

## Problem 1

[1.0, 0.9666666666666667, 0.8666666666666667, 0.9333333333333333, 0.733333333333333]

### Using GridSearchCV with Random Forest on Digits dataset ###

Number of physical cores: 8

Model: Random Forest

	params	... std_test_score
0	{'criterion': 'gini', 'n_estimators': 5} ...	0.007379
1	{'criterion': 'gini', 'n_estimators': 10} ...	0.006444
2	{'criterion': 'gini', 'n_estimators': 15} ...	0.008826
3	{'criterion': 'gini', 'n_estimators': 20} ...	0.010341
4	{'criterion': 'entropy', 'n_estimators': 5} ...	0.018127
5	{'criterion': 'entropy', 'n_estimators': 10} ...	0.010714
6	{'criterion': 'entropy', 'n_estimators': 15} ...	0.009807
7	{'criterion': 'entropy', 'n_estimators': 20} ...	0.007955

[8 rows x 3 columns]

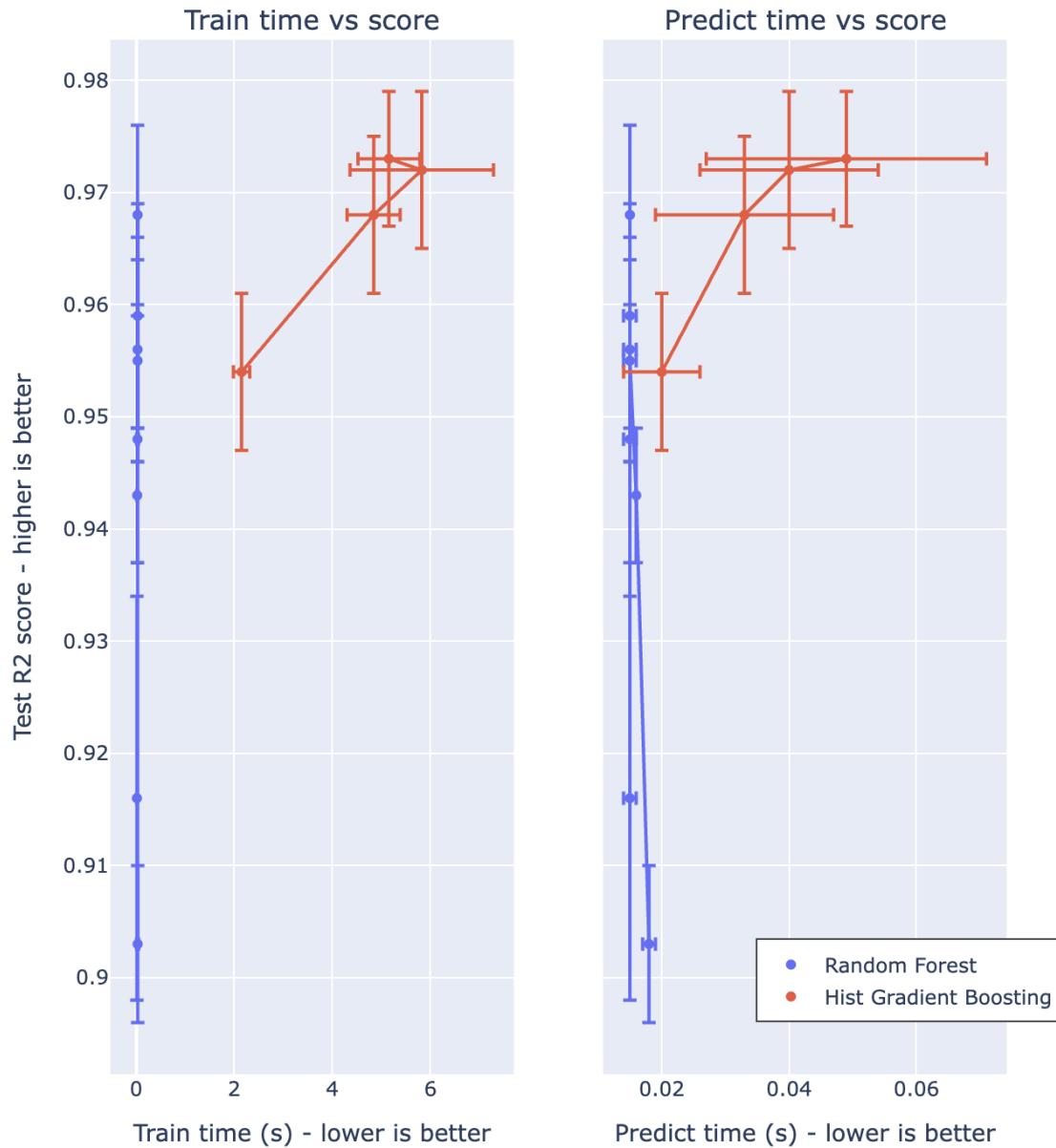
Model: Hist Gradient Boosting

	params	mean_test_score	std_test_score
0	{'max_iter': 25}	0.954372	0.007152
1	{'max_iter': 50}	0.967727	0.007378
2	{'max_iter': 75}	0.972177	0.007257
3	{'max_iter': 100}	0.973290	0.006490

Process finished with exit code 0

---

### Speed-score trade-off of tree-based ensembles



### Route 3 - Bridge Repair

• Bridge Repair (40 min added) Prob = 60% (0.6)

• No Repair Prob = 40% (0.4)

$$\text{Adjustment } (0.6 \times 40) + (0.4 \times 0) = 24 \text{ min} // 106.8 + 24 = 130.8$$

A: Route 1 is the fastest option based on these presimels

### ④ Expected Expected Time If route 2 is not Rocky

Sandy or Smooth Prob = 60% (1-40%)

Total Expected Time:

$$(0.4 \times 30) + (0.2 \times 12) = 8 + 2.4 = 10.4 \text{ min/km} // 10.4 \times 7 = 72.8$$

minutes

### ⑤ Expected Benefit of Waiting for Satellite

$$(0.6 \times 72.8) + (0.4 \times 103.5) = 43.68 + 41.4 = 85.08 \text{ minutes}$$

The decision to Wait Would balance the expected time for the satellite to reach the position.

### Route 3 - Bridge Repair

• Bridge Repair (40 min added) Prob = 60% (0.6)

• No Repair Prob = 40% (0.4)

$$\text{Adjustment } (0.6 \times 40) + (0.4 \times 0) = 24 \text{ min} // 106.8 + 24 = 130.8$$

A: Route 1 is the fastest option based on these presimels

### ④ Expected Expected Time If route 2 is not Rocky

Sandy or Smooth Prob = 60% (1-40%)

Total Expected Time:

$$(0.4 \times 30) + (0.2 \times 12) = 8 + 2.4 = 10.4 \text{ min/km} // 10.4 \times 7 = 72.8$$

minutes

### ⑤ Expected Benefit of Waiting for Satellite

$$(0.6 \times 72.8) + (0.4 \times 103.5) = 43.68 + 41.4 = 85.08 \text{ minutes}$$

The decision to Wait Would balance the expected time for the satellite to reach the position.