



CIS 678 - Machine Learning

ML Models: Ensemble Learning



Ensemble Learning/Meta Learning

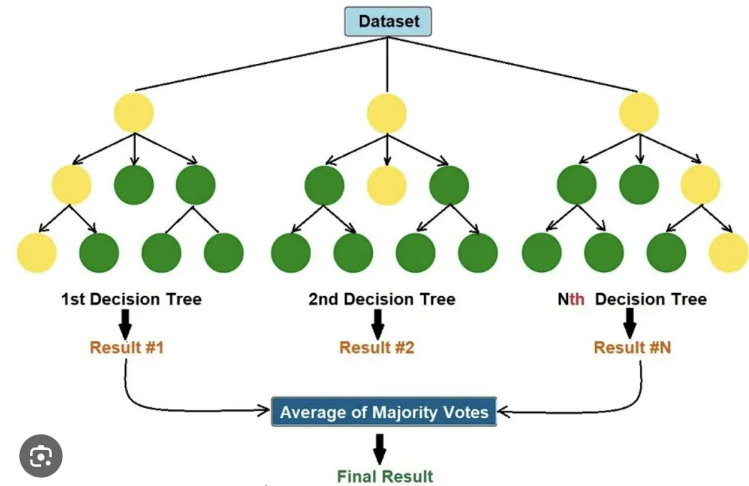


Ensemble Learning/Meta Learning

- Ensemble (more than one model)
 - Bagging
 - Averaging (RF)
 - Reduces Variance
 - Boosting
 - Gradual improvement over weak learners (Adaboost/XGBoost)
 - Reduces Bias??

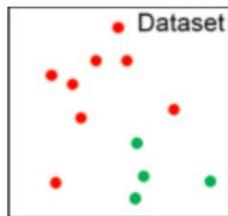
Random Forest

- Instead of one, we have many (but finite) Trees

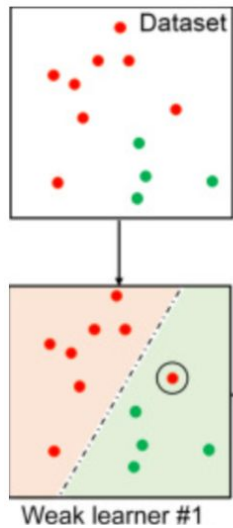


Boosting

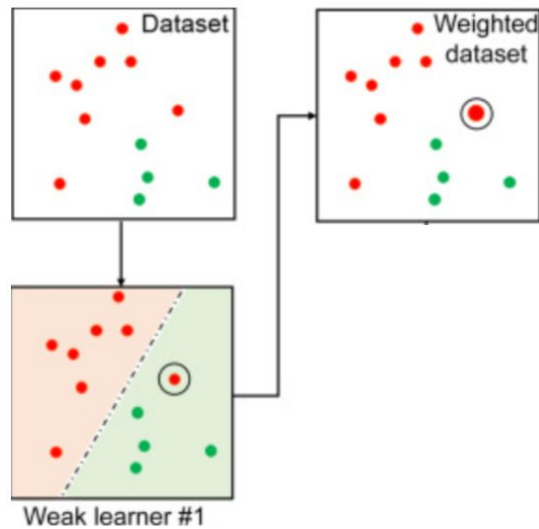
- Combination of some weak models
- Power of many



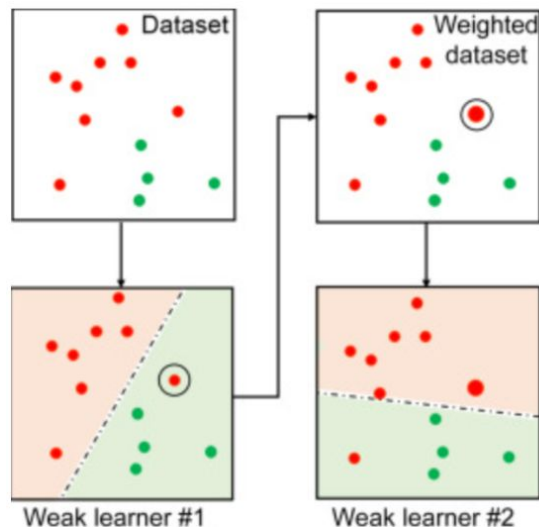
Boosting



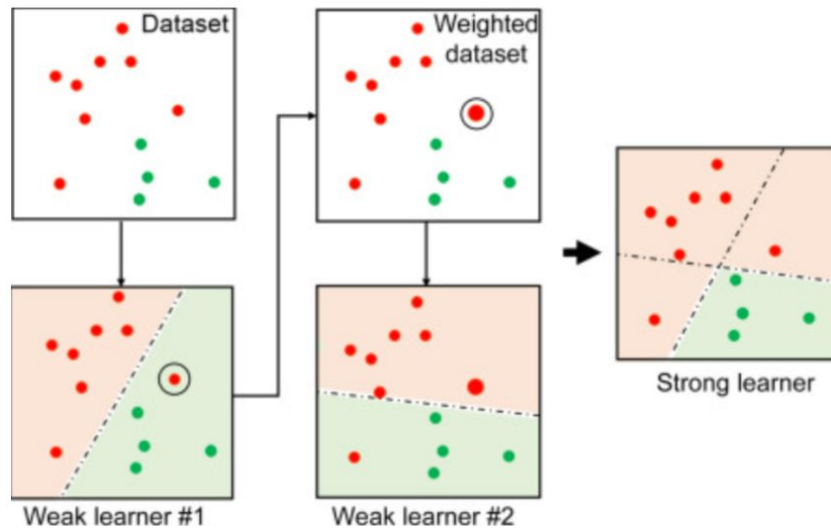
Boosting



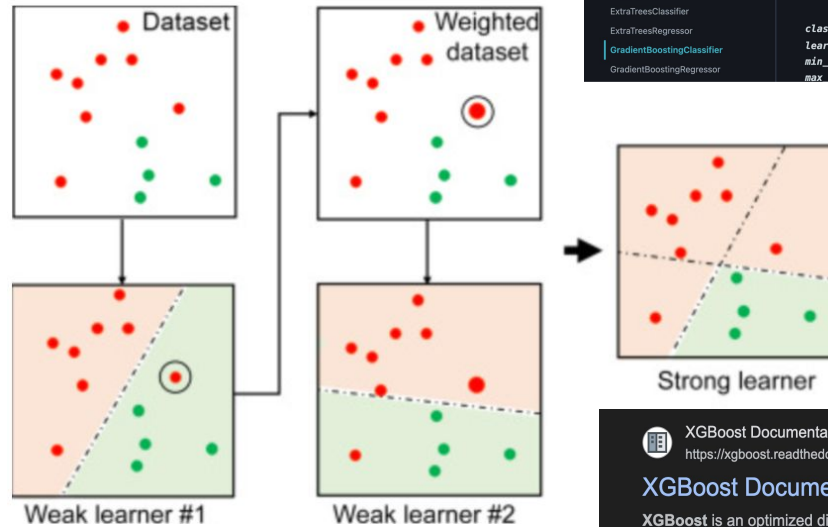
Boosting



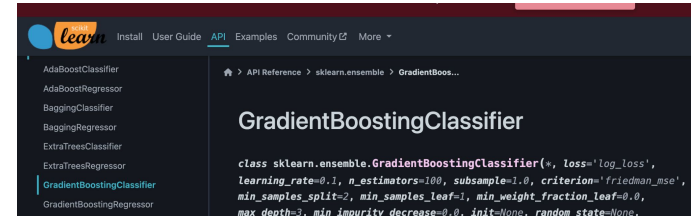
Boosting



Boosting



[img src](#)



XGBoost Documentation
<https://xgboost.readthedocs.io>

XGBoost Documentation — xgboost 2.1.1 documentation

XGBoost is an optimized distributed gradient boosting library designed to be highly efficient, flexible and portable. It implements machine learning algorithms ...

[Introduction to Boosted Trees](#) · [XGBoost Parameters](#) · [Get Started with XGBoost](#)



Notebook extension/presentation

- See notebooks section (Blackboard)