log_2(p_j)$$

C : Number of Classes in the label
Pj: Count of Class j / Total count

WIN: 5
Prob 1 = 5/10
= 0.5

Lost: 5
Prob 2 = 5/10
= 0.5

Entropy = - ((0.5)*(log(0.5) + (0.5) * (log(0.5))
=

Entropy Max/Min

Scenarios	#Win	#Loss	Entropy
1	0	10	
2	1	9	
3	2	8	
4	3	7	
5	4	6	
6	5	5	
7	6	4	
8	7	3	
9	8	2	
10	9	1	
11	10	0	

Entropy Max/Min

Scenarios	#Win	#Loss	Entropy
1	0	10	
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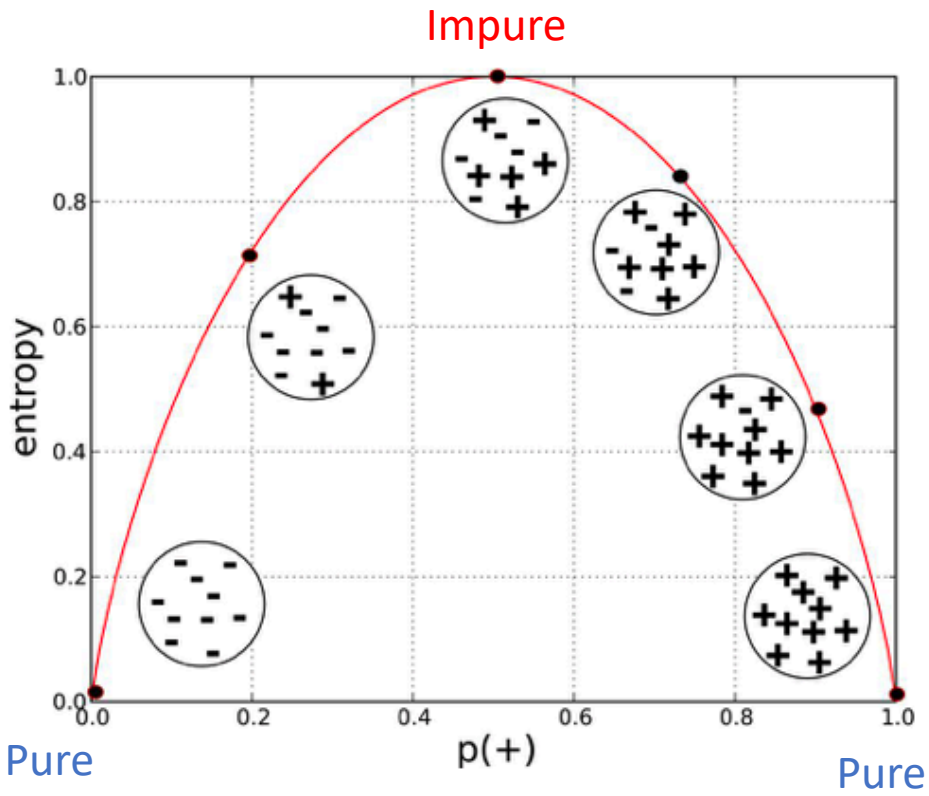
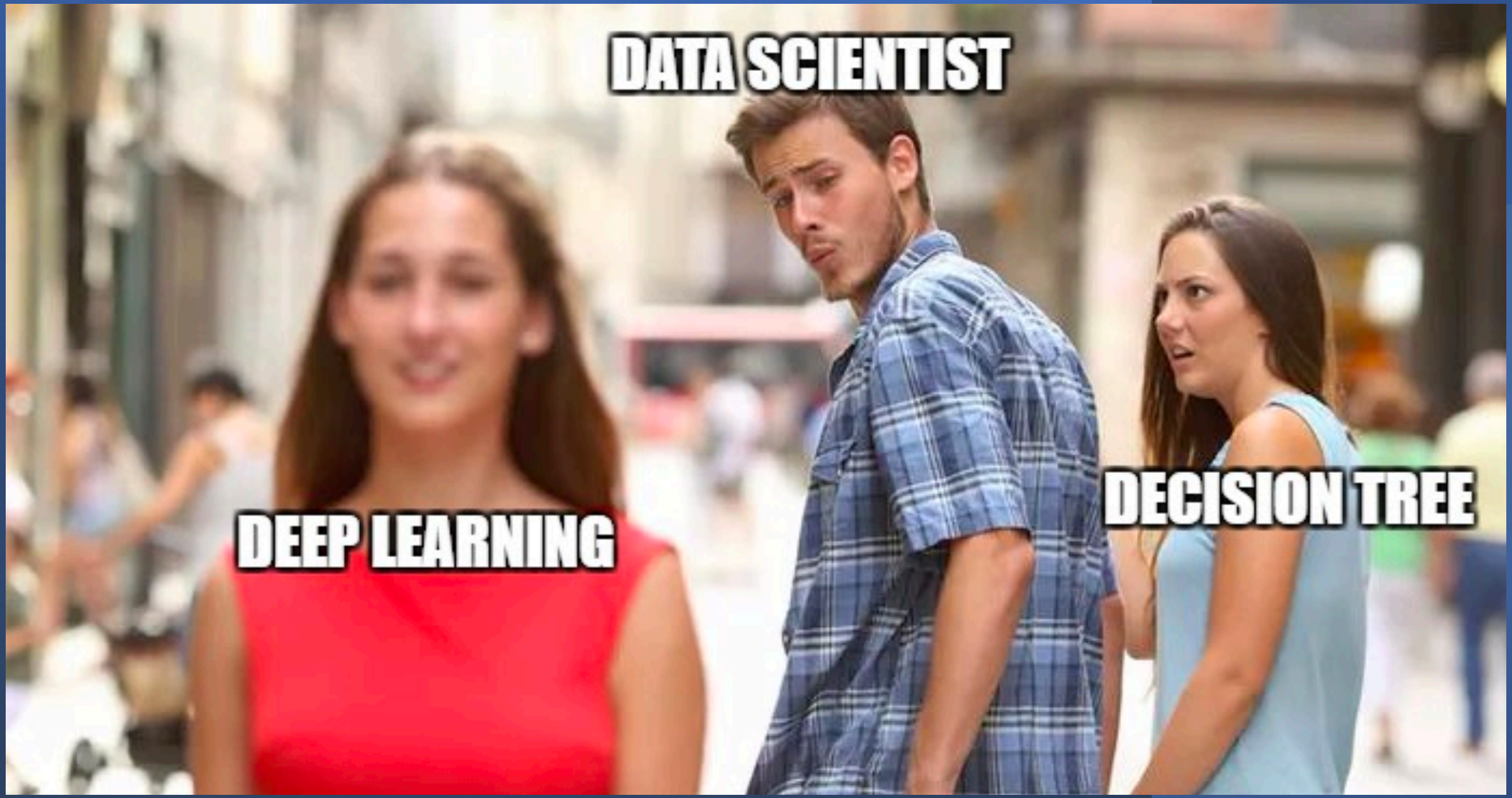


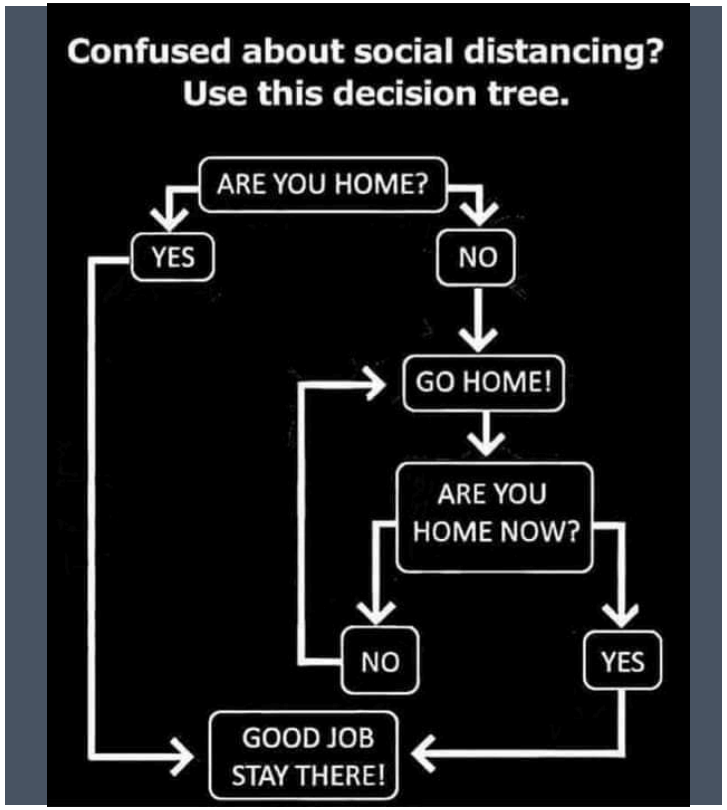
Entropy is Min

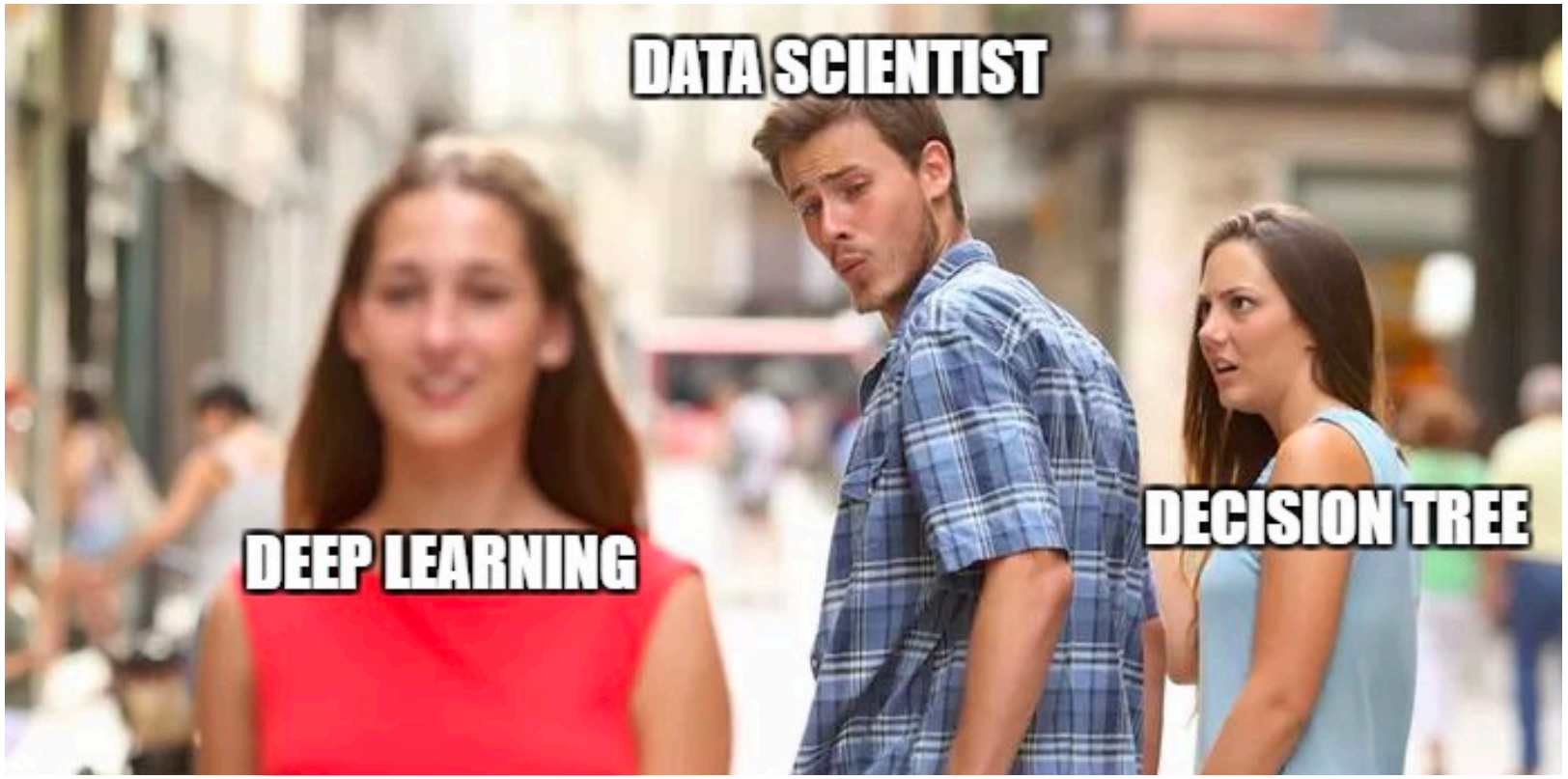
when all elements belong to one class

Entropy is Max

when all elements are equally probable


DATA SCIENTIST
DEEP LEARNING
DECISION TREE





Thank you

- Calculate entropy of below variable ‘Pass’ :

  [Yes , Yes , Yes , Yes , Yes, No, No, Yes, No, Yes, No, Yes , Yes, No]