🌳 Bagging Ensemble – Part 2 | Bagging Classifiers

1. What is Bagging Classifier?

- A **bagging classifier** applies **bagging** to **classification problems**.
- Steps:
    1. Create multiple bootstrap samples from the training set.
    2. Train a **classifier** (e.g., Decision Tree, SVM, Logistic Regression) on each sample.
    3. Combine predictions with **majority voting**.

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2. Example

Suppose we want to classify whether a patient has a disease:

- Model 1 → "Yes"
- Model 2 → "No"
- Model 3 → "Yes"
- Final prediction (Majority) → **Yes**

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3. Benefits of Bagging Classifiers

- ❖ Reduces variance → improves stability.
- ❖ Less prone to overfitting than a single tree.
- ❖ Handles noisy datasets well.

📈 Bagging Ensemble – Part 3 | Bagging Regressor

1. What is Bagging Regressor?

- Same idea as Bagging Classifier, but for **regression problems** (predicting numbers).
- Instead of majority voting, predictions are combined via **averaging**.

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2. Example

We want to predict **house prices**:

- Model 1 → $250,000
- Model 2 → $270,000

- Model 3 → $260,000
- Final prediction = Average = **$260,000** ✅

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3. Benefits of Bagging Regressor

- ❖ Reduces variance in regression predictions.
- ❖ Captures complex relationships better than a single weak regressor.
- ❖ Smooths out extreme predictions from unstable models.

❖ Bagging Classifier vs Bagging Regressor

Feature	Bagging Classifier	Bagging Regressor
Task	Classification	Regression
Aggregation Method	Majority Vote	Average
Example Output	Yes/No, Class A/B	Continuous Value
Base Models	Trees, Logistic...	Trees, Linear Models...

❖ Final Takeaway:

- Bagging Classifier → **classification tasks** (uses majority vote).
- Bagging Regressor → **regression tasks** (uses averaging).
- Both reduce variance, improve stability, and work best with **unstable, high-variance models** (like decision trees).
