=== Tuning XGBoost ===

Best Params: {'learning\_rate': 0.1, 'max\_depth': 6, 'n\_estimators': 200}

MSE: 0.0004

Training Time: 43.6s

=== Tuning LightGBM ===

Best Params: {'learning\_rate': 0.1, 'max\_depth': 6, 'n\_estimators': 200}

MSE: 0.0004

Training Time: 86.49s

=== Tuning Random Forest ===

Best Params: {'max\_depth': 6, 'n\_estimators': 100}

MSE: 0.0028

Training Time: 2558.38s

=== Tuning HistGradientBoosting ===

Best Params: {'learning\_rate': 0.1, 'max\_depth': 6, 'max\_iter': 200}

MSE: 0.0004

Training Time: 79.56s

=== Tuning CatBoost ===

Best Params: {'depth': 6, 'iterations': 200, 'learning\_rate': 0.1}

MSE: 0.0004

Training Time: 92.88s

=== Model Performance Summary ===

MSE Time (s)

XGBoost 0.000359 43.6

HistGradientBoosting 0.000375 79.56

LightGBM 0.000376 86.49

CatBoost 0.000384 92.88

Random Forest 0.002803 2558.38