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Bagging and Boosting

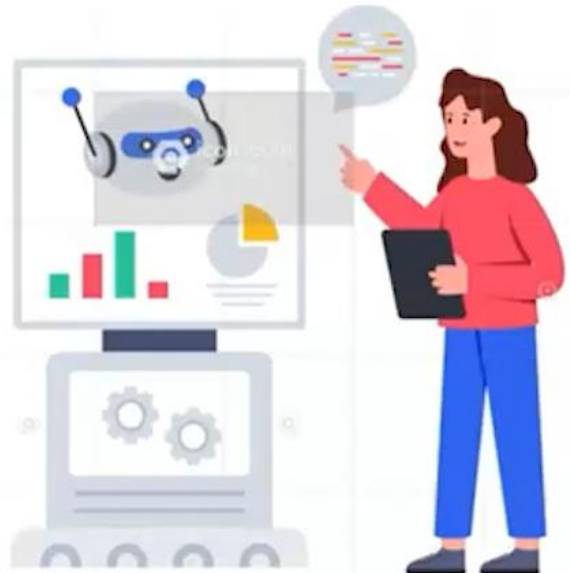


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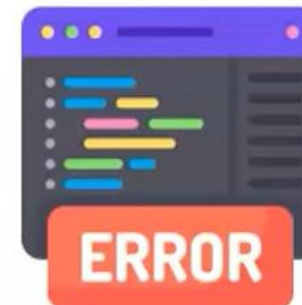
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Ensemble learning is a machine learning technique that combines multiple models, called **weak learners** or **base models**, to make more accurate and reliable predictions.



Machine Learning



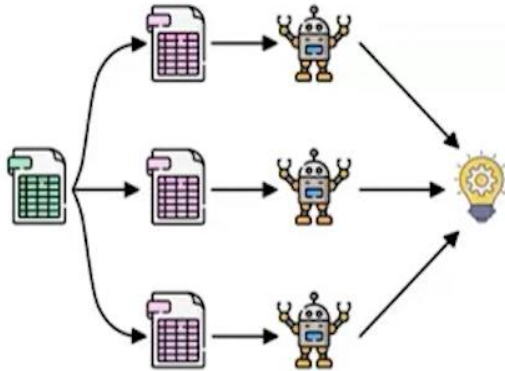


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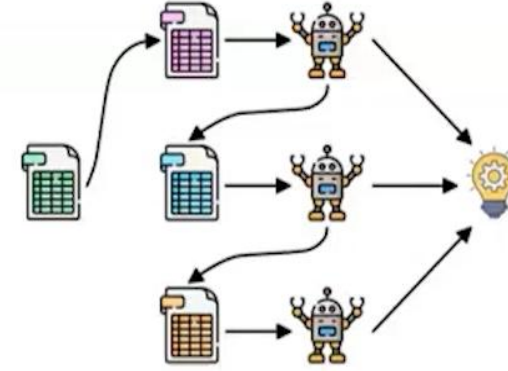


Bagging



Accurate

Boosting



Reliable



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By Averaging (**Bagging**)

More weight to Stronger Models (**Boosting**)



Fraud Detection

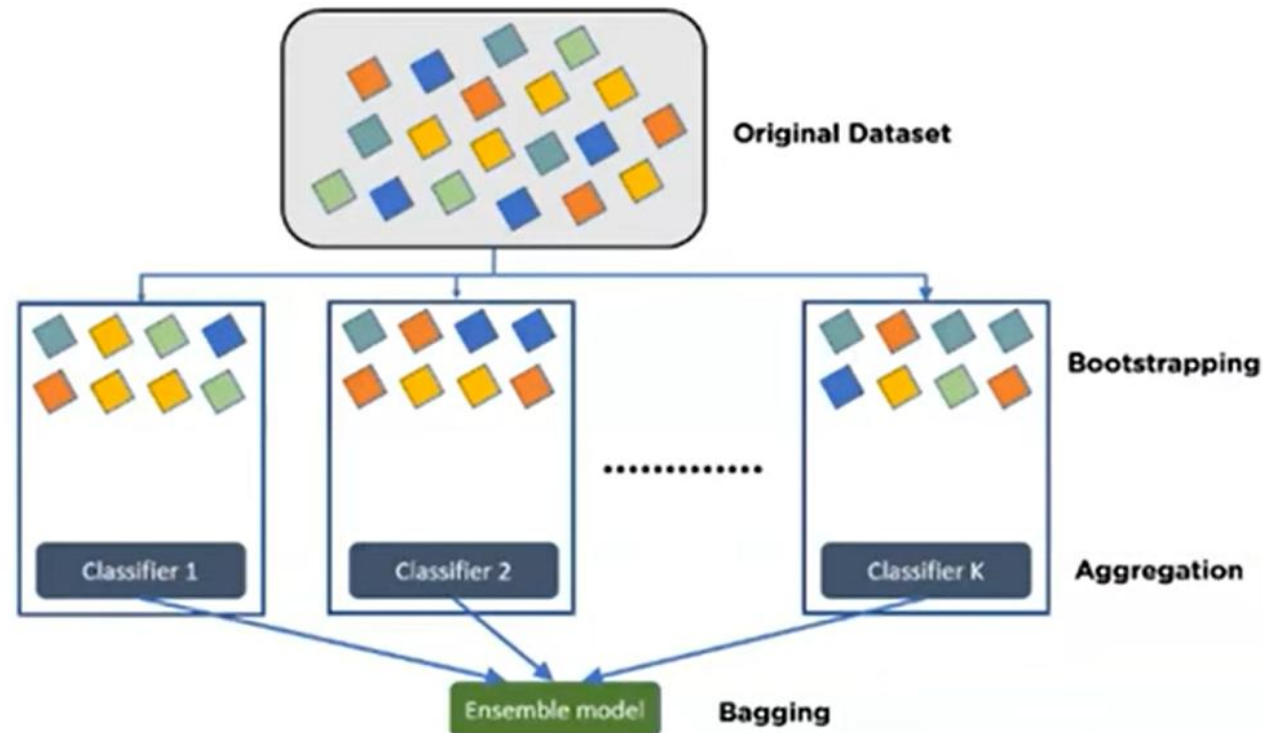


Stock Market Forecasting



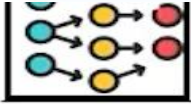
Medical Diagnosis

Bagging (Bootstrap Aggregating) is an ensemble learning method that improves the accuracy and reliability of predictions.





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Implementation Steps of Bagging

Dataset Preparation

Bootstrap Sampling

Model Training

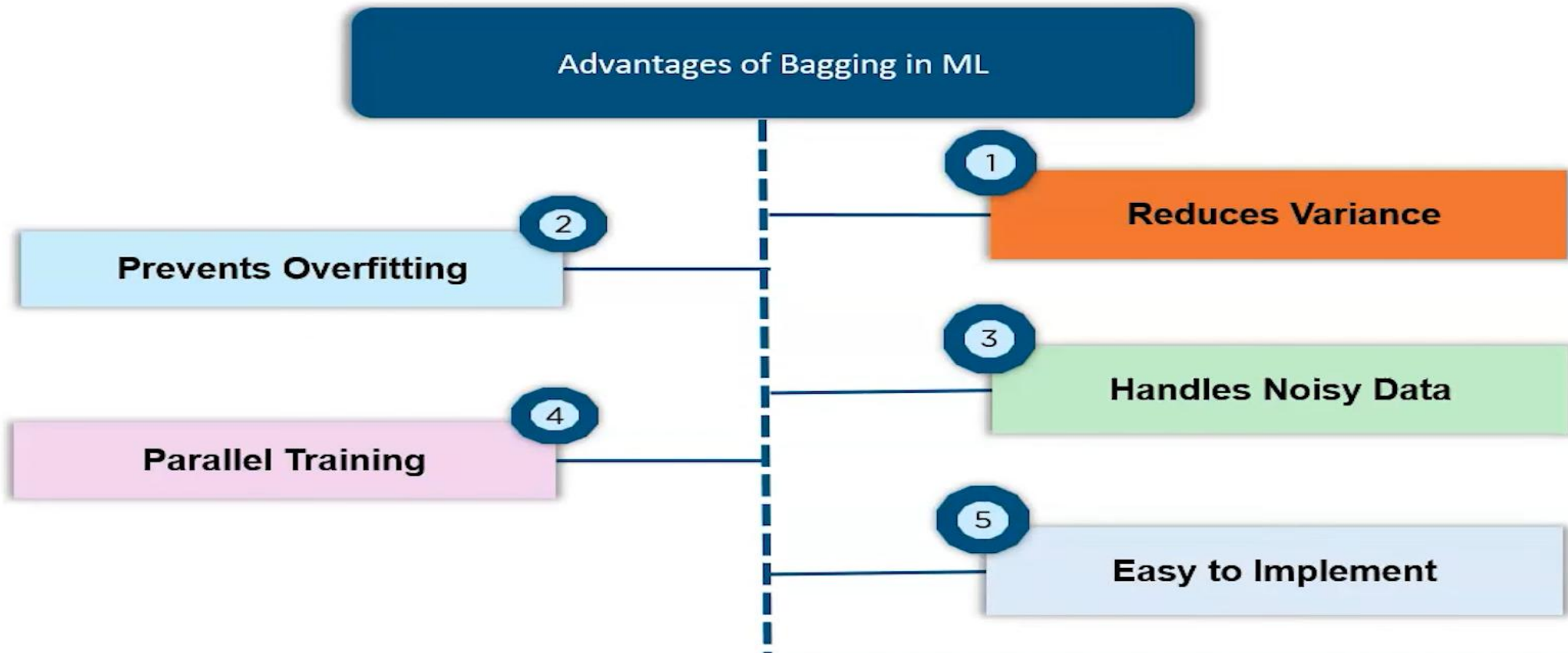
Prediction Generation

Combining Predictions

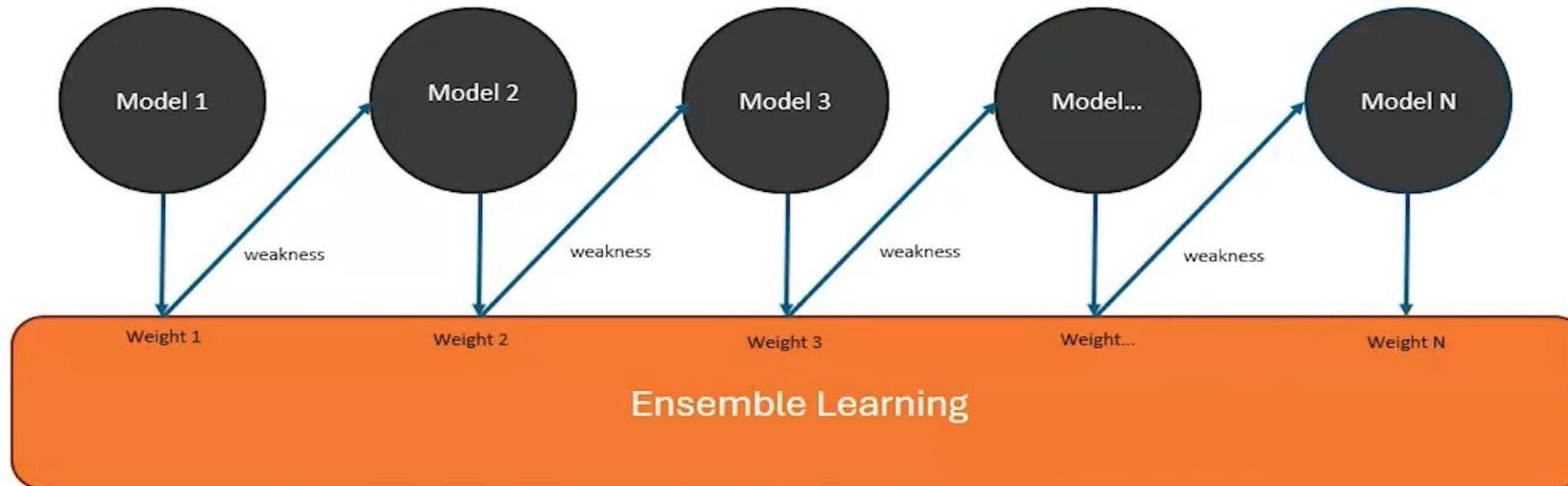
Evaluation

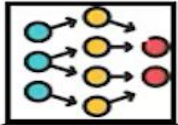
Hyperparameter Tuning

Deployment



Boosting is an ensemble learning method that improves accuracy by training models one after another.





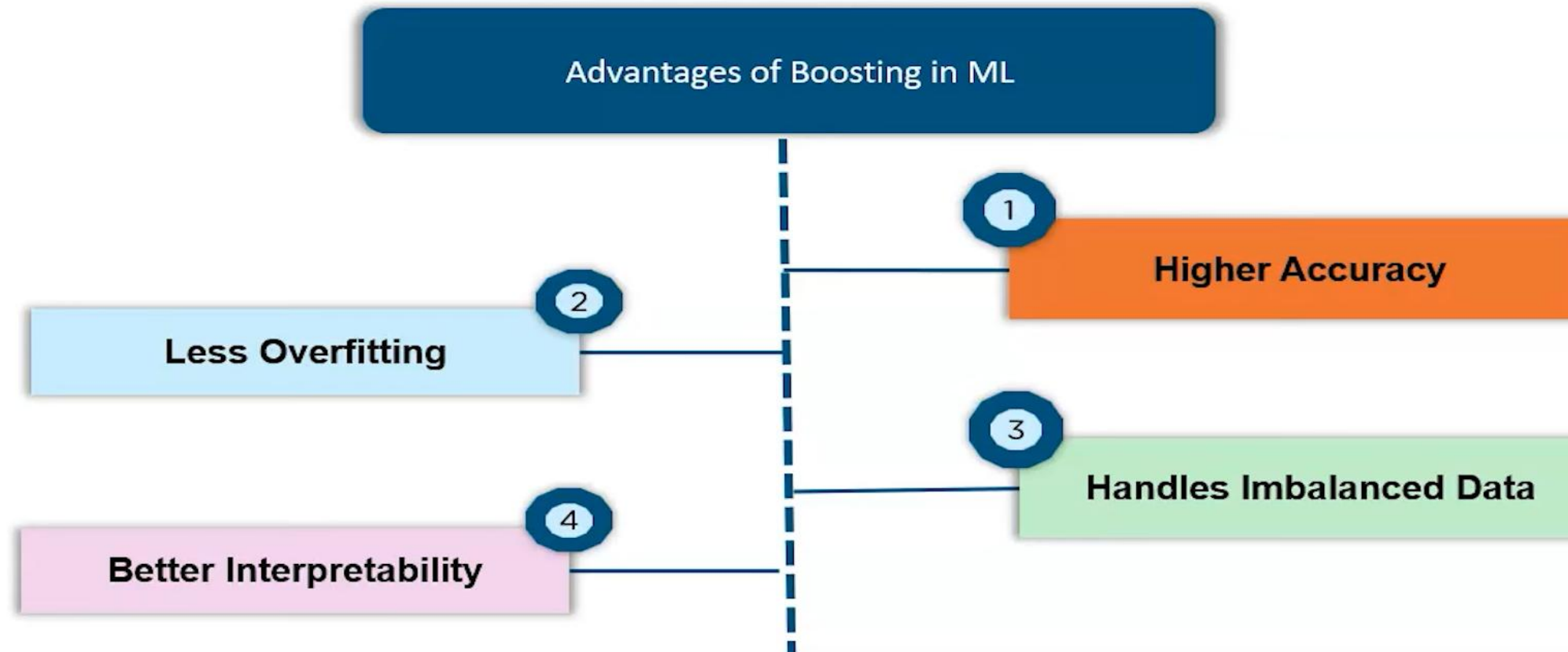
Steps to perform Boosting

Start with Equal Weights: The algorithm gives equal importance to all data points and trains the first base model (usually a decision tree)

Identify Errors: It checks which predictions were wrong and increases the weight of those samples, making them more important for the next model.

Train the Next Model: A new model is trained with the updated weights, focusing more on the difficult cases.

Repeat Until Optimized: This process continues until the error rate is low or the set number of iterations is reached.





Boosting

Boosting combines different models to improve predictions

The goal of boosting is to reduce bias (error due to incorrect assumptions)

Models in boosting get different importance based on their performance

Bagging

Bagging combines multiple versions of the same model for better results.

The goal of bagging is to reduce variance (error due to sensitivity to data changes)

All models in bagging have equal importance in the final result.



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Boosting

Each new model learns from the mistakes of the previous model, improving step by step

Works well with weak models and turns them into strong learners.

More prone to overfitting if not tuned properly.

Bagging

All models work independently without relying on each other

Works best with strong models, reducing their variability

Less prone to overfitting because models run in parallel