I've created a comprehensive guide that covers each boosting algorithm in detail with practical examples and specific use cases. Here are the key takeaways for when to use each algorithm:

Quick Selection Guide:

Use AdaBoost when:

* You have binary classification problems
* Simple, interpretable rules can be combined effectively
* Dataset is clean with minimal noise
* Examples: Face detection, medical diagnosis with clear symptoms

Use Gradient Boosting when:

* You need a solid baseline for regression problems
* Want to understand the boosting fundamentals
* Have medium-sized datasets
* Examples: House pricing, basic forecasting tasks

Use XGBoost when:

* Maximum accuracy is your priority
* You're working on Kaggle competitions or similar challenges
* Have structured/tabular data with mixed feature types
* Examples: Risk modeling, biomedical research, supply chain optimization

Use LightGBM when:

* Speed and memory efficiency are critical
* You have large datasets (>10K samples)
* Need real-time predictions
* Examples: Real-time bidding, recommendation systems, high-frequency trading

Use CatBoost when:

* You have many high-cardinality categorical features
* Want to minimize preprocessing effort
* Working with mixed data types (numerical + categorical + text)
* Examples: Customer segmentation, fraud detection, job matching platforms

The choice ultimately depends on your specific constraints: data size, feature types, accuracy requirements, speed needs, and preprocessing time available. Many practitioners start with XGBoost for general excellence, then switch to LightGBM for speed or CatBoost for categorical-heavy datasets**.**