

## 1 Introduction

Here are some results from tests of the algorithm. In each test there is a feature `uvot_detection`. 13 out of 17 high redshifts are “no” for `uvot_detection`. 36 out of 134 lows are “no” for this feature. I ran the algorithm using 0, 1, 10, and 25 noise features. Originally I had been using rpart default pruning for constructing trees but this seemed to be underpruning trees so I switched to pruning to minimize CV error.

The algorithm does fine for 0 noise features. There is a slight decrease in performance with 1 noise feature. With 10 and 25 noise features there is a clear decrease in performance. It’s not entirely clear what is causing this. The final section may have some clues. In the final section “The Trees” I printed all possible classifiers that we could have ended up choosing for the case with 25 noise variables. In other words for each prior on high from .05 through .95 (increments of .05) I constructed a tree. I did this using the CV pruning rpart provides (“With Pruning”), and the default R pruning (“Without Pruning” section). It appears that with 25 noise variables we are at the detection limit for choosing `uvot_detection` as the first split. Several of the trees split on other features. This is with the entire data set. In practice, CART will be using only 80% of the data since it will be inside two cross validation loops when trying to assess CV error. This indicates to me that 25 features may be about as many as is appropriate to use, given the amount of data we have.

## 2 0 Noise Features

	Actual Low	Actual High
Pred. Low	122.87 ( 122.79 , 122.92 )	13.03 ( 12.98 , 13.11 )
Pred High	11.13 ( 11.08 , 11.21 )	3.97 ( 3.89 , 4.02 )

Table 1: CV Confusion Matrix for alpha = 0.1 . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	100.83 ( 100.72 , 100.72 )	4.87 ( 4.98 , 4.98 )
Pred High	33.17 ( 33.28 , 33.28 )	12.13 ( 12.02 , 12.02 )

Table 2: CV Confusion Matrix for alpha = 0.3 . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	72.54 ( 72.54 , 72.54 )	2.96 ( 2.96 , 2.96 )
Pred High	61.46 ( 61.46 , 61.46 )	14.04 ( 14.04 , 14.04 )

Table 3: CV Confusion Matrix for alpha = 0.5 . The parentheses are .25 and .75 quantiles.

Feature	Number Times
uvot_detection	91

Table 4: Splits for alpha = 0.1 model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	98

Table 5: Splits for alpha = 0.3 model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	100

Table 6: Splits for  $\alpha = 0.5$  model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

### 3 1 Noise Features

	Actual Low	Actual High
Pred. Low	122.55 ( 122.22 , 123.02 )	13.35 ( 12.88 , 13.68 )
Pred High	11.45 ( 10.98 , 11.78 )	3.65 ( 3.32 , 4.12 )

Table 7: CV Confusion Matrix for  $\alpha = 0.1$  . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	100.71 ( 100.72 , 100.82 )	4.99 ( 4.88 , 4.98 )
Pred High	33.29 ( 33.18 , 33.28 )	12.01 ( 12.02 , 12.12 )

Table 8: CV Confusion Matrix for  $\alpha = 0.3$  . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	72.43 ( 72.47 , 72.57 )	3.07 ( 2.93 , 3.03 )
Pred High	61.57 ( 61.43 , 61.53 )	13.93 ( 13.97 , 14.07 )

Table 9: CV Confusion Matrix for  $\alpha = 0.5$  . The parentheses are .25 and .75 quantiles.

Feature	Number Times
uvot_detection	92
f1	46

Table 10: Splits for  $\alpha = 0.1$  model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	100
f1	26

Table 11: Splits for  $\alpha = 0.3$  model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	100
f1	26

Table 12: Splits for  $\alpha = 0.5$  model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

	Actual Low	Actual High
Pred. Low	122 ( 121.72 , 122.62 )	13.9 ( 13.28 , 14.18 )
Pred High	12 ( 11.38 , 12.28 )	3.1 ( 2.82 , 3.72 )

Table 13: CV Confusion Matrix for alpha = 0.1 . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	99.45 ( 98.8 , 100.36 )	6.25 ( 5.34 , 6.9 )
Pred High	34.55 ( 33.64 , 35.2 )	10.75 ( 10.1 , 11.66 )

Table 14: CV Confusion Matrix for alpha = 0.3 . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	71.31 ( 70.43 , 72.3 )	4.19 ( 3.2 , 5.07 )
Pred High	62.69 ( 61.7 , 63.57 )	12.81 ( 11.93 , 13.8 )

Table 15: CV Confusion Matrix for alpha = 0.5 . The parentheses are .25 and .75 quantiles.

Feature	Number Times
uvot_detection	89
f10	22
f3	11
f4	10
f6	10
f1	3
f2	3
f8	3
f9	1

Table 16: Splits for alpha = 0.1 model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	97
f10	14
f6	4
f8	3
f2	2
f3	2
f4	2
f5	1

Table 17: Splits for alpha = 0.3 model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	94
f10	13
f6	7
f4	6
f1	2
f3	2
f5	2
f2	1
f8	1

Table 18: Splits for alpha = 0.5 model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

## 5 25 Noise Features

	Actual Low	Actual High
Pred. Low	122.27 ( 121.67 , 122.86 )	13.63 ( 13.04 , 14.23 )
Pred High	11.73 ( 11.14 , 12.33 )	3.37 ( 2.77 , 3.96 )

Table 19: CV Confusion Matrix for alpha = 0.1 . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	97.06 ( 95.83 , 98.1 )	8.64 ( 7.6 , 9.87 )
Pred High	36.94 ( 35.9 , 38.17 )	8.36 ( 7.13 , 9.4 )

Table 20: CV Confusion Matrix for alpha = 0.3 . The parentheses are .25 and .75 quantiles.

	Actual Low	Actual High
Pred. Low	69.37 ( 68.56 , 70.1 )	6.13 ( 5.4 , 6.94 )
Pred High	64.63 ( 63.9 , 65.44 )	10.87 ( 10.06 , 11.6 )

Table 21: CV Confusion Matrix for alpha = 0.5 . The parentheses are .25 and .75 quantiles.

Feature	Number Times
uvot_detection	66
f19	53
f10	10
f17	5
f11	2
f12	2
f14	2
f15	2
f25	2
f1	1
f6	1

Table 22: Splits for alpha = 0.1 model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	76
f19	39
f10	3
f17	2
f1	1
f3	1
f11	1
f14	1
f20	1
f25	1

Table 23: Splits for  $\alpha = 0.3$  model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

Feature	Number Times
uvot_detection	72
f19	47
f11	4
f15	2
f1	1
f14	1
f17	1

Table 24: Splits for  $\alpha = 0.5$  model. The Number Times column is the number of trees the given feature appeared in out of a total of 100 created for cross validation.

## 6 The Trees

### 6.1 With Pruning

```
[1] "prior on being high: 0.05"
n= 151
```

```
node), split, n, loss, yval, (yprob)
* denotes terminal node
```

```
1) root 151 7.55 high (0.0500000 0.9500000) *
[1] "prior on being high: 0.1"
n= 151
```

```
node), split, n, loss, yval, (yprob)
* denotes terminal node
```

```
1) root 151 15.1 high (0.1000000 0.9000000) *
[1] "prior on being high: 0.15"
n= 151
```

```
node), split, n, loss, yval, (yprob)
* denotes terminal node
```

```
1) root 151 22.65 high (0.1500000 0.8500000) *
[1] "prior on being high: 0.2"
n= 151
```

```
node), split, n, loss, yval, (yprob)
* denotes terminal node
```

```
1) root 151 30.20000 high (0.2000000 0.8000000)
```

```

2) f19>=0.7679173 43 0.00000 low (1.0000000 0.0000000) *
3) f19< 0.7679173 108 20.50896 high (0.1451356 0.8548644) *
[1] "prior on being high: 0.25"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 37.75 high (0.2500000 0.7500000) *
[1] "prior on being high: 0.3"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 45.3 high (0.3000000 0.7000000) *
[1] "prior on being high: 0.35"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 52.85000 high (0.3500000 0.6500000)
2) f19>=0.7679173 43 0.00000 low (1.0000000 0.0000000) *
3) f19< 0.7679173 108 35.89067 high (0.2677596 0.7322404) *
[1] "prior on being high: 0.4"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 60.4 high (0.4000000 0.6000000) *
[1] "prior on being high: 0.45"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 67.95000 high (0.4500000 0.5500000)
2) uvot_detection=yes 102 19.54118 low (0.7177597 0.2822403) *
3) uvot_detection=no 49 18.25522 high (0.2232671 0.7767329) *
[1] "prior on being high: 0.5"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 75.50000 low (0.5000000 0.5000000)
2) uvot_detection=yes 102 17.76471 low (0.7565849 0.2434151) *
3) uvot_detection=no 49 20.28358 high (0.2599830 0.7400170) *
[1] "prior on being high: 0.55"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 67.95000 low (0.5500000 0.4500000)
2) uvot_detection=yes 102 15.98824 low (0.7916199 0.2083801) *
3) uvot_detection=no 49 22.31194 high (0.3004016 0.6995984)
6) f19>=0.7059694 14 0.00000 low (1.0000000 0.0000000) *

```

```

7) f19< 0.7059694 35 13.63507 high (0.2078618 0.7921382) *
[1] "prior on being high: 0.6"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 60.40000 low (0.6000000 0.4000000)
2) uvot_detection=yes 102 14.21176 low (0.8233937 0.1766063) *
3) uvot_detection=no 49 24.34030 high (0.3451128 0.6548872)
6) f19>=0.7059694 14 0.00000 low (1.0000000 0.0000000) *
7) f19< 0.7059694 35 14.87463 high (0.2435953 0.7564047)
14) f10>=0.8366564 7 0.00000 low (1.0000000 0.0000000) *
15) f10< 0.8366564 28 10.14179 high (0.1800424 0.8199576) *
[1] "prior on being high: 0.65"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 52.85000 low (0.6500000 0.3500000)
2) uvot_detection=yes 102 12.43529 low (0.8523416 0.1476584) *
3) uvot_detection=no 49 26.36866 high (0.3948387 0.6051613)
6) f19>=0.7059694 14 0.00000 low (1.0000000 0.0000000) *
7) f19< 0.7059694 35 16.11418 high (0.2850610 0.7149390)
14) f10>=0.8366564 7 0.00000 low (1.0000000 0.0000000) *
15) f10< 0.8366564 28 10.98694 high (0.2137469 0.7862531) *
[1] "prior on being high: 0.7"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 45.30000 low (0.7000000 0.3000000)
2) uvot_detection=yes 102 10.658820 low (0.8788244 0.1211756) *
3) uvot_detection=no 49 28.397010 high (0.4504732 0.5495268)
6) f19>=0.7059694 14 0.00000 low (1.0000000 0.0000000) *
7) f19< 0.7059694 35 17.353730 high (0.3337583 0.6662417)
14) f10>=0.8366564 7 0.00000 low (1.0000000 0.0000000) *
15) f10< 0.8366564 28 11.832090 high (0.2545999 0.7454001)
30) f14>=0.7870227 7 2.664706 low (0.6397849 0.3602151) *
31) f14< 0.7870227 21 7.099254 high (0.1816794 0.8183206) *
[1] "prior on being high: 0.75"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 37.75 low (0.7500000 0.2500000) *
[1] "prior on being high: 0.8"
n= 151

node), split, n, loss, yval, (yprob)
* denotes terminal node

1) root 151 30.2 low (0.8000000 0.2000000) *
[1] "prior on being high: 0.85"
n= 151

node), split, n, loss, yval, (yprob)

```

```

* denotes terminal node

1) root 151 22.65 low (0.8500000 0.1500000) *
[1] "prior on being high: 0.9"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 15.1 low (0.9000000 0.1000000) *
[1] "prior on being high: 0.95"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 7.55 low (0.9500000 0.0500000) *

```

## 6.2 Without Pruning

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[1] "prior on being high: 0.05"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 7.5500000 high (0.050000000 0.950000000)
2) f19>=0.7679173 43 0.0000000 low (1.000000000 0.000000000) *
3) f19< 0.7679173 108 5.1272390 high (0.034508912 0.965491088)
6) f10>=0.8179204 21 0.0000000 low (1.000000000 0.000000000) *
7) f10< 0.8179204 87 3.9440300 high (0.026758410 0.973241590)
14) f3>=0.7624466 17 0.0000000 low (1.000000000 0.000000000) *
15) f3< 0.7624466 70 2.9861940 high (0.020392459 0.979607541)
30) f10< 0.05966855 9 0.0000000 low (1.000000000 0.000000000) *
31) f10>=0.05966855 61 2.4791040 high (0.016988417 0.983011583)
62) f20>=0.7917701 19 1.0141790 high (0.107293128 0.892706872) *
63) f20< 0.7917701 42 1.4649250 high (0.010733887 0.989266113)
126) uvot_detection=yes 23 1.0705220 high (0.030741410 0.969258590)
252) f13>=0.5325059 15 0.0000000 low (1.000000000 0.000000000) *
253) f13< 0.5325059 8 0.2253731 high (0.006632852 0.993367148) *
127) uvot_detection=no 19 0.3944030 high (0.003879887 0.996120113) *
[1] "prior on being high: 0.1"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 15.1000000 high (0.100000000 0.900000000)
2) f19>=0.7679173 43 0.0000000 low (1.000000000 0.000000000) *
3) f19< 0.7679173 108 10.2544800 high (0.070161912 0.929838088)
6) f10>=0.8179204 21 0.0000000 low (1.000000000 0.000000000) *
7) f10< 0.8179204 87 7.8880600 high (0.054858934 0.945141066)
14) f3>=0.7624466 17 0.0000000 low (1.000000000 0.000000000) *
15) f3< 0.7624466 70 5.9723880 high (0.042096902 0.957903098)
30) f10< 0.05966855 9 0.0000000 low (1.000000000 0.000000000) *
31) f10>=0.05966855 61 4.9582090 high (0.035200000 0.964800000)
62) f20>=0.7917701 19 2.0283580 high (0.202380952 0.797619048) *
63) f20< 0.7917701 42 2.9298510 high (0.022393353 0.977606647)
126) uvot_detection=yes 23 2.1410450 high (0.062755003 0.937244997)
252) f13>=0.5325059 15 0.0000000 low (1.000000000 0.000000000) *

```



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        253) f13< 0.5325059 8 0.4507463 high (0.013900245 0.986099755) *
        127) uvot_detection=no 19 0.7888060 high (0.008155712 0.991844288) *
[1] "prior on being high: 0.15"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 22.6500000 high (0.15000000 0.85000000)
  2) f19>=0.7679173 43 0.0000000 low (1.00000000 0.00000000) *
  3) f19< 0.7679173 108 15.3817200 high (0.10701686 0.89298314)
    6) f10>=0.8179204 21 0.0000000 low (1.00000000 0.00000000) *
    7) f10< 0.8179204 87 11.8320900 high (0.08440514 0.91559486)
      14) f3>=0.7624466 17 0.0000000 low (1.00000000 0.00000000) *
      15) f3< 0.7624466 70 8.9585820 high (0.06524415 0.93475585)
        30) f10< 0.05966855 9 0.0000000 low (1.00000000 0.00000000) *
        31) f10>=0.05966855 61 7.4373130 high (0.05477178 0.94522822)
          62) f20>=0.7917701 19 3.0425370 high (0.28723404 0.71276596) *
          63) f20< 0.7917701 42 4.3947760 high (0.03510351 0.96489649)
            126) uvot_detection=yes 23 3.2115670 high (0.09612142 0.90387858)
              252) f13>=0.5325059 15 0.0000000 low (1.00000000 0.00000000) *
              253) f13< 0.5325059 8 0.6761194 high (0.02189781 0.97810219) *
              127) uvot_detection=no 19 1.1832090 high (0.01289134 0.98710866) *
[1] "prior on being high: 0.2"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 30.2000000 high (0.20000000 0.80000000)
  2) f19>=0.7679173 43 0.0000000 low (1.00000000 0.00000000) *
  3) f19< 0.7679173 108 20.5089600 high (0.14513557 0.85486443)
    6) f10>=0.8179204 21 0.0000000 low (1.00000000 0.00000000) *
    7) f10< 0.8179204 87 15.7761200 high (0.11551155 0.88448845)
      14) f3>=0.7624466 17 0.0000000 low (1.00000000 0.00000000) *
      15) f3< 0.7624466 70 11.9447800 high (0.08998302 0.91001698)
        30) f10< 0.05966855 9 0.0000000 low (1.00000000 0.00000000) *
        31) f10>=0.05966855 61 9.9164180 high (0.07586207 0.92413793)
          62) f20>=0.7917701 19 4.0567160 high (0.36342043 0.63657957) *
          63) f20< 0.7917701 42 5.8597010 high (0.04901308 0.95098692)
            126) uvot_detection=yes 23 4.2820900 high (0.13092825 0.86907175)
              252) f13>=0.5325059 15 0.0000000 low (1.00000000 0.00000000) *
              253) f13< 0.5325059 8 0.9014925 high (0.03074141 0.96925859) *
              127) uvot_detection=no 19 1.5776120 high (0.01816517 0.98183483) *
[1] "prior on being high: 0.25"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 37.7500000 high (0.25000000 0.75000000)
  2) f19>=0.7679173 43 0.0000000 low (1.00000000 0.00000000) *
  3) f19< 0.7679173 108 25.636190 high (0.18458418 0.81541582)
    6) f10>=0.8179204 21 0.0000000 low (1.00000000 0.00000000) *
    7) f10< 0.8179204 87 19.720150 high (0.14830508 0.85169492)
      14) f3>=0.7624466 17 0.0000000 low (1.00000000 0.00000000) *
      15) f3< 0.7624466 70 14.930970 high (0.11648352 0.88351648)
        30) f10< 0.05966855 9 0.0000000 low (1.00000000 0.00000000) *
        31) f10>=0.05966855 61 12.395520 high (0.09865471 0.90134529)
          62) f20>=0.7917701 19 5.070896 high (0.43220339 0.56779661) *

```

```

        63) f20< 0.7917701 42 7.324627 high (0.06430026 0.93569974)
        126) uvot_detection=yes 23 5.352612 high (0.16727084 0.83272916)
        252) f13>=0.5325059 15 0.000000 low (1.00000000 0.00000000) *
        253) f13< 0.5325059 8 1.126866 high (0.04057279 0.95942721) *
        127) uvot_detection=no 19 1.972015 high (0.02407445 0.97592555) *
[1] "prior on being high: 0.3"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 45.300000 high (0.30000000 0.70000000)
  2) f19>=0.7679173 43 0.000000 low (1.00000000 0.00000000) *
  3) f19< 0.7679173 108 30.763430 high (0.22543353 0.77456647)
    6) f10>=0.8179204 21 0.000000 low (1.00000000 0.00000000) *
    7) f10< 0.8179204 87 23.664180 high (0.18292683 0.81707317)
      14) f3>=0.7624466 17 0.000000 low (1.00000000 0.00000000) *
      15) f3< 0.7624466 70 17.917160 high (0.14494075 0.85505925)
        30) f10< 0.05966855 9 0.000000 low (1.00000000 0.00000000) *
        31) f10>=0.05966855 61 14.874630 high (0.12336449 0.87663551)
          62) f20>=0.7917701 19 6.085075 high (0.49461207 0.50538793) *
          63) f20< 0.7917701 42 8.789552 high (0.08118036 0.91881964)
            126) uvot_detection=yes 23 6.423134 high (0.20525312 0.79474688)
            252) f13>=0.5325059 15 0.000000 low (1.00000000 0.00000000) *
            253) f13< 0.5325059 8 1.352239 high (0.05156724 0.94843276) *
            127) uvot_detection=no 19 2.366418 high (0.03074141 0.96925859) *
[1] "prior on being high: 0.35"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 52.850000 high (0.35000000 0.65000000)
  2) f19>=0.7679173 43 0.000000 low (1.00000000 0.00000000) *
  3) f19< 0.7679173 108 35.890670 high (0.2677596 0.7322404)
    6) uvot_detection=yes 68 23.094120 low (0.5222161 0.4777839)
      12) f17< 0.6069954 39 0.000000 low (1.00000000 0.00000000) *
      13) f17>=0.6069954 29 9.860075 high (0.2992055 0.7007945)
        26) f17>=0.8233584 15 0.000000 low (1.00000000 0.00000000) *
        27) f17< 0.8233584 14 3.944030 high (0.1458691 0.8541309) *
    7) uvot_detection=no 40 10.648880 high (0.1242507 0.8757493)
      14) f10>=0.8366564 8 0.000000 low (1.00000000 0.00000000) *
      15) f10< 0.8366564 32 7.493657 high (0.0907777 0.9092223) *
[1] "prior on being high: 0.4"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 60.400000 high (0.40000000 0.60000000)
  2) uvot_detection=yes 102 21.317650 low (0.67449393 0.32550607)
    4) f17< 0.6181522 62 0.000000 low (1.00000000 0.00000000) *
    5) f17>=0.6181522 40 16.226870 high (0.43220339 0.56779661)
      10) f17>=0.8233584 19 0.000000 low (1.00000000 0.00000000) *
      11) f17< 0.8233584 21 7.662687 high (0.26440988 0.73559012)
        22) f11< 0.5076154 11 0.000000 low (1.00000000 0.00000000) *
        23) f11>=0.5076154 10 2.704478 high (0.11258278 0.88741722) *
    3) uvot_detection=no 49 16.226870 high (0.18976744 0.81023256)
      6) f19>=0.7059694 14 0.000000 low (1.00000000 0.00000000) *
      7) f19< 0.7059694 35 9.916418 high (0.12520924 0.87479076)

```

```

14) f10>=0.8366564 7 0.000000 low (1.00000000 0.00000000) *
15) f10< 0.8366564 28 6.761194 high (0.08891213 0.91108787) *
[1] "prior on being high: 0.45"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 67.950000 high (0.4500000 0.5500000)
2) uvot_detection=yes 102 19.541180 low (0.7177597 0.2822403)
4) f17< 0.6181522 62 0.000000 low (1.0000000 0.0000000) *
5) f17>=0.6181522 40 18.255220 high (0.4829884 0.5170116)
10) f17>=0.8233584 19 0.000000 low (1.0000000 0.0000000) *
11) f17< 0.8233584 21 8.620522 high (0.3061080 0.6938920)
22) f11< 0.5076154 11 0.000000 low (1.0000000 0.0000000) *
23) f11>=0.5076154 10 3.042537 high (0.1347226 0.8652774) *
3) uvot_detection=no 49 18.255220 high (0.2232671 0.7767329)
6) f19>=0.7059694 14 0.000000 low (1.0000000 0.0000000) *
7) f19< 0.7059694 35 11.155970 high (0.1494141 0.8505859)
14) f10>=0.8366564 7 0.000000 low (1.0000000 0.0000000) *
15) f10< 0.8366564 28 7.606343 high (0.1069581 0.8930419) *
[1] "prior on being high: 0.5"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 75.500000 low (0.5000000 0.5000000)
2) uvot_detection=yes 102 17.764710 low (0.7565849 0.2434151)
4) f17< 0.6181522 62 0.000000 low (1.0000000 0.0000000) *
5) f17>=0.6181522 40 17.764710 low (0.5331010 0.4668990)
10) f17>=0.7067298 31 4.441176 low (0.7919255 0.2080745)
20) f14>=0.2576103 24 0.000000 low (1.0000000 0.0000000) *
21) f14< 0.2576103 7 3.380597 high (0.4322034 0.5677966) *
11) f17< 0.7067298 9 3.380597 high (0.2023810 0.7976190) *
3) uvot_detection=no 49 20.283580 high (0.2599830 0.7400170)
6) f19>=0.7059694 14 0.000000 low (1.0000000 0.0000000) *
7) f19< 0.7059694 35 12.395520 high (0.1767486 0.8232514)
14) f10>=0.8366564 7 0.000000 low (1.0000000 0.0000000) *
15) f10< 0.8366564 28 8.451493 high (0.1276915 0.8723085) *
[1] "prior on being high: 0.55"
n= 151

```

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 67.950000 low (0.5500000 0.4500000)
2) uvot_detection=yes 102 15.988240 low (0.7916199 0.2083801)
4) f12< 0.9616202 95 7.994118 low (0.8782003 0.1217997)
8) f16>=0.2427335 69 0.000000 low (1.0000000 0.0000000) *
9) f16< 0.2427335 26 7.994118 low (0.6504348 0.3495652)
18) f20< 0.5804801 16 0.000000 low (1.0000000 0.0000000) *
19) f20>=0.5804801 10 4.958209 high (0.3828045 0.6171955) *
5) f12>=0.9616202 7 3.098881 high (0.2793546 0.7206454) *
3) uvot_detection=no 49 22.311940 high (0.3004016 0.6995984)
6) f19>=0.7059694 14 0.000000 low (1.0000000 0.0000000) *
7) f19< 0.7059694 35 13.635070 high (0.2078618 0.7921382)
14) f10>=0.8366564 7 0.000000 low (1.0000000 0.0000000) *
15) f10< 0.8366564 28 9.296642 high (0.1517611 0.8482389) *
[1] "prior on being high: 0.6"

```

n= 151

node), split, n, loss, yval, (yprob)  
\* denotes terminal node

```
1) root 151 60.400000 low (0.6000000 0.4000000)
 2) uvot_detection=yes 102 14.211760 low (0.8233937 0.1766063)
   4) f15< 0.907698 95 7.105882 low (0.8984656 0.1015344)
      8) f6< 0.7878589 75 0.000000 low (1.0000000 0.0000000) *
      9) f6>=0.7878589 20 7.105882 low (0.6313618 0.3686382)
         18) f5< 0.7435474 13 0.000000 low (1.0000000 0.0000000) *
         19) f5>=0.7435474 7 3.380597 high (0.3223767 0.6776233) *
   5) f15>=0.907698 7 3.380597 high (0.3223767 0.6776233) *
 3) uvot_detection=no 49 24.340300 high (0.3451128 0.6548872)
   6) f19>=0.7059694 14 0.000000 low (1.0000000 0.0000000) *
   7) f19< 0.7059694 35 14.874630 high (0.2435953 0.7564047)
      14) f10>=0.8366564 7 0.000000 low (1.0000000 0.0000000) *
      15) f10< 0.8366564 28 10.141790 high (0.1800424 0.8199576) *
[1] "prior on being high: 0.65"
```

n= 151

node), split, n, loss, yval, (yprob)  
\* denotes terminal node

```
1) root 151 52.850000 low (0.6500000 0.3500000)
 2) uvot_detection=yes 102 12.435290 low (0.85234160 0.14765840)
   4) f12< 0.9616202 95 6.217647 low (0.91635829 0.08364171) *
   5) f12>=0.9616202 7 3.662313 high (0.37068098 0.62931902) *
 3) uvot_detection=no 49 26.368660 high (0.39483871 0.60516129)
   6) f19>=0.7059694 14 0.000000 low (1.0000000 0.0000000) *
   7) f19< 0.7059694 35 16.114180 high (0.28506098 0.71493902)
      14) f10>=0.8366564 7 0.000000 low (1.0000000 0.0000000) *
      15) f10< 0.8366564 28 10.986940 high (0.21374686 0.78625314)
         30) f14>=0.7870227 7 3.108824 low (0.58568905 0.41431095) *
         31) f14< 0.7870227 21 6.592164 high (0.15016988 0.84983012) *
[1] "prior on being high: 0.7"
```

n= 151

node), split, n, loss, yval, (yprob)  
\* denotes terminal node

```
1) root 151 45.300000 low (0.7000000 0.3000000)
 2) uvot_detection=yes 102 10.658820 low (0.87882442 0.12117558)
   4) f12< 0.9616202 95 5.329412 low (0.93227192 0.06772808) *
   5) f12>=0.9616202 7 3.944030 high (0.42530379 0.57469621) *
 3) uvot_detection=no 49 28.397010 high (0.45047319 0.54952681)
   6) f19>=0.7059694 14 0.000000 low (1.0000000 0.0000000) *
   7) f19< 0.7059694 35 17.353730 high (0.33375829 0.66624171)
      14) f10>=0.8366564 7 0.000000 low (1.0000000 0.0000000) *
      15) f10< 0.8366564 28 11.832090 high (0.25459991 0.74540009)
         30) f14>=0.7870227 7 2.664706 low (0.63978495 0.36021505) *
         31) f14< 0.7870227 21 7.099254 high (0.18167939 0.81832061) *
[1] "prior on being high: 0.75"
```

n= 151

node), split, n, loss, yval, (yprob)  
\* denotes terminal node

```
1) root 151 37.750000 low (0.7500000 0.2500000)
 2) uvot_detection=yes 102 8.882353 low (0.9031442 0.0968558) *
```

```

3) uvot_detection=no 49 28.867650 low (0.5131358 0.4868642)
6) f19>=0.7059694 14 0.000000 low (1.0000000 0.0000000) *
7) f19< 0.7059694 35 18.593280 high (0.3917598 0.6082402)
14) f10>=0.8366564 7 0.000000 low (1.0000000 0.0000000) *
15) f10< 0.8366564 28 12.677240 high (0.3051456 0.6948544)
30) f1< 0.2796553 10 4.441176 low (0.6035503 0.3964497) *
31) f1>=0.2796553 18 5.916045 high (0.1949754 0.8050246) *

```

[1] "prior on being high: 0.8"

n= 151

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 30.200000 low (0.80000000 0.20000000)
2) uvot_detection=yes 102 7.105882 low (0.92555556 0.07444444) *
3) uvot_detection=no 49 23.094120 low (0.58424821 0.41575179)
6) f19>=0.2736455 35 8.882353 low (0.75276753 0.24723247)
12) f25< 0.6901317 28 3.552941 low (0.86836935 0.13163065) *
13) f25>=0.6901317 7 3.605970 high (0.40356083 0.59643917) *
7) f19< 0.2736455 14 5.408955 high (0.27567568 0.72432432) *

```

[1] "prior on being high: 0.85"

n= 151

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 22.650000 low (0.85000000 0.15000000)
2) uvot_detection=yes 102 5.329412 low (0.94627464 0.05372536) *
3) uvot_detection=no 49 17.320590 low (0.66564299 0.33435701)
6) f19>=0.2736455 35 6.661765 low (0.81179775 0.18820225) *
7) f19< 0.2736455 14 5.747015 high (0.35030303 0.64969697) *

```

[1] "prior on being high: 0.9"

n= 151

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 15.100000 low (0.90000000 0.10000000)
2) uvot_detection=yes 102 3.552941 low (0.96548616 0.03451384) *
3) uvot_detection=no 49 11.547060 low (0.75972414 0.24027586)
6) f19>=0.2736455 35 4.441176 low (0.87262357 0.12737643) *
7) f19< 0.2736455 14 6.085075 high (0.46130653 0.53869347) *

```

[1] "prior on being high: 0.95"

n= 151

```

node), split, n, loss, yval, (yprob)
* denotes terminal node

```

```

1) root 151 7.55 low (0.9500000 0.0500000) *

```