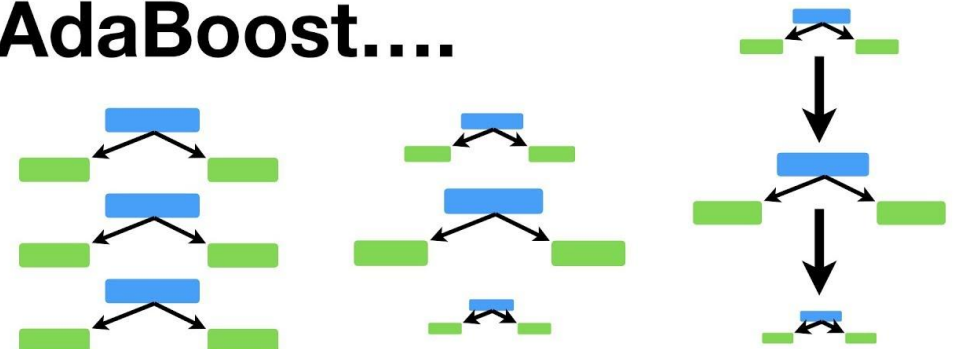


1. AdaBoost (Adaptive Boosting)

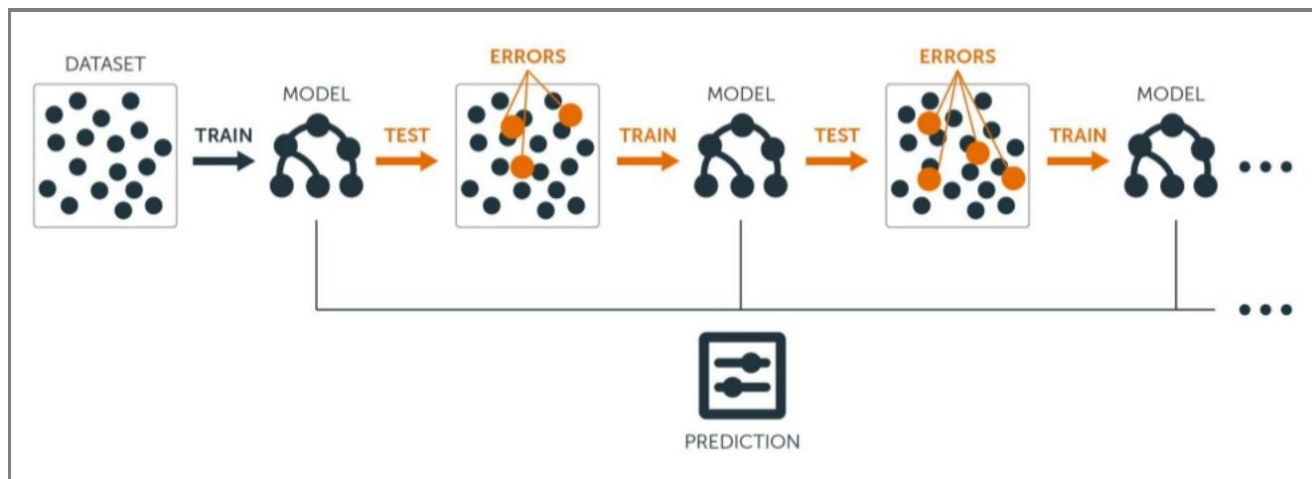
- "Learns from mistakes by increasing attention to them."
- Starts with a simple model.
- Increases weight on wrongly predicted samples.
- Next models try harder to get those right.
- Good for: Clean, small datasets.
- Downside: Struggles with noisy data.

AdaBoost....



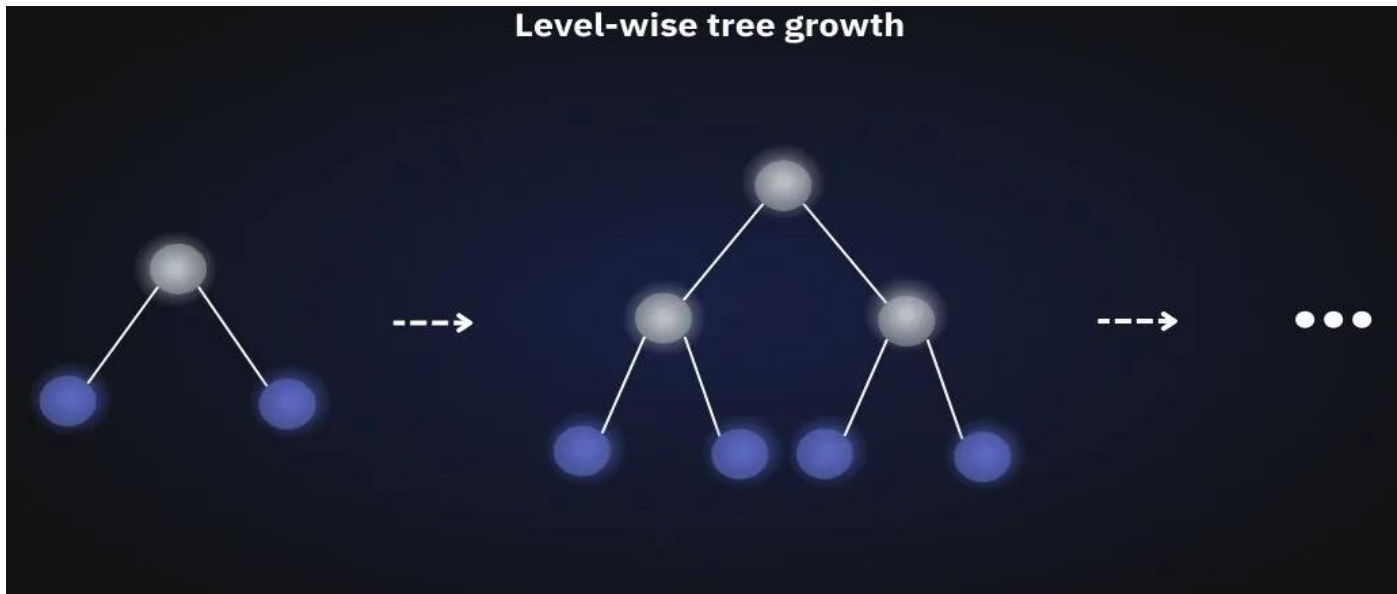
2. Gradient Boosting (GBM)

- Fixes errors by following the direction of the gradient.
- Fits a model to residuals (errors) from the previous one.
- It corrects mistakes step by step.
- More flexible than AdaBoost.
- Good for: Most real-world regression/classification tasks.
- Trade-off: Slower training compared to newer methods.



3. XGBoost (Extreme Gradient Boosting)

- A faster, smarter version of Gradient Boosting.
- Adds regularization to avoid overfitting.
- Supports parallelization and missing values.
- Good for: Tabular data, when performance and speed matter.



4. LightGBM (Light Gradient Boosting Machine)

- Grows trees differently for ultimate speed.
- Uses leaf-wise growth (vs level-wise in others).
- Uses histograms to speed up calculation.
- GPU support, huge datasets, blazing fast.
- Good for: Large-scale data, production systems.
- Caution: Can overfit small datasets if not tuned.

(overfitting is when a model becomes too tailored to the training data, losing its ability to generalize to new examples.)

