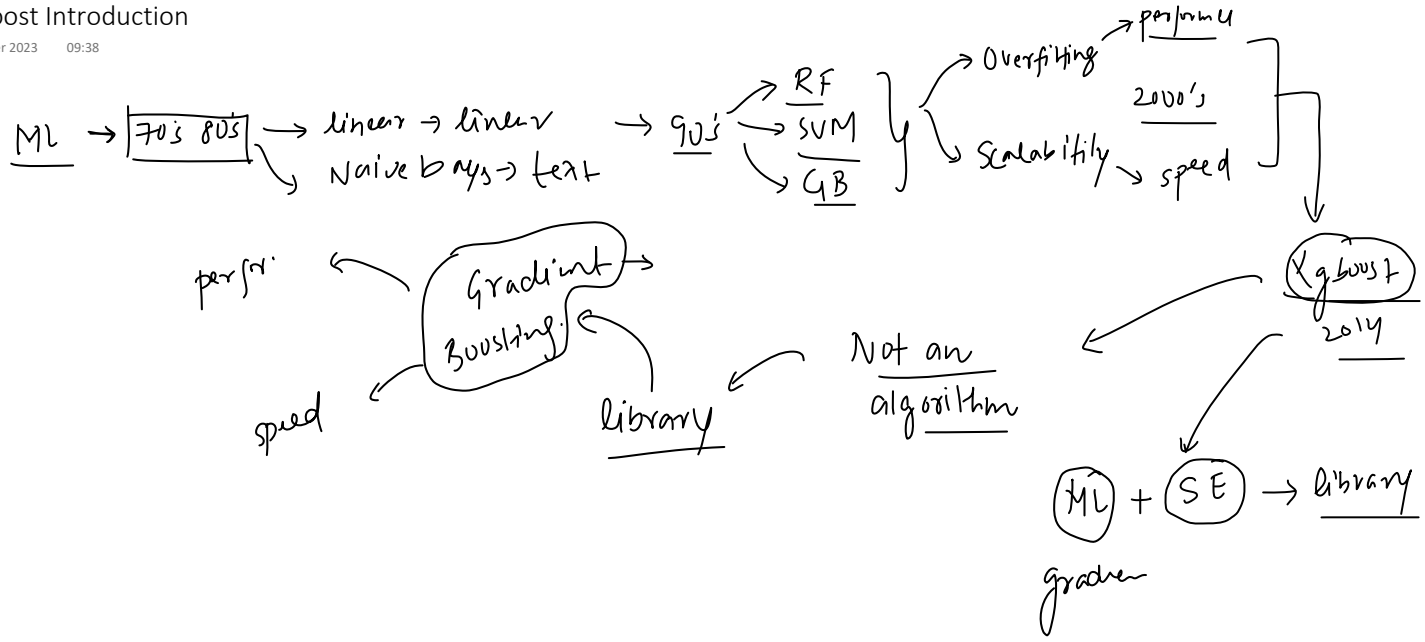
XGBoost Introduction

12 October 2023 09:38



History

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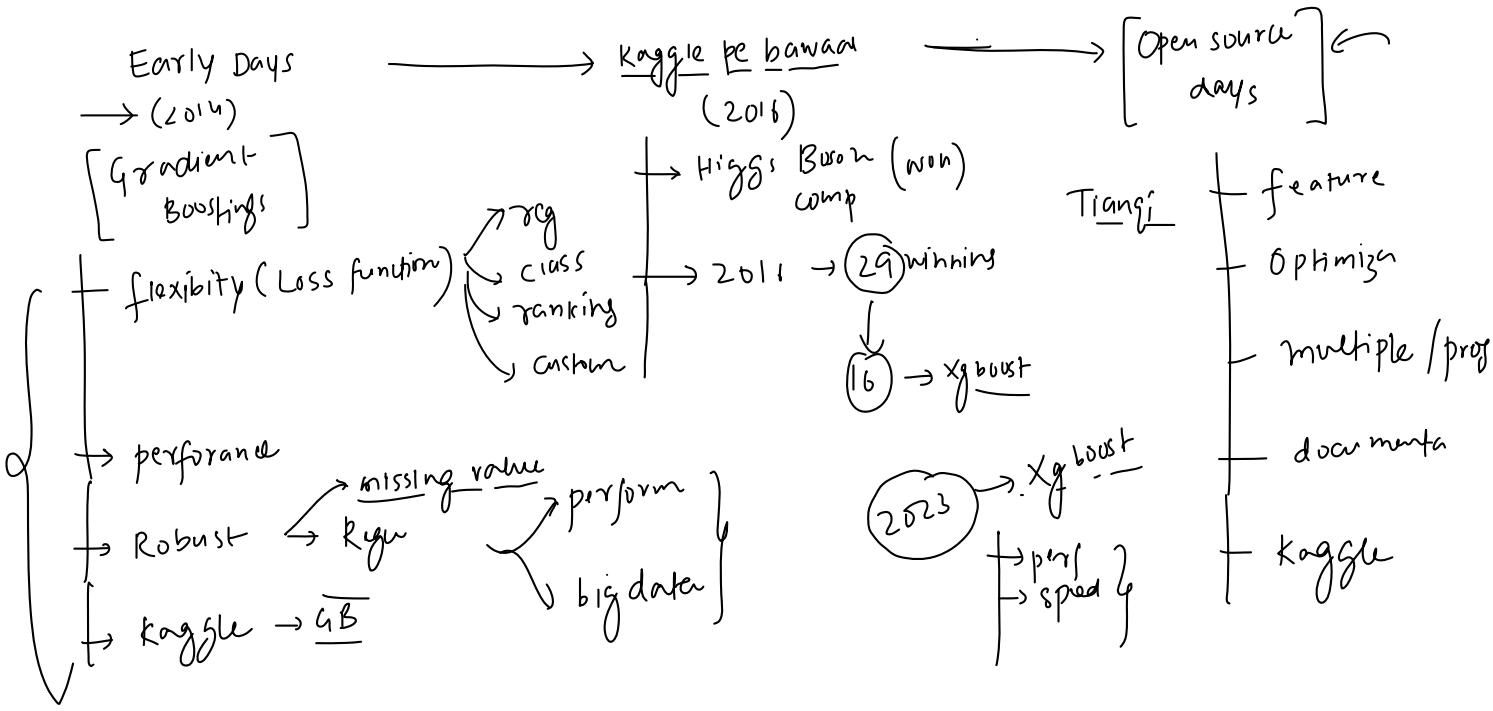

XGBoost Features

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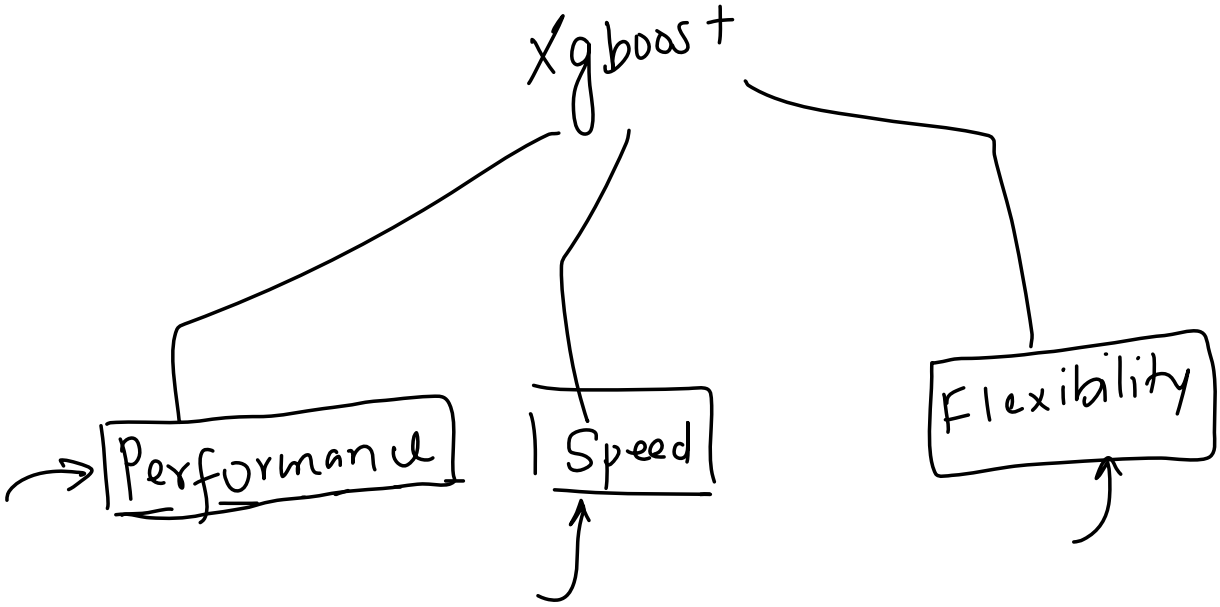

1. Flexibility

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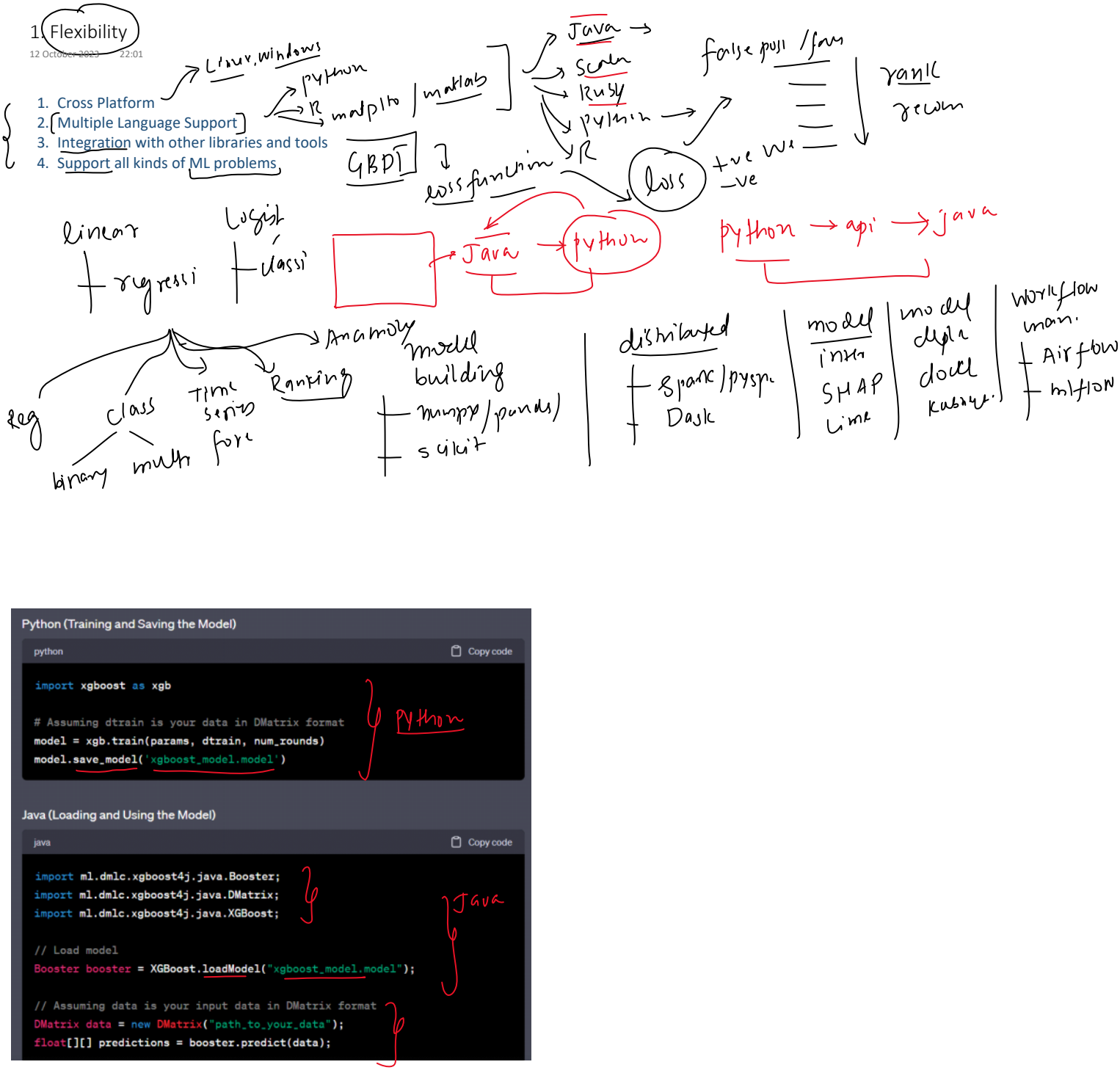
1. Cross Platform
2. Multiple Language Support
3. Integration with other libraries and tools
4. Support all kinds of ML problems



Python (Training and Saving the Model)

python — Copy code

```python
import xgboost as xgb

# Assuming dtrain is your data in DMatrix format
model = xgb.train(params, dtrain, num_rounds)
model.save_model('xgboost_model.model')
```

Python

Java (Loading and Using the Model)

java — Copy code

```java
import ml.dmlc.xgboost4j.java.Booster;
import ml.dmlc.xgboost4j.java.DMatrix;
import ml.dmlc.xgboost4j.java.XGBoost;

// Load model
Booster booster = XGBoost.loadModel("xgboost_model.model");

// Assuming data is your input data in DMatrix format
DMatrix data = new DMatrix("path_to_your_data");
float[][] predictions = booster.predict(data);
```

Java

2. Speed

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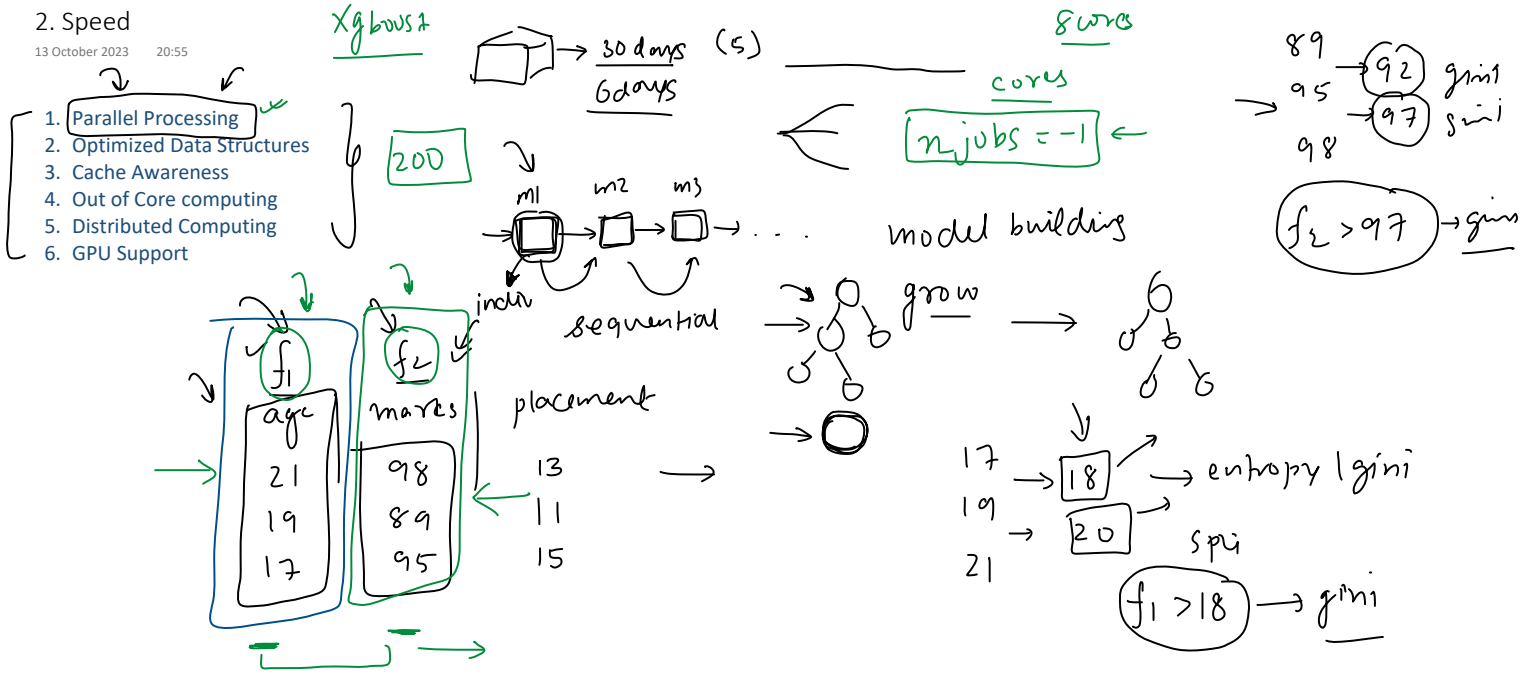
1. Parallel Processing
2. Optimized Data Structures
3. Cache Awareness
4. Out of Core computing
5. Distributed Computing
6. GPU Support



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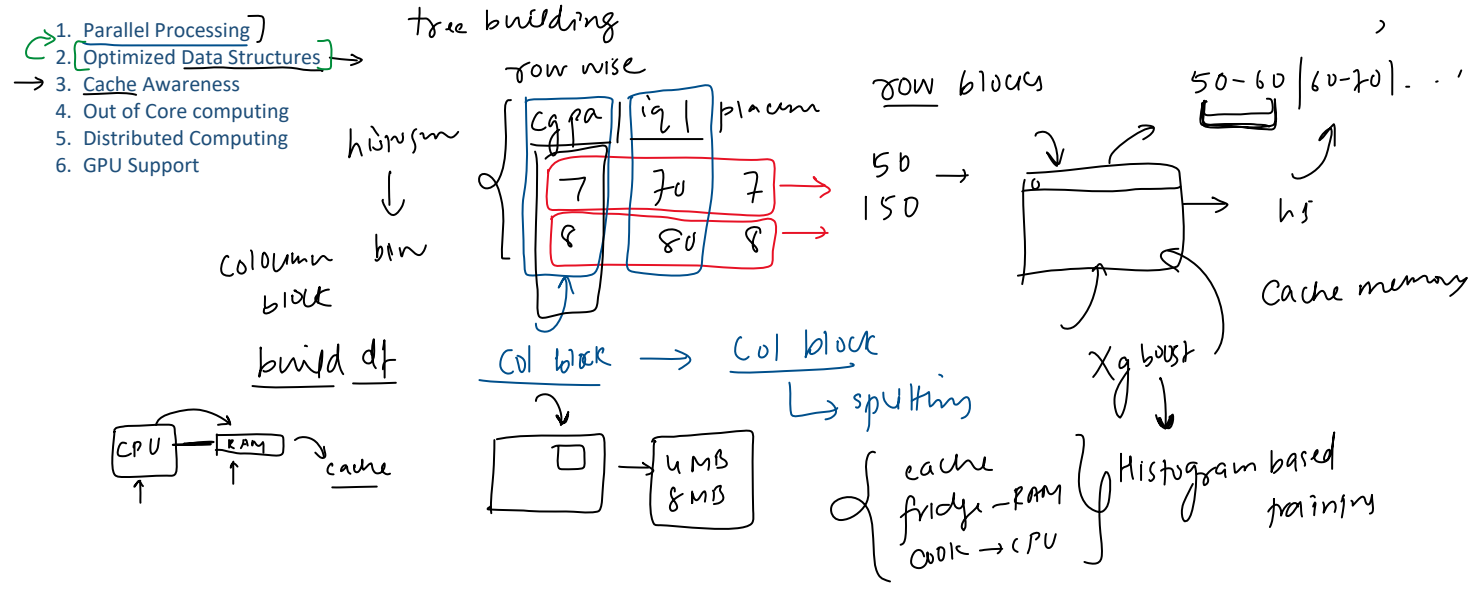

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2. Optimized Data Structures ✓
3. Cache Awareness ✓
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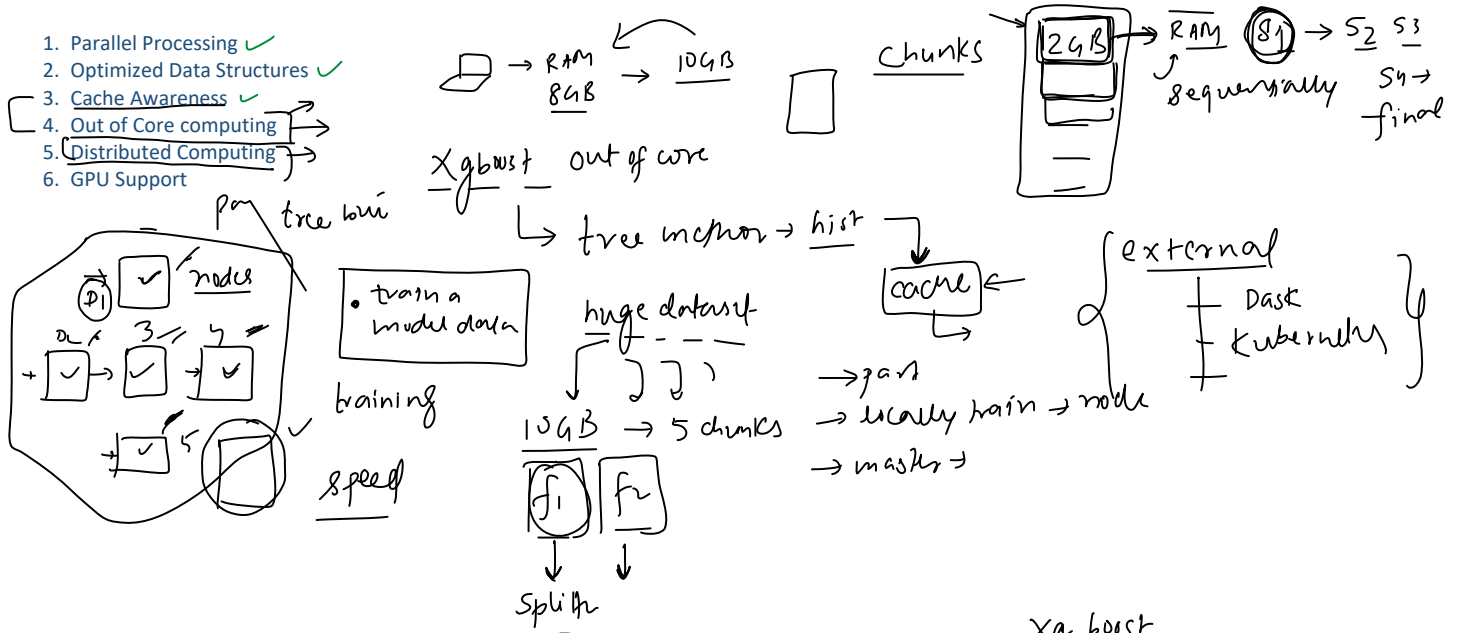

Split

Software → Extreme

Software

Xg boost

Extreme GB

1. Parallel Processing ✓
2. Optimized Data Structures ✓
3. Cache Awareness ✓
4. Out of Core computing ✓
5. Distributed Computing ✓
6. GPU Support →

CPU → data → CPU → GPU

↳ cores → less powerful

more in number

parallel

histogram split finding

tree_method: gpu_hist

Software env

ML → performance

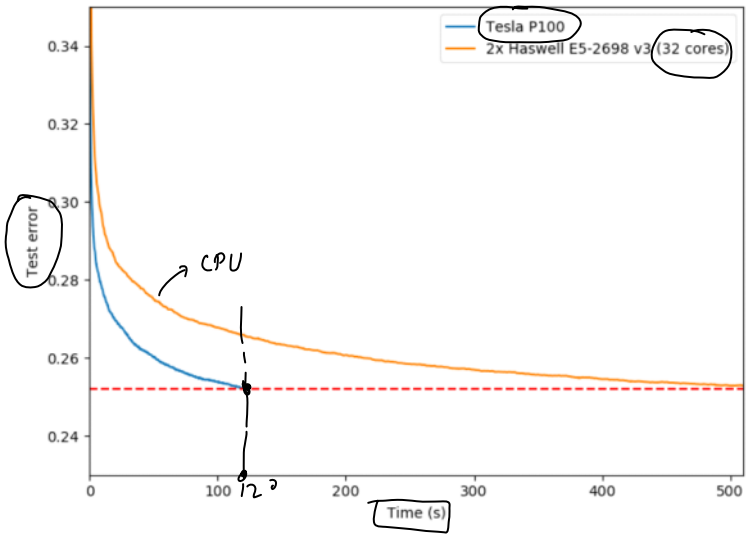

Figure 3. Test error over time for the Higgs dataset, 1000 boosting iterations.

B. Performance →

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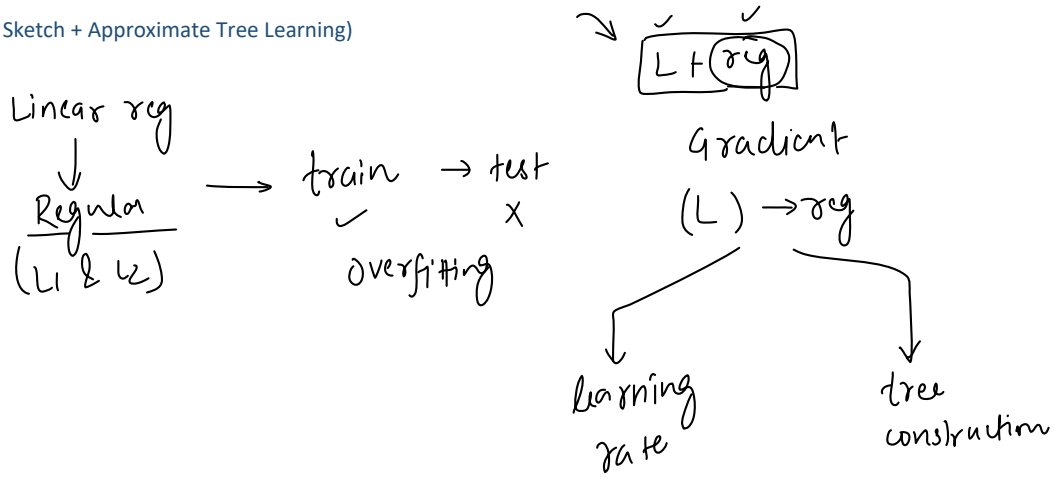
Xgboost

Xgboost → Loss function → min

1. Regularized Learning Objective
2. Handling Missing values
3. Sparsity Aware Split Finding
4. Efficient Split Finding(Weighted Quantile Sketch + Approximate Tree Learning)
5. Tree Pruning



1. Regularized Learning Objective ✓
2. Handling Missing values
3. Sparsity Aware Split Finding →
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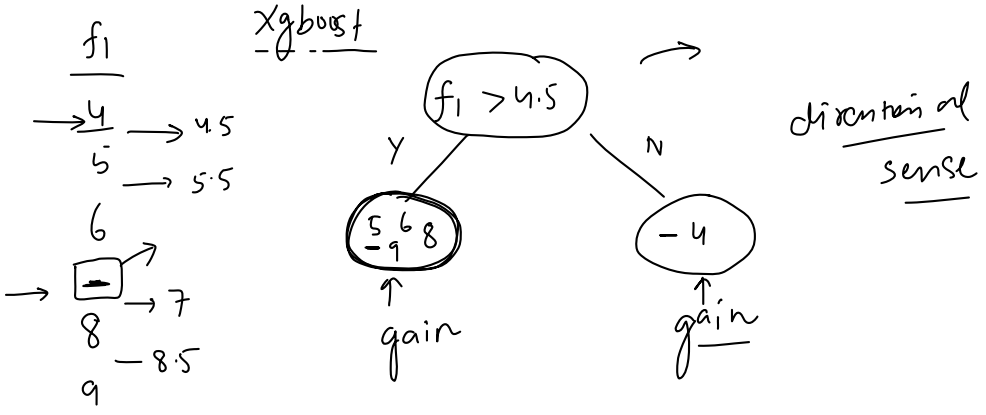
ml → missing
↳ prepro
↳ impute



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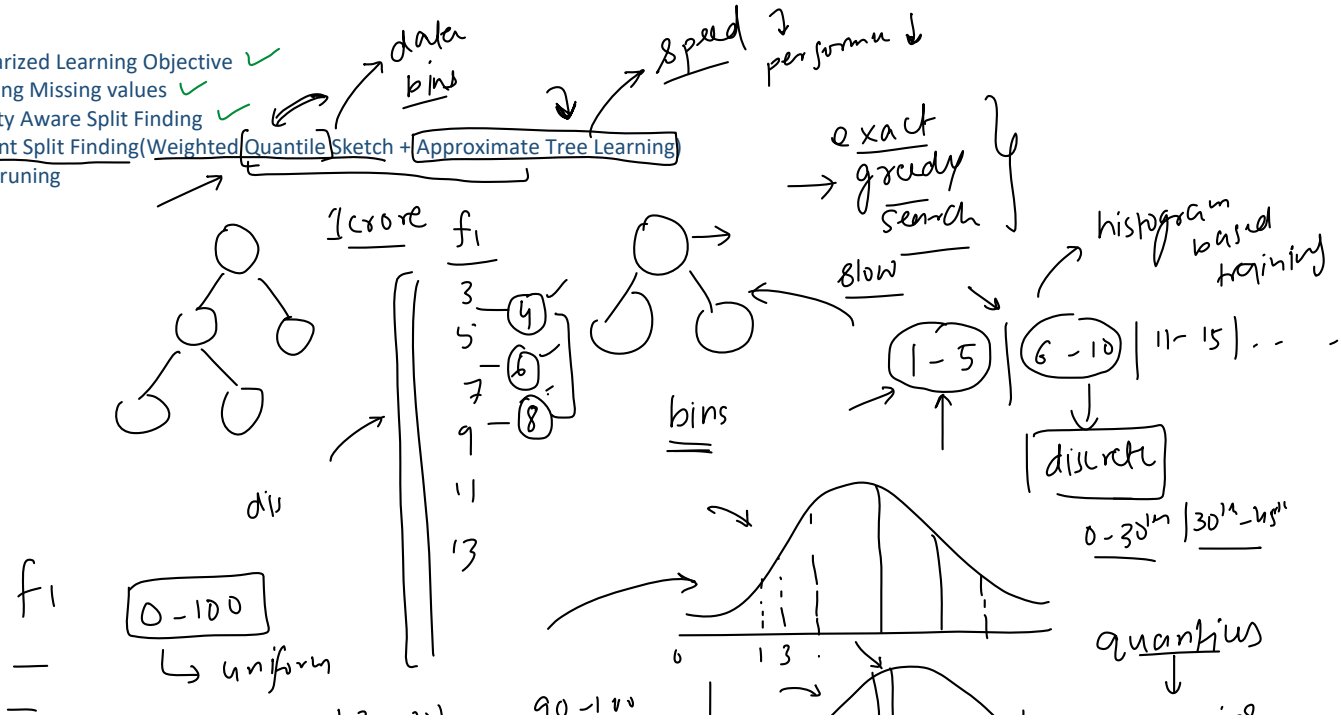
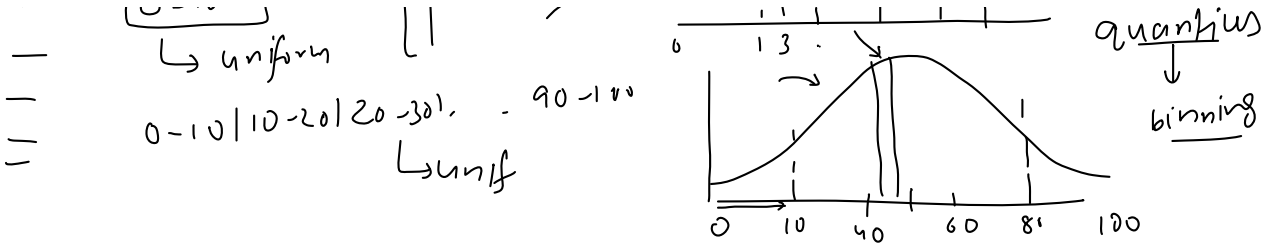
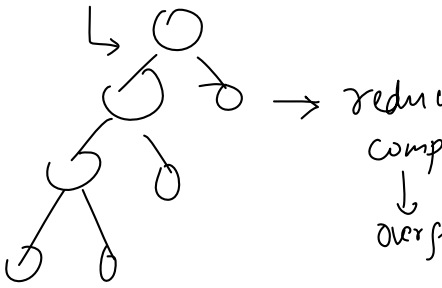




GB

1. Regularized Learning Objective ✓
2. Handling Missing values ✓
3. Sparsity Aware Split Finding ✓
4. Efficient Split Finding(Weighted Quantile Sketch + Approximate Tree Learning) ✓
5. Tree Pruning → purpose xgboost



→ reduce complexity → overfitting

→ Post pruning
→ pre pruning

XgBoost
- pre pruning
- post
- gamma value