

☀️ **Bagging vs. Boosting: Supercharging Your Models!** 🚀 🌳

In the world of machine learning, Bagging and Boosting are two powerful ensemble techniques that improve model accuracy by combining predictions from multiple models. 💡 Let's dive into what makes them unique and impactful! ☀️

🔧 **What is Bagging?** 🛒 ✨

Bagging stands for Bootstrap Aggregating. It aims to reduce variance by training multiple models on different subsets of data and combining their predictions. 🎯

🔑 **How It Works:**

- 1 Randomly sample subsets of the dataset with replacement.
- 2 Train individual models (usually the same algorithm).
- 3 Combine predictions (e.g., averaging for regression, majority vote for classification).

☀️ **Examples:**

Random Forest 🌳: Uses bagging with decision trees to improve accuracy and reduce overfitting.

🥳 **Key Benefits:**

Reduces overfitting.

Works well with high-variance models like decision trees.

🔧 **What is Boosting?** 🔥 ✨

Boosting focuses on reducing bias by sequentially training models, where each subsequent model corrects the errors of the previous one. 🎯

🔑 **How It Works:**

- 1 Train a model on the dataset.
- 2 Identify misclassified points and give them higher weights.
- 3 Train the next model to focus on these difficult examples.

4 Combine predictions from all models.

🔧 Examples:

AdaBoost 💡 : Adjusts weights of misclassified points iteratively.

Gradient Boosting 🌞 : Optimizes model performance using gradients.

😊 Key Benefits:

Reduces bias while maintaining low variance.

Works well for complex datasets.

📊 Bagging vs. Boosting: The Showdown ⚡

Feature	Bagging 🛒	Boosting 🔥
Goal	Reduce variance	Reduce bias
Model Training	Parallel	Sequential
Focus	Treats all data equally	Focuses on hard examples
Common Algorithms	Random Forest	AdaBoost, XGBoost

GitHub Code: <https://github.com/NafisAnsari786/Machine-Learning-Algorithms/blob/main/18%20Bagging/Exercise/Heart%20Failure%20Prediction%20using%20bagging.ipynb>