

Tree models

Decision
Tree

(Single tree is
used to take
the decision)

Ensemble

Techniques

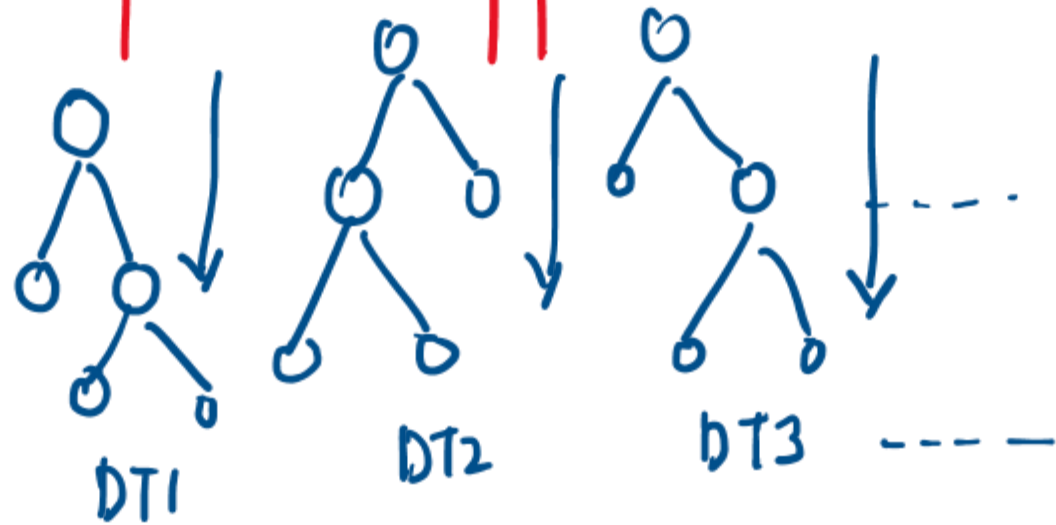
(Decision being
taken by combining the
o/p of multiple trees)

Bagging

Boosting

Bagging [Overfitting]

→ Parallel Approach

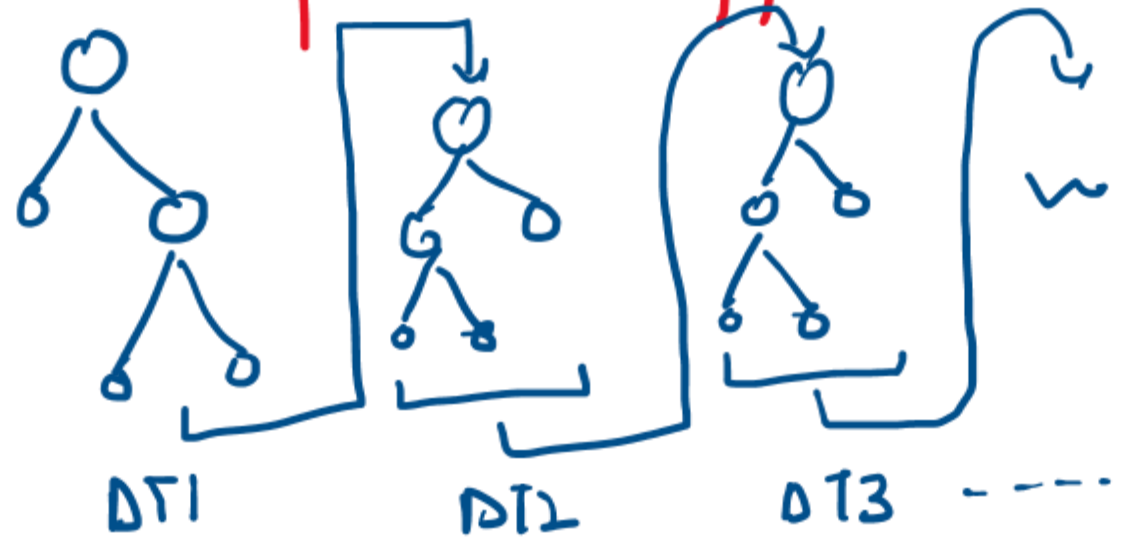


→ All trees are independent from each other

→ Random forest Algorithm

Boosting [Underfitting]

→ Sequential Approach



→ Every second tree is dependent from previous one

→ Adaboost, GBM, XGBoost
x ✓ ✓✓✓

→ Challenges with Boosting :-

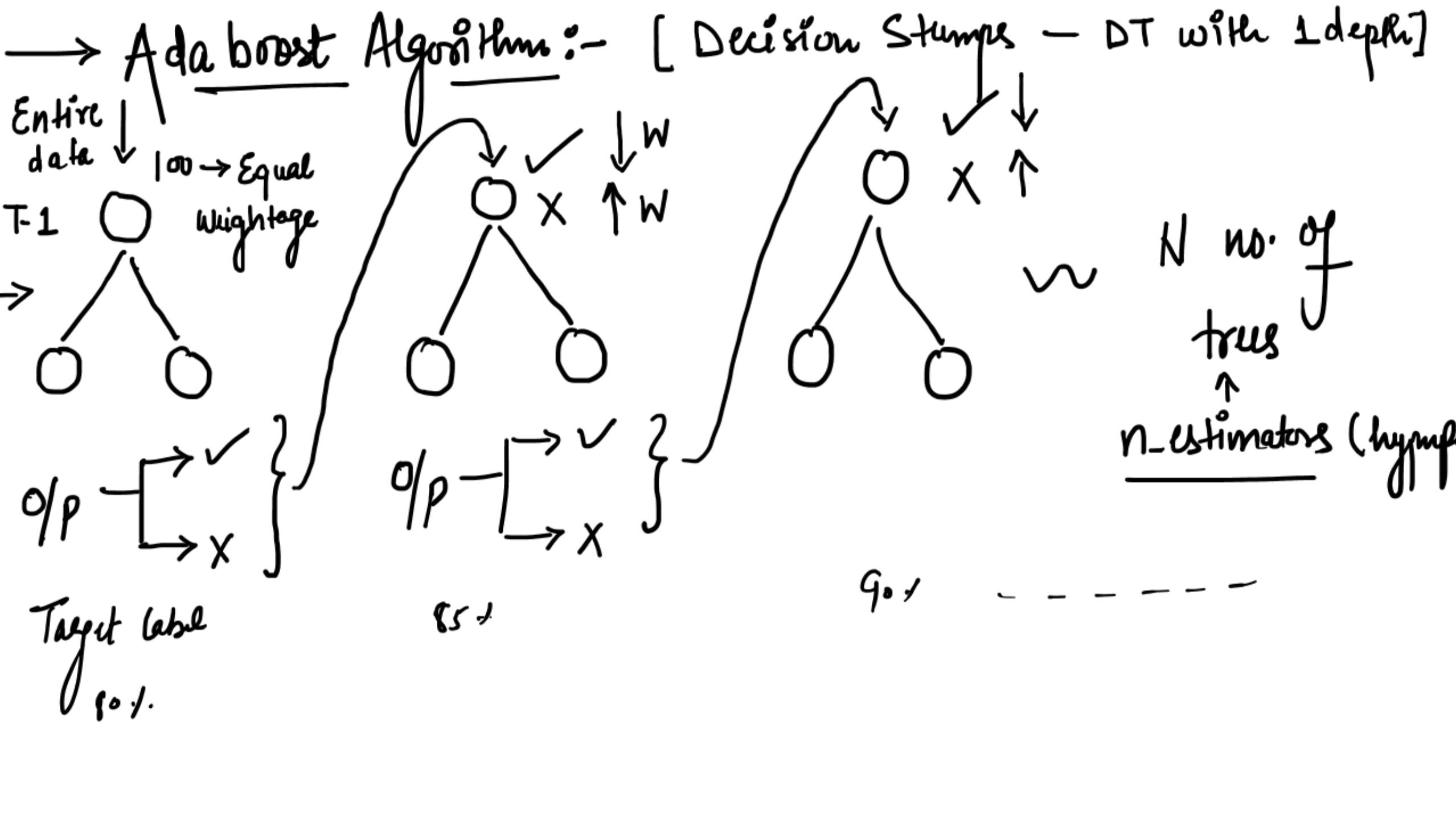
* Boosting principle promotes overfitting - !

✓ * ✓ Computational Challenges [A high configuration system is required]

Bags

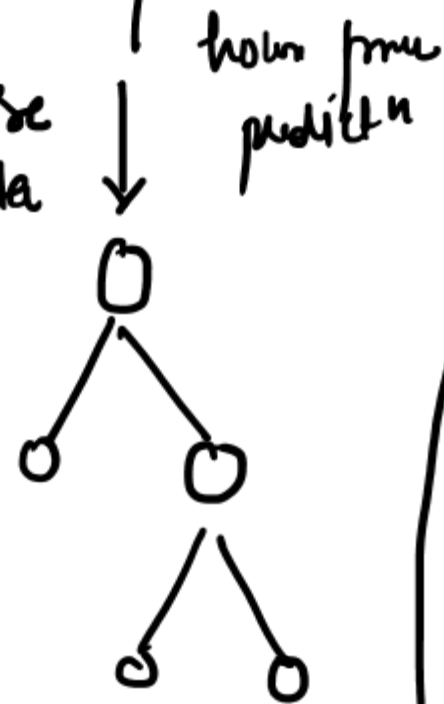
P1	<u>4s</u>	} <u>4s</u>
P2	<u>4s</u>	

<u>↑ P1</u>	<u>2s</u>	X	} <u>8s</u> <u>4s</u>
<u>↑ P2</u>	X	<u>2s</u>	

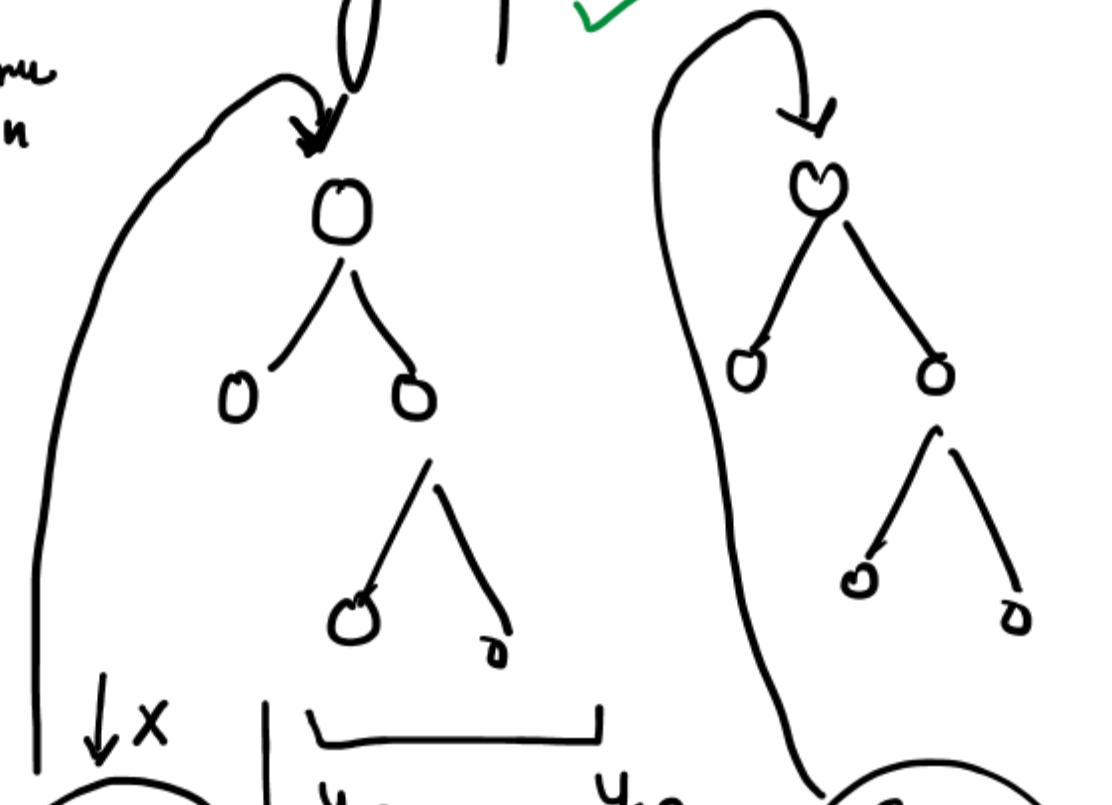


→ Gradient Boosting Machine :- max depth → HP

Entire data



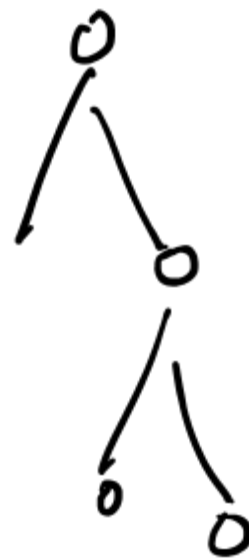
train from prediction



Residual

y_a	y_p	
500000	$450000 +$	50000
200000	25000	-50000
200000	150000	50000

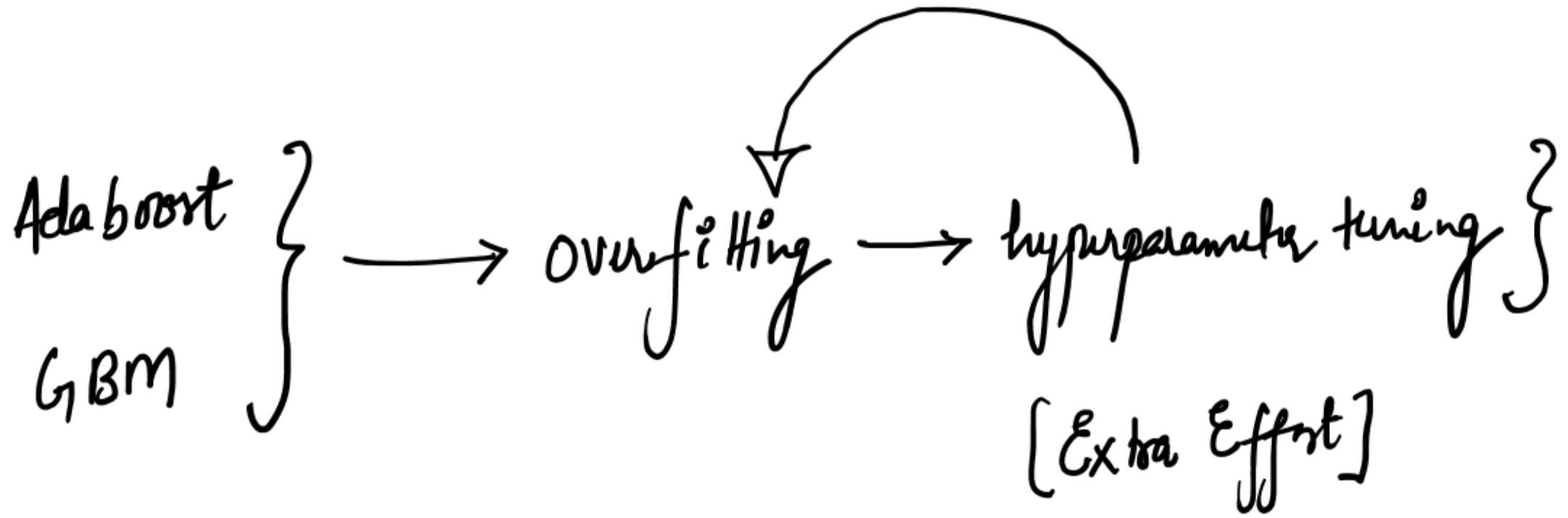
y_a	y_p	<u>Residual</u>
50000	$40,000 +$	10000
-50000	-30,000	-20,000
50000	10000	40000



→ N no. of trees

n_estimators

$$y_1 + y_2 + y_3 + y_n \rightarrow y_p$$



→ XG Boost :-

* eXtreme Gradient Boosting :-

has inherently regularisation
[Effort hyperparameter
tuning ↓↓↓]

→ hardware → multithreading → faster → low configuratⁿ
system