Introduction to Boosting

Ensembles

Bagging | Boosting | Stacking

Bagging: base learner (decision tree)
Boosting: Weak learners (decision tree)

Bagging
Bootstrap Aggregation

→ { Random forest Classifier }

① AdBoost
② Gradient Boosting → for both regression & Classification problem.
③ XG Boost
④ Cat Boost

→ Random forest Regressor.
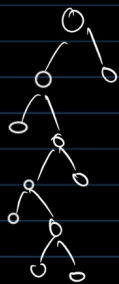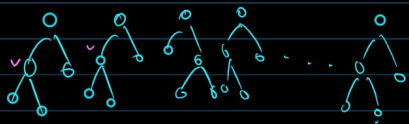
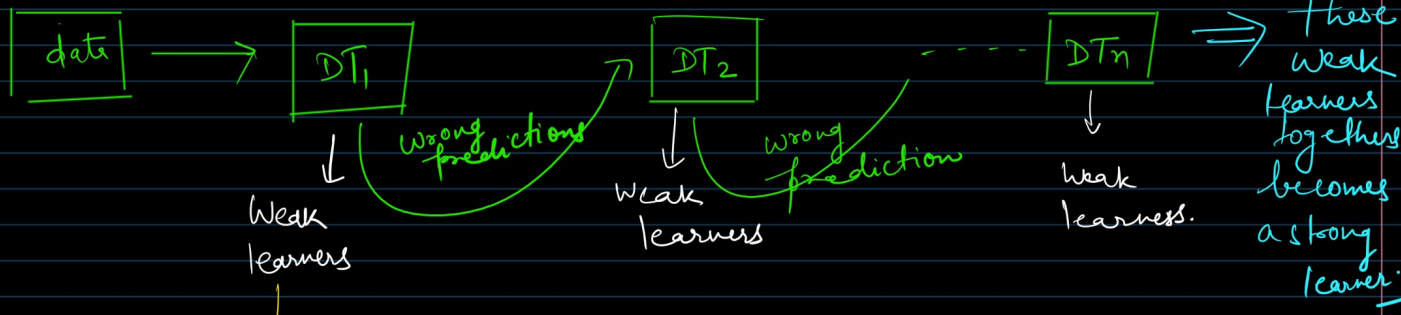DT leads to overfitting (High Variance)

To reduce overfitting, we studied Bagging :- Random forest.

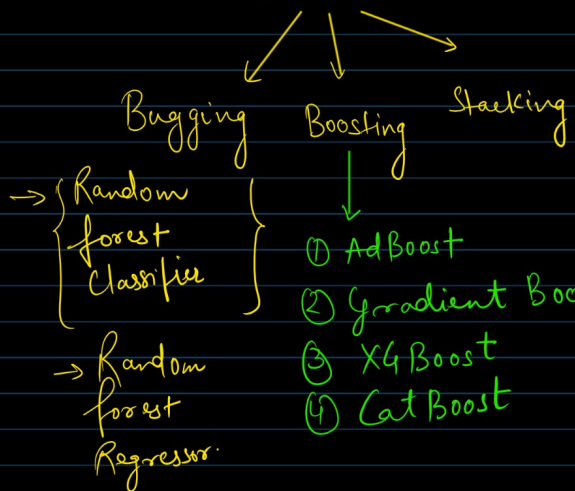✗ Bagging reduces the variance.
↳ multiple overfitted models combined reduces the Variance.

Boosting (to Boost | enhance)

Principles :- Build a first model on training dataset and then build a second model to rectify the errors present in the first model. This procedure is continued until and unless the errors are minimised or data Is correctly predicted or the numbers of trees you want to build is constructed.

| data | → | DT₁ | | DT₂ | - - - | DTn | ⇒ these weak learners together becomes a strong learner

wrong predictions
wrong prediction

Weak learners
Weak learners
weak learners.

because model is
very simple | Not trained
properly or has not learned
much from data:

Analogy
→ Football → pass
the
ball.
→ easy to break
a stick but
hard to break
group/log of
sticks.

* <u>prediction</u>

<u>Bagging</u>
→ Classification: Voting
→ Regression : Average

<u>Boosting</u>

$M_1 \longrightarrow M_2 \longrightarrow M_3 \cdots M_n.$

$\{ \alpha_1(M_1) + \alpha_2(M_2) + \cdots \alpha_n(M_n) \}$

$\alpha_1, \alpha_2 \cdots \alpha_n \Rightarrow$ weights

<u>Strong learner</u>