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13 November 2024

CS 386

Part 1: Decision Trees in sci-kit-learn

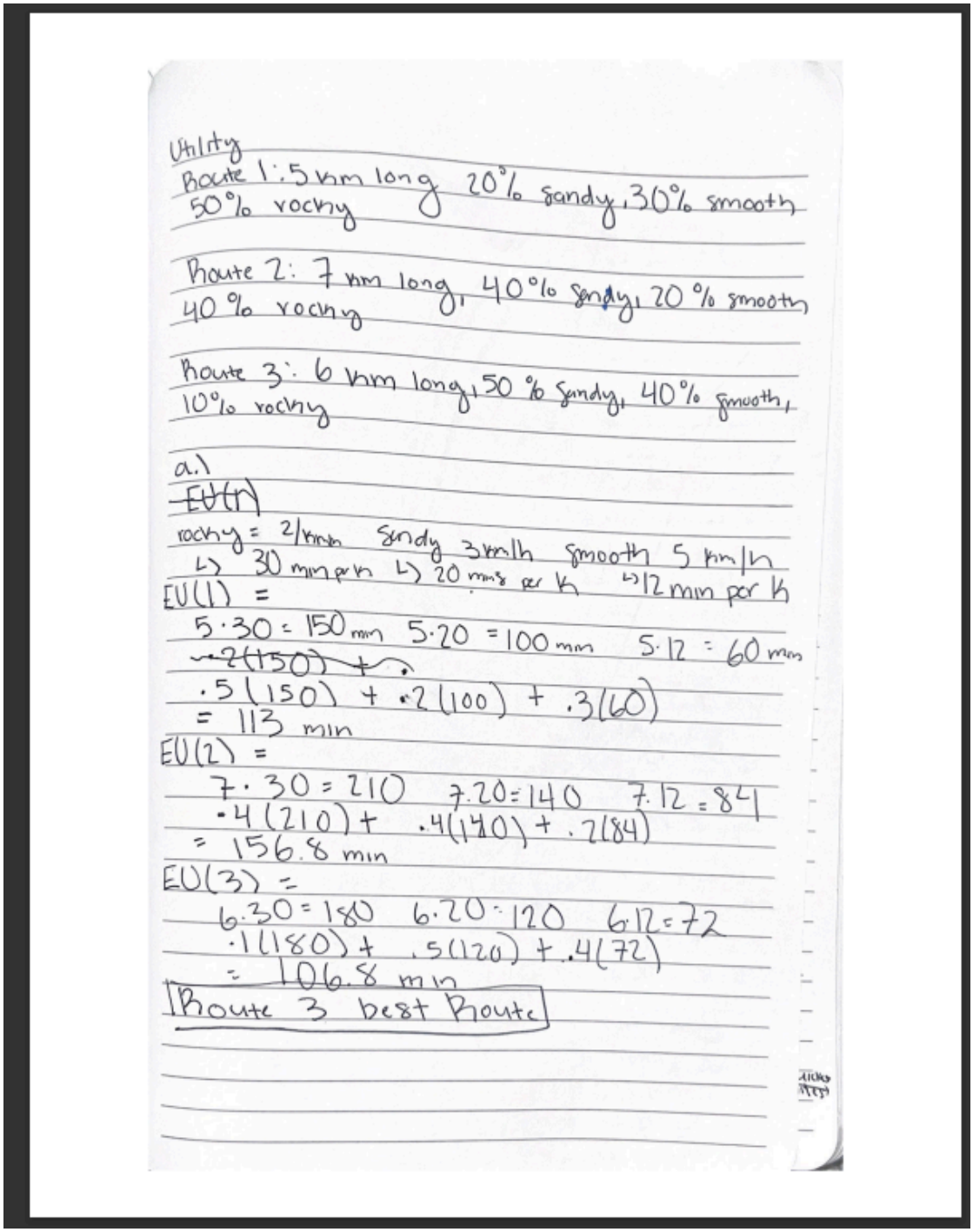
Dataset: Breast Cancer

Result Scores

Estimators:	Gini	Entropy
10	[0.9473684210526315, 0.9122807017543859, 0.9736842105263158, 0.9736842105263158, 0.9646017699115044]	[0.9122807017543859, 0.956140350877193, 0.9912280701754386, 0.9736842105263158, 0.9646017699115044]
25	[0.9035087719298246, 0.956140350877193, 0.9736842105263158, 0.9649122807017544, 0.9823008849557522]	[0.9210526315789473, 0.9473684210526315, 0.9912280701754386, 0.956140350877193, 0.9823008849557522]
50	[0.9122807017543859, 0.9385964912280702, 0.9736842105263158, 0.956140350877193, 0.9734513274336283]	[0.9210526315789473, 0.9473684210526315, 0.9912280701754386, 0.956140350877193, 0.9823008849557522]

Hyperparameter Search Plot

Part 4: Utility.



Utility

Route 1: 5 km long 20% sandy, 30% smooth 50% rocky

Route 2: 7 km long, 40% sandy, 20% smooth 40% rocky

Route 3: 6 km long, 50% sandy, 40% smooth, 10% rocky

a.)

~~EU(r)~~

rocky = 2 km/h sandy 3 km/h smooth 5 km/h
↳ 30 min per km ↳ 20 mins per km ↳ 12 min per km

EU(1) =

5·30 = 150 min 5·20 = 100 min 5·12 = 60 min

~~.2(150) +~~

.5(150) + .2(100) + .3(60)

= 113 min

EU(2) =

7·30 = 210 7·20 = 140 7·12 = 84

.4(210) + .4(140) + .2(84)

= 156.8 min

EU(3) =

6·30 = 180 6·20 = 120 6·12 = 72

.1(180) + .5(120) + .4(72)

= 106.8 min

Route 3 best Route

b.)

EU(1) =

$.5(150) + .2(100) + .3(60) + .3(15)$

$= 117.5$ min

EU(2) = 156.8 min

EU(3) =

~~$.4(210) + .4(140) + .2(8$~~

$.1(180) + .5(120) + .4(72) + .6(40)$

~~$= 130.8$ min~~

Route 1 seems the best

c.)

EU(2) =

$.4(140) + .2(84) = 72.8$ min

d.) There's a 100% probability that the satellite will tell us that route 2 is rocky or not given it's in the right position. but a 50% chance of it being not rocky.

e.) If the satellite tells us route 2 is rocky, we should take another route, given we haven't moved we should take route 1, which is about 117.5 mins.

d.) We should wait for the satellite for 44.7 mins, which is 117.5 - 72.8. Since 117.5 mins is the quickest route given, Route 2 is rocky, we should wait no more than 44.7 mins for satellite, because the wait time and execution time would be more than the quickest route.