1. (table shows averages)

	gini	entropy
10	0.947259742276044	0.9525850023288308
25	0.9596180717279925	0.956078248719143
50	0.9631268436578171	0.963113181183046

Speed-score trade-off of tree-based ensembles
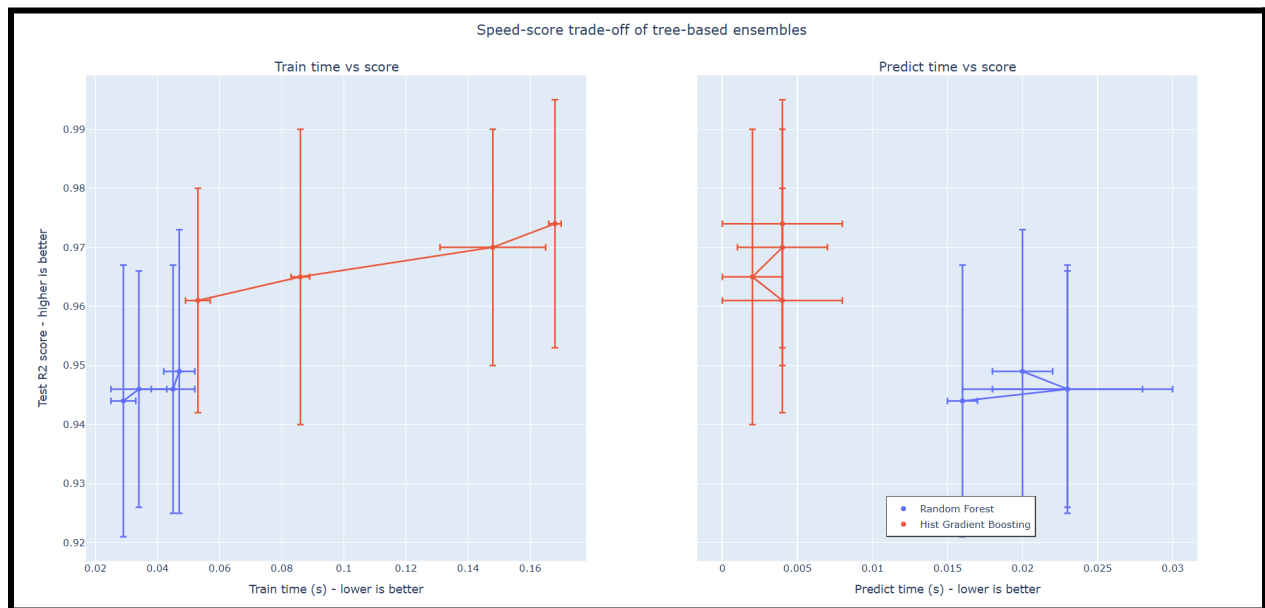
4.1) $2km/h = \dfrac{60 \text{ min/k}}{2 \text{ km/k}} = 30 \dfrac{\text{min}}{km} \rightarrow$ rocky terrain

$3km/h = \dfrac{60 \text{ min/h}}{3 \text{ km/h}} = 20 \dfrac{\text{min}}{km} \rightarrow$ sandy terrain

$5km/h = \dfrac{60 \text{ min/h}}{5 \text{ km/h}} = 12 \dfrac{\text{min}}{km} \rightarrow$ smooth terrain

Utility (R1) $= (0.2 \times 20 + 0.3 \times 12 + 0.5 \times 30) = 22.6$ min/km $\times 5$ km $= 113$ min $\circlearrowright \times 5$

Utility (R2) $= (0.4 \times 20 + 0.2 \times 12 + 0.4 \times 30) = 22.4$ min/km $\times 7$ km $= 156.8$ min $\rightarrow \times 7$

Utility (R3) $= (0.5 \times 20 + 0.4 \times 12 + 0.1 \times 30) = 17.8$ min/km $\times$ (6 km $= 106.8$ min) $\rightarrow \times 6$

Route 3 is the best one.

4.2) Route 1 adjustment $= 0.7 \times (-20) + 0.3 \times 15 = -9.5$ minutes

$113 - 9.5 = 103.5$ minutes

Route 3 adjustment $= 0.6 \times 40 = 24$ minutes

$106.8 + 24 = 130.8$ minutes. Route 1 is now the best one.

4.3) If it's not rocky anymore, we have to change the probabilities

$P(\text{sandy}) = \dfrac{0.4}{0.4 + 0.2} = 0.67$ $P(\text{smooth}) = 1 - 0.67 = 0.33$

$\underset{\text{sandy}}{\uparrow} \quad \underset{\text{smooth}}{\uparrow}$

$\circlearrowright \times 7$

New Utility (R3) $= (0.67 \times 20 + 0.33 \times 12) = 16.2$ min/km $\times 7$ km $= 121.3$ min

4.4) The probability the satellite will tell us this is 0.6, because that's the complement of the probability that it is rocky.

4.5) If it is rocky $\rightarrow 1 \times 30 = 30$ min/km $\times 7$ km $= 210$ min.

4.6) Even with the new utility, Route 1 is still better. Therefore, it is best to take it without waiting for the satellite.