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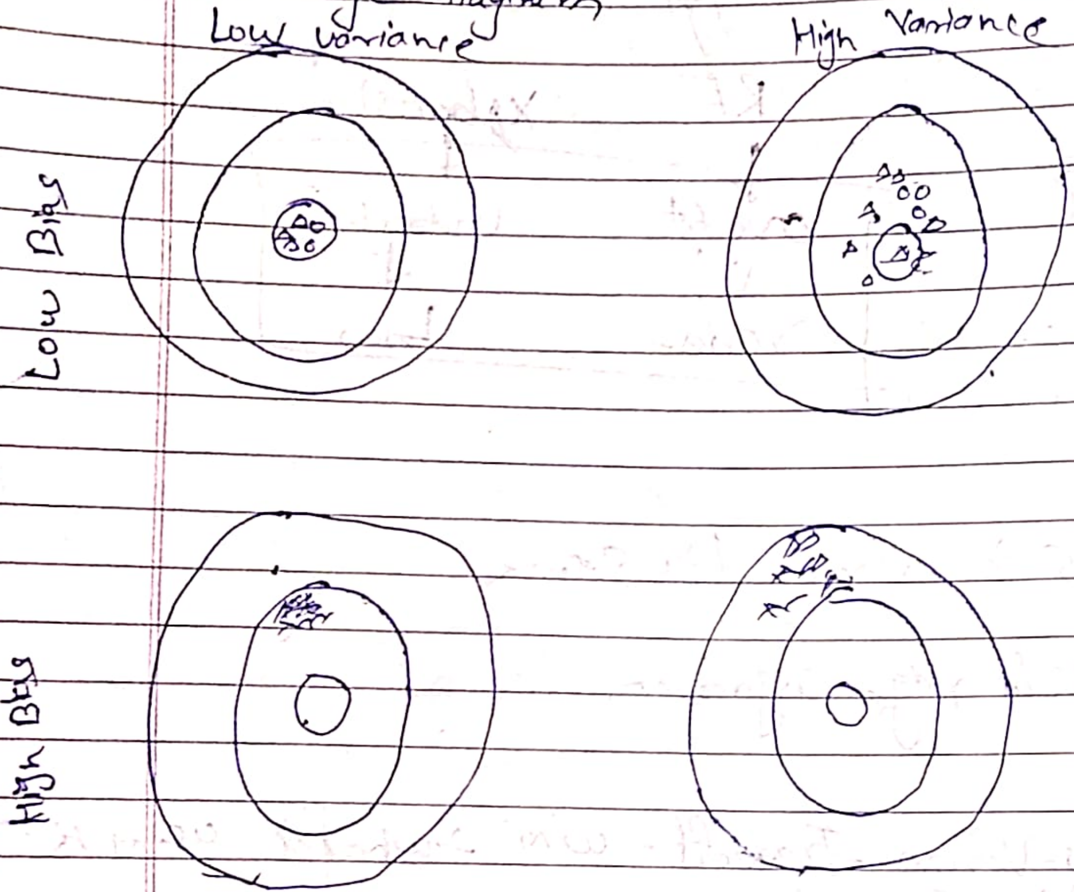
Bias Variance - Trade off

* Bull's eye diagram



why?..

* (i)

Why Bias & Variance Tradeoff

- To avoid overfitting and underfitting conditions
- To have consistencies in predictions.

Errors in M/C Learning model

* Errors due to Bias
* -11- to Variance

* Errors due to Bias.

Expections of error in predictions of a model

Error due to assumptions in the model.

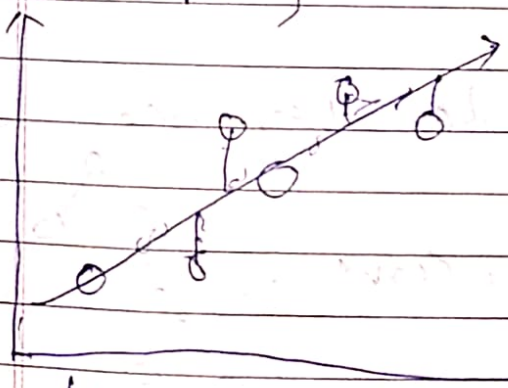
Underfitting

If a Error rate of a model is high in Trainning & Test data set then it's underfitting model.

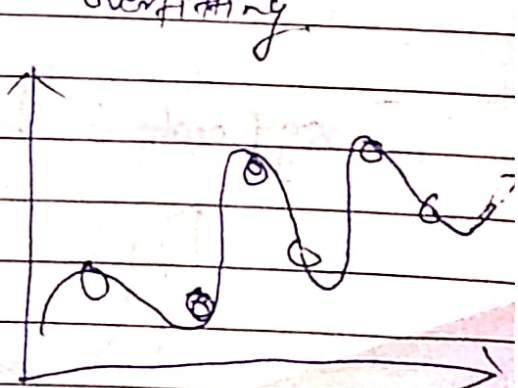
Overfitting

If a Error rate is low in Trainning Data Set & High in Test Data Set then it's called as overfitting model.

Underfitting



overfitting



High Bias mode → In Training data set

High Variance → In Test

Low Bias → In Training

High Varian → In Test

High Bias
When model Not Learn Training Data Properly ⇒

Low Bias
When model learn Training Data So properly.

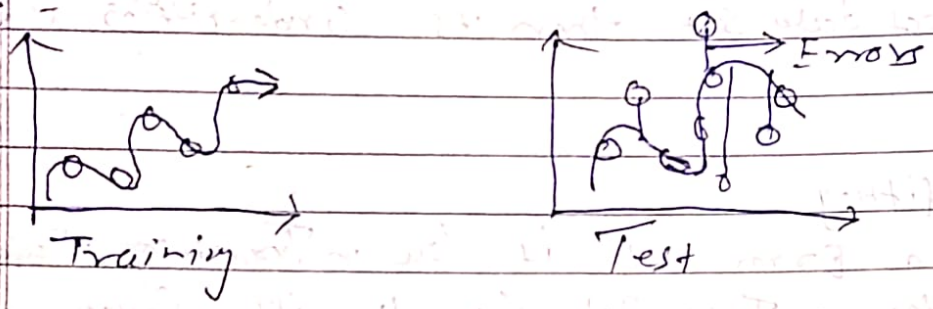
Now let's and

Our Model Should have Low Bias & Low Variance to do a perfect predictions.

~~High~~ Low Bias, High Variance

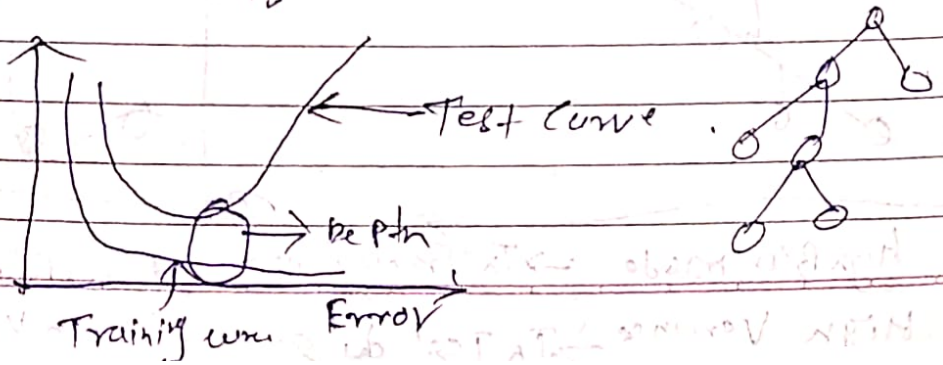
Model is SB perfect in Training Dataset & have so much of error in Test Data set

Eg:-



~~Decision~~ Decision Tree - ~~High~~ Low Bias & High Variance

XgBoost ⇒ ~~High Bias~~ & Low Variance



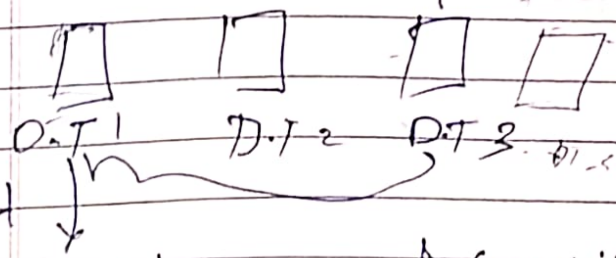
gradient Method,
↳ Ensemble Technique

XgBoost → High Bias & Low Variance

It's consist of multiple Decision Tree, & Depth of each Decision Tree is restricted

So it does High Bias will become Low Bias

→ Each DT have High Bias & Low Variance So High Bias will become Low Varian



weak Learner & combine the all weak learner Become Strong Lern.

Precision, Recall

Total sample → 165

165	NO	Yes	
No	TN 50	FP 10	60
Yes	FN 5	TP 100	105
	55	110	

Predicted (columns), ACTUAL (rows)

FP → Type-I Error

FN → Type-2 Error

Accuracy = $\frac{TP + TN}{Total}$ = $\frac{100 + 50}{165}$ = 0.91

Error rate = 1 − accuracy = OR $\frac{FP + FN}{Total}$ = 0.09

Precision = $\frac{TP\ [100]}{\text{Predicted Yes}\ [110]}$; Recall = $\frac{TP\ [100]}{\text{Actual Yes}\ [105]}$