

ADA BOOST

Steps

1 Data

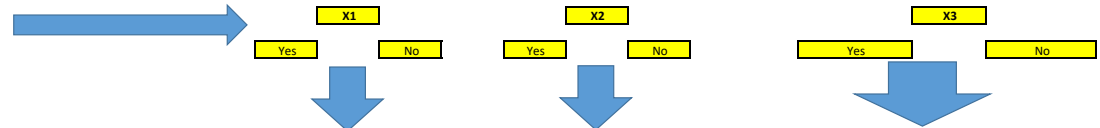
Sr.No.	X1	X2	X3	Target
1	X	X	X	Y
2	X	X	X	N
3	X	X	X	N
4	X	X	X	Y
5	X	X	X	Y
6	X	X	X	N
7	X	X	X	Y
8	X	X	X	N

2 Assigning equal weights to each observation

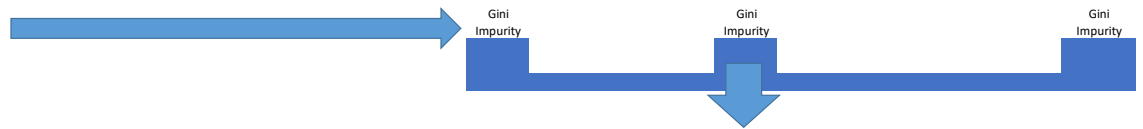
Sr.No.	X1	X2	X3	Target	Weight
1	X	X	X	Y	1/8
2	X	X	X	N	1/8
3	X	X	X	N	1/8
4	X	X	X	Y	1/8
5	X	X	X	Y	1/8
6	X	X	X	N	1/8
7	X	X	X	Y	1/8
8	X	X	X	N	1/8

3 Finding best base learner

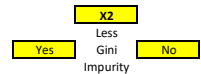
3A Creating stumps or base learners sequentially



3B Computing gini impurity

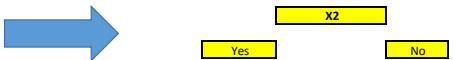


3C Whichever learner have less impurity will be selecting as base learner



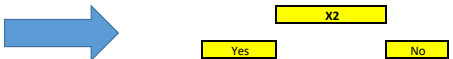
4 Train a model with base learner

Sr.No.	X1	X2	X3	Target	Weight
1	X	X	X	Y	1/8
2	X	X	X	N	1/8
3	X	X	X	N	1/8
4	X	X	X	Y	1/8
5	X	X	X	Y	1/8
6	X	X	X	N	1/8
7	X	X	X	Y	1/8
8	X	X	X	N	1/8



5 Predicted on the model

Sr.No.	X1	X2	X3	Target	Weight
1	X	X	X	Y	1/8
2	X	X	X	N	1/8
3	X	X	X	N	1/8
4	X	X	X	Y	1/8
5	X	X	X	Y	1/8
6	X	X	X	N	1/8
7	X	X	X	Y	1/8
8	X	X	X	N	1/8



Pred	
Y	Correctly Classified
Y	Wornly Classified
N	Correctly Classified
Y	Correctly Classified
N	Wornly Classified
N	Correctly Classified
Y	Correctly Classified
N	Correctly Classified

6 Counting Misclassification

Sr.No.	X1	X2	X3	Target	Weight
2	X	X	X	N	0.125
5	X	X	X	Y	0.125

7 Computing Misclassification Error

Total error = sum(Weight of misclassifier data)
0.25

8 Computing performance of the stumps

Performance of stumps = $1/2 * \log-e(1 - \text{total error} / \text{total error})$
 $1/2 * \log-e(3)$
 $1/2 * 1.098612$
0.549306

9 Update the weights of incorrectly classified data
Updating the weights of correctly classified data

New Weight = Old Weight * $e^{\text{performance of stump}}$
New Weight = Old Weight * $e^{-\text{performance of stump}}$

Sr.No.	X1	X2	X3	Target	Weight	New Weight
1	X	X	X	Y	0.125	0.072
2	X	X	X	N	0.125	0.217
3	X	X	X	N	0.125	0.072
4	X	X	X	Y	0.125	0.072
5	X	X	X	Y	0.125	0.217
6	X	X	X	N	0.125	0.072
7	X	X	X	Y	0.125	0.072
8	X	X	X	N	0.125	0.072

10 Normalize weight

Sr.No.	X1	X2	X3	Target	Weight	New Weight	Normalize weight
1	X	X	X	Y	0.125	0.072	0.08
2	X	X	X	N	0.125	0.217	0.25
3	X	X	X	N	0.125	0.072	0.08
4	X	X	X	Y	0.125	0.072	0.08
5	X	X	X	Y	0.125	0.217	0.25
6	X	X	X	N	0.125	0.072	0.08
7	X	X	X	Y	0.125	0.072	0.08
8	X	X	X	N	0.125	0.072	0.08
Total						0.866025404	1.00

11 Creating buckets on normalize weight

Sr.No.	X1	X2	X3	Target	Weight	New Weight	Normalize weight	Buckets	Sr.No.
1	X	X	X	Y	0.125	0.072	0.08	0 to 0.08	1
2	X	X	X	N	0.125	0.217	0.25	0.08 to 0.16	2
3	X	X	X	N	0.125	0.072	0.08	0.16 to 0.24	3
4	X	X	X	Y	0.125	0.072	0.08	0.24 to 0.32	4
5	X	X	X	Y	0.125	0.217	0.25	0.32 to 0.4	5
6	X	X	X	N	0.125	0.072	0.08	0.4 to 0.48	6
7	X	X	X	Y	0.125	0.072	0.08	0.48 to 0.56	7
8	X	X	X	N	0.125	0.072	0.08	0.56 to 0.64	8
Total						0.866025404	1.00		

12 Algorithm generating random number equals to number of observation

Random Number
0.15
0.51
0.38
0.15
0.32
0.5
0.09
0.36

13 Selecting where the random numbers fall in the buckets

Sr.No.	Random Number	Buckets
2	0.15	0.08 to 0.16
7	0.51	0.48 to 0.56
5	0.38	0.32 to 0.4

2	0.15	0.08 to 0.16
4	0.32	0.24 to 0.32
7	0.5	0.48 to 0.56
2	0.09	0.08 to 0.16
5	0.36	0.32 to 0.4

14 Creating a new data for 2nd iteration

Sr.No.	X1	X2	X3	Target
1	X	X	X	Y
2	X	X	X	N
3	X	X	X	N
4	X	X	X	Y
5	X	X	X	Y
6	X	X	X	N
7	X	X	X	Y
8	X	X	X	N

Sr.No.	X1	X2	X3	Target
2	X	X	X	N
7	X	X	X	Y
5	X	X	X	Y
2	X	X	X	N
4	X	X	X	Y
7	X	X	X	Y
2	X	X	X	N
5	X	X	X	Y

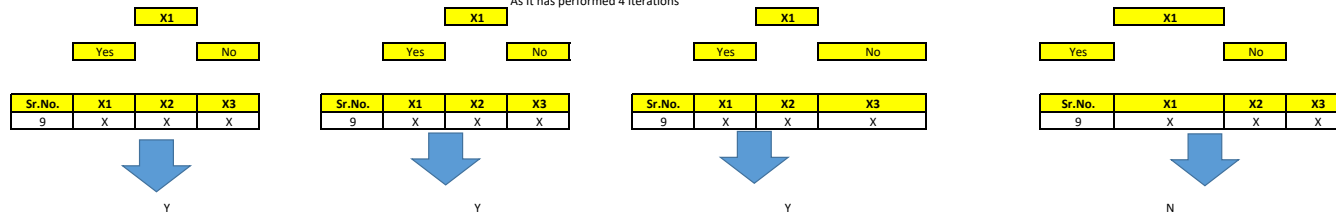
15 Running 1 to 14 steps below each iteration until it reaches its limit

There will be less error at the end of iteration

- 1 Assigning equal weights to each observation
- 2 Finding best base learner
- 3 Train a model with base learner
- 4 Predicted on the model
- 5 Counting Misclassification Error
- 6 Computing Misclassification Error
- 7 Computing performance of the stumps
- 8 Update the weights of incorrectly classified data
- 9 Updating the weights of correctly classified data
- 10 Normalize weight
- 11 Creating buckets on normalized weight
- 12 Algorithm generating random number equals to number of observation
- 13 Selecting where the random numbers fall in the buckets
- 14 Creating a new data for 2nd iteration

16 Prediction on the model

As it has performed 4 iterations



18 Collecting Vote

Sr.No.	X1	X2	X3	Model1	Model2	Model3	Model4
9	X	X	X	Y	Y	Y	N

19 Majority vote will be considered as final output

Sr.No.	X1	X2	X3	Model1
9	X	X	X	Y