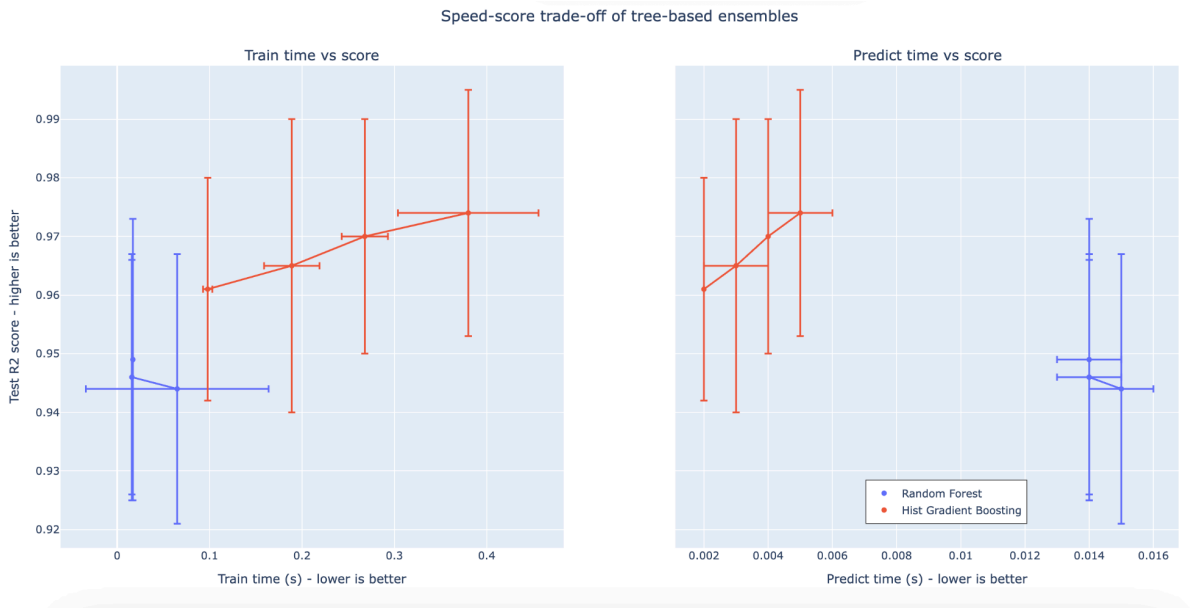
Noah Cavestany
CS 386
Prof. Brooks

Assignment 5: Working with Uncertainty

n_estimators	gini	entropy
10	[0.8771929824561403, 0.9210526315789473, 0.9824561403508771, 0.9649122807017544, 0.9646017699115044]	[0.9210526315789473, 0.9385964912280702, 0.9824561403508771, 0.9473684210526315, 0.9557522123893806]
25	[0.9035087719298246, 0.956140350877193, 0.9824561403508771, 0.956140350877193, 0.9734513274336283]	[0.9298245614035088, 0.956140350877193, 0.9912280701754386, 0.956140350877193, 0.9823008849557522]
50	[0.9298245614035088, 0.956140350877193, 0.9736842105263158, 0.9736842105263158, 0.9734513274336283]	[0.9035087719298246, 0.9473684210526315, 0.9912280701754386, 0.9649122807017544, 0.9734513274336283]



Part 4:

It knows that over rocky terrain it can go 2 km/h. Over sandy terrain it can go 3 km/h, and over smooth terrain it can go 5 km/h.

Rocky: 2 km/hr = 30 min per km
Sandy: 3 km/hr = 20 min per km
Smooth: 5 km/hr = 12 min per km

Route 1 is 5 km long. There is a 20% chance it is sandy, 30% chance it is smooth, and a 50% chance it is rocky.
Sandy: 20 * 5 = 100 min
Smooth: 12 * 5 = 60 min
Rocky: 30 * 5 = 150 min
(100 * .2) + (60 * .3) + (150 * .5) = 113 minutes on average

Route 2 is 7 km long. There is a 40% chance it is sandy, a 20% chance it is smooth, and a 40 % chance it is rocky.
Sandy: 20 * 7 = 140 min
Smooth: 12 * 7 = 84 min
Rocky: 30 * 7 = 210 min
(140 * .4) + (84 * .2) + (210 * .4) = 156.8 minutes on average

Route 3 is 6 km long. There is a 50% chance it is sandy, a 40% chance it is smooth, and a 10% chance it is rocky.
Sandy: 20 * 6 = 120
Smooth: 12 * 6 = 72
Rocky: 30 * 6 = 180
(120 * .5) + (72 * .4) + (180 * .1) = 106.8 minutes on average

Route 3 has the lowest time on average, so it is the best route.

Part 2:

Route 1 contains a crater. If the wall of the crater is intact, we can take a shortcut through the crater, which will save 20 minutes. If the wall has been damaged, we will need to go around, which will add 15 minutes to our journey. There is a 30% chance that the wall is damaged. (Therefore 70% chance that it's not and we saved 20 minutes.)

(113 - 20) * 0.7 + (113 + 15) * 0.3 = 103.5 minutes on average

Route 3 contains a bridge. If that bridge is damaged, we will need to repair it, which will add 40 minutes to our time. There is a 60% chance that the bridge is damaged. (40% chance that it is not damaged.)

(106.8 + 40) * 0.6 + (106.8) * 0.4 = 130.8 minutes on average

With this new information, Route 1 is the best choice.

Part 3:

First: If the satellite said that route 2 was not rocky, how long would we expect it to take?

(Updated) Route 2 is 7 km long. There is a 66.6% chance it is sandy, a 33.3% chance it is smooth.
Sandy: 20 * 7 = 140 min
Smooth: 12 * 7 = 84 min
(140 * 2/3) + (84 * 1/3) = 121.333 minutes on average (better than 156.8 minutes from before)

Second: What's the probability that the satellite will tell us this?

There is a 40% chance it is sandy, a 20% chance it is smooth, and a 40 % chance it is rocky. Therefore there is a 60% chance that it will tell us that it's not rocky.

Third: If the satellite tells us route 2 is in fact rocky, what do we do? How long will that take?

With the crater and bridge information, we would take Route 1, which would take 103.5 minutes on average.

Last: given all of this, how long should we wait for the satellite?

Even if we wait for the satellite, the average time for Route 2 is 121.33 minutes. This is still worse than our previous options, whether the bridge and crater exist or not. Therefore, we shouldn't wait for the satellite at all.