Bayesian Learning with Sparse Data

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Classification of CRTS detections

Objective: Predict the nature of the object based on available information
About 40 useful different observations may be found.

```
delm12, "FirstDetection_agnitude","minus","SecondDetection_agnitude"
delm13,"FirstDetection_agnitude","minus", "ThirdDetection_agnitude"
delm14,"FirstDetection_agnitude","minus", "FourthDetection_agnitude"
delm23,"SecondDetection_agnitude","minus","ThirdDetection_agnitude"
delm24,"SecondDetection_agnitude","minus","FourthDetection_agnitude"
delm34, "ThirdDetection_agnitude","minus", "FourthDetection_agnitude"
cdm12, "catotFirstDetection_agnitude","minus","catotSecondDetection_agnitude"
cdm13, "catotFirstDetection_agnitude","minus","catotThirdDetection_agnitude"
cdm14, "catotFirstDetection_agnitude","minus", "catotFourthDetection_agnitude"
cdm23,"catotSecondDetection_agnitude","minus","catotThirdDetection_agnitude"
cdm24,"catotSecondDetection_agnitude","minus","catotFourthDetection_agnitude"
cdm34,"catotThirdDetection_agnitude","minus","catotFourthDetection_agnitude"
gi, "pphotT_gpr__Magnitude","minus", "pphotT_ipr__Magnitude"
gr, "pphotT_gpr__Magnitude","minus", "pphotT_rpr__Magnitude"
gz,"pphotT_gpr__Magnitude","minus", "pphotT_zpr__Magnitude"
ir, "pphotT_ipr__Magnitude","minus", "pphotT_rpr__Magnitude"
iz, "pphotT_ipr__Magnitude","minus", "pphotT_zpr__Magnitude"
rz, "pphotT_rpr__Magnitude","minus", "pphotT_zpr__Magnitude"
csNusnoD,"cs_nearest_obj_usnobdistance","",""
csNcgraD,"cs_nearest_obj_cgrabsdistance","",""
csNcrateD,"cs_nearest_obj_cratesdistance","",""
csNnedD,"cs_nearest_obj_neddistance","",""
csNveroD,"cs_nearest_obj_verondistance","",""
csNsimbD,"cs_nearest_obj_simbaddistance","",""
csNnvssD,"cs_nearest_obj_nvssdistance","",""
csNradioD,"cs_nearest_obj_radiodistance","",""
```

Skyalert portfolio

.194300000000002 -0.201802000000001 -0.00750199999999879 -9999 -9999 -9999 -9999 -9999 -9999 -9999
99838 0.176599 0.167200000000001 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
3979999999986 0.158201999999999 0.200599999999998 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -
165499000000001 -0.0354989999999979 0.130000000000003 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -99
298999999997 0.206899 -0.397399999999998 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -999
.00820000000000043 -0.0401000000000007 -0.0483000000000011 -9999 -9999 -9999 -9999 -9999 -9999 -999
002 0.5975 0.0286009999999983 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -99
9 -0.147600000000001 0.057700999999998 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
.0284999999999993 0.0168000000000017 0.045300000000001 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9
0890009999999997 -0.0369980000000005 -0.125999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -999
.00680000000000014 -0.017199999999999 -0.0239999999999991 -9999 -9999 -9999 -9999 -9999 -9999 -9999
-0.215001000000001 -0.212799 0.00220200000000048 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -
.0323999999999991 -0.00370000000000026 -0.0360999999999994 -9999 -9999 -9999 -9999 -9999 -9999 -999
003 0.132400000000001 0.1173 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -999
5 0.0419 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 0.2 -9999 -9999 -9
745 0.141898999999999 -0.132601000000001 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -999
0.0114000000000001 0.00859999999999995 -0.00280000000000058 0.0139999999999993 0.0368999999999993 0
99999 -0.0257000000000005 -0.322201 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -99
88600000000002 0.0740000000000016 -0.4146 -9999 -9999 -9999 -9999 -9999 -9999 76.0276 0 78.663 -76.
001 -0.100398999999999 -0.122398 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
99998 -0.0397979999999976 0.212502000000001 -9999 -9999 -9999 -9999 -9999 -9999 0.282900000000001 0
-0.0185999999999993 -0.00290000000000035 0.0156999999999989 0.0226000000000006 0.0405000000000015 -
0.0219009999999997 0.0179009999999984 -0.00400000000000134 -9999 -9999 -9999 -9999 -9999 -9999 4.80
000213 -0.258499 -0.254397999999998 -9999 -9999 -9999 -9999 -9999 -9999 1.5529 1.0345 -9999 -0.5184

Missing values

Class	Total Instances	Missing-Galaxydata	Missing-stardata	Missing-Both
1(CV)	437	376(86.04%)	375(85.81%)	375(85.81%)
2(SN)	546	379(69.41%)	387(70.87%)	377(69.04%)
3(OT)	19	11(57.89%)	11(57.89%)	11(57.89%)
5(BL)	202	151(74.75%)	151(74.75%)	151(74.75%)
6(AGN)	76	43(56.57%)	43(56.57%)	43(56.57%)
7(UVC)	46	43(93.47%)	43(93.47%)	43(93.47%)
9(VS)	64	57(89.06%)	57(89.06%)	57(89.06%)
10(MV)	9	9(100%)	9(100%)	9(100%)
Total	1399	1069(76.41%)	1076(76.91%)	1066(76.19%)

Most ML algorithms crash with so many missing entries.

Questions

- How will we represent the data vector?

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- How will we train the ML algorithm when most entries are missing?
- How can we quantify the significance of each input feature?
- What algorithms can handle the scenario?
- How can we quantify the reliability of the predictions?

Data Representation

- The nature or class of the object is fixed. What changes is the available input to describe it.

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- The nature or class of the object is fixed. What changes is the available input to describe it.

- It was decided to use a binary genetic coding to represent the input vector.
- Each observation has a particular slot in the genetic chain/sequence. A 0 means missing.
- All events with the same genetic code have the same set of observations.
- New observations are appended to the right of the chain, reading from left to right.

Training on Missing Data

- With every input vector, also supply an input mask (genetic code for the input vector) so that the ML algorithm knows what to use for learning and what all is to be ignored.
- Each *species vector* is treated independently by the learning algorithm.
- Update the algorithm (for available inputs) such that the cost function is minimised.
- Test on new data with known nature to estimate the accuracy of the predictions.

1,"Cataclysmic Variable"
2,"Supernova"
3,"other"
5,"Blazar Outburst"
6,"Active Galactic Nucleus Variability"
7,"UVCeti Variable"
8,"Asteroid"
9,"Variable"
10,"Mira Variable"
11,"High Proper Motion Star"
12,"Comet"
16,"Nova"

Results (Training used 80% data)

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```
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8,"Asteroid"
9,"Variable"
10,"Mira Variable"
11,"High Proper Moti
12,"Comet"
16,"Nova"
```

```
"11061113504741171 00",2,  2.000000,100.000000, 1.000000,0.000000
"11061113206941379 73",1,  1.000000,73.974426, 6.000000,26.025574
"11061112607641396 10",2,  2.000000,98.924429, 1.000000,1.075571
"11061110708841312 28",1,  1.000000,99.999996, 6.000000,0.000004
"11061015204741161 85",2,  2.000000,92.100441, 6.000000,5.611119
"11061013806241026 29",11,  11.000000,99.952249, 2.000000,0.047751
"11061013508041256 10",1,  2.000000,51.359278, 1.000000,48.640722
"11061012908541385 13",1,  1.000000,58.537439, 2.000000,41.462561
"11060914605141273 17",2,  2.000000,100.000000, 1.000000,0.000000
"11060914305341105 87",2,  2.000000,100.000000, 6.000000,0.000000
"11060914005841281 36",2,  2.000000,100.000000, 6.000000,0.000000
"11060912107741153 15",2,  2.000000,100.000000, 6.000000,0.000000
"11060810411741371 40",2,  2.000000,89.355383, 1.000000,10.644617
"11060714006541016 71",6,  6.000000,100.000000, 1.000000,0.000000
"11060700706141076 31",2,  2.000000,100.000000, 1.000000,0.000000
"11060700106141082 86",2,  2.000000,99.957624, 1.000000,0.042230
"11060611211241829 67",1,  1.000000,99.989827, 2.000000,0.010173
"11060600107641243 42",2,  2.000000,100.000000, 6.000000,0.000000
"11060511807641437 36",11,  11.000000,99.999783, 2.000000,0.000217
"11060511507941294 11",2,  2.000000,100.000000, 6.000000,0.000000
"11060402308241546 29",10,  1.000000,58.537439, 2.000000,41.462561
"11060402108441287 59",10,  2.000000,90.926754, 1.000000,9.073243
"11060400107041269 32",2,  2.000000,100.000000, 1.000000,0.000000
"11060301208741139 78",1,  1.000000,76.496431, 2.000000,23.503569
```

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```

Results

Real-> Predict.	[1]	[2]	[3]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[16]	Total
[1]	261.	3.	6.	0.	1.	0.	2.	4.	3.	1.	0.	0.	281.
[2]	4.	398.	4.	1.	2.	1.	3.	2.	0.	0.	1.	2.	418.
[3]	0.	0.	28.	0.	0.	0.	0.	0.	0.	0.	0.	0.	28.
[5]	0.	0.	0.	66.	0.	0.	0.	0.	1.	0.	0.	0.	67.
[6]	1.	0.	0.	0.	131.	1.	0.	0.	1.	0.	0.	0.	134.
[7]	0.	0.	0.	0.	0.	28.	0.	0.	0.	0.	0.	0.	28.
[8]	0.	0.	0.	0.	0.	0.	5.	0.	0.	0.	0.	0.	5.
[9]	0.	0.	0.	0.	0.	0.	0.	18.	0.	0.	0.	0.	18.
[10]	0.	0.	0.	0.	0.	0.	0.	0.	10.	0.	0.	0.	10.
[11]	0.	0.	1.	0.	0.	0.	0.	0.	0.	40.	0.	0.	41.
[12]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	3.
[16]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[]													
Total.	266.	401.	39.	67.	134.	30.	10.	24.	15.	41.	4.	2.	1033

```
1,"Cataclysmic Variable"
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Results

Real-> / Predict.	[1] .	[2] .	[3] .	[5] .	[6] .	[7] .	[8] .	[9] .	[10] .	[11] .	[12] .	[16] .	Total
[1] .	261.	3.	6.	0.	1.	0.	2.	4.	3.	1.	0.	0.	281.
[2] .	4.	398.	4.	1.	2.	1.	3.	2.	0.	0.	1.	2.	418.
[3] .	0.	0.	28.	0.	0.	0.	0.	0.	0.	0.	0.	0.	28.
[5] .	0.	0.	0.	66.	0.	0.	0.	0.	1.	0.	0.	0.	67.
[6] .	1.	0.	0.	0.	131.	1.	0.	0.	1.	0.	0.	0.	134.
[7] .	0.	0.	0.	0.	0.	28.	0.	0.	0.	0.	0.	0.	28.
[8] .	0.	0.	0.	0.	0.	0.	5.	0.	0.	0.	0.	0.	5.
[9] .	0.	0.	0.	0.	0.	0.	0.	18.	0.	0.	0.	0.	18.
[10] .	0.	0.	0.	0.	0.	0.	0.	0.	10.	0.	0.	0.	10.
[11] .	0.	0.	1.	0.	0.	0.	0.	0.	0.	40.	0.	0.	41.
[12] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	3.
[16] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[]													
Total.	266.	401.	39.	67.	134.	30.	10.	24.	15.	41.	4.	2.	1033

Real-> / Predict.	[1] .	[2] .	[3] .	[5] .	[6] .	[7] .	[8] .	[9] .	[10] .	[11] .	[12] .	[16] .	Total
[1] .	627.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	627.
[2] .	0.	767.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	767.
[3] .	0.	0.	81.	0.	0.	0.	0.	0.	0.	0.	0.	0.	81.
[5] .	0.	0.	0.	65.	0.	0.	0.	0.	0.	0.	0.	0.	65.
[6] .	0.	0.	0.	0.	171.	0.	0.	0.	0.	0.	0.	0.	171.
[7] .	0.	0.	0.	0.	0.	39.	0.	0.	0.	0.	0.	0.	39.
[8] .	0.	0.	0.	0.	0.	0.	4.	0.	0.	0.	0.	0.	4.
[9] .	0.	0.	0.	0.	0.	0.	0.	17.	0.	0.	0.	0.	17.
[10] .	0.	0.	0.	0.	0.	0.	0.	0.	4.	0.	0.	0.	4.
[11] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	36.	0.	0.	36.
[12] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	3.
[16] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[]													
Total.	627.	767.	81.	65.	171.	39.	4.	17.	4.	36.	3.	0.	1814

Cross Validation

Real-> / Predict.	[1]	[2]	[3]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[16]	Total
[1]	39.	12.	2.	0.	1.	2.	0.	1.	2.	1.	0.	0.	60.
[2]	16.	55.	8.	1.	5.	0.	1.	2.	0.	4.	1.	0.	93.
[3]	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
[5]	0.	0.	1.	5.	0.	0.	0.	0.	0.	0.	0.	0.	6.
[6]	6.	6.	3.	3.	20.	1.	0.	0.	0.	0.	0.	0.	39.
[7]	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	1.
[8]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[9]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[10]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[11]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[12]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[16]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	61.	74.	14.	9.	26.	4.	1.	3.	2.	5.	1.	0.	200

Real-> / Predict.	[1]	[2]	[3]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[16]	Total
[1]	29.	8.	2.	4.	4.	0.	0.	1.	1.	2.	0.	0.	51.
[2]	15.	53.	0.	0.	10.	2.	2.	1.	0.	2.	0.	0.	85.
[3]	1.	2.	3.	0.	0.	1.	0.	0.	1.	0.	0.	0.	8.
[5]	0.	0.	0.	6.	0.	0.	0.	0.	1.	0.	0.	0.	7.
[6]	7.	10.	1.	6.	13.	4.	0.	1.	0.	0.	0.	0.	42.
[7]	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	1.
[8]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[9]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[10]	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.
[11]	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.	0.	0.	5.
[12]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[16]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	54.	73.	6.	16.	27.	8.	2.	3.	3.	9.	0.	0.	201

Real-> / Predict.	[1]	[2]	[3]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[16]	Total
[1]	24.	12.	2.	2.	3.	1.	0.	3.	1.	4.	0.	0.	52.
[2]	7.	65.	1.	1.	2.	2.	2.	1.	1.	2.	1.	1.	86.
[3]	0.	1.	0.	0.	0.	1.	0.	1.	0.	1.	0.	0.	4.
[5]	1.	0.	0.	11.	1.	0.	0.	1.	0.	0.	0.	0.	14.
[6]	7.	6.	1.	6.	15.	2.	0.	1.	0.	0.	0.	0.	38.
[7]	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	2.
[8]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[9]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[10]	0.	0.	0.	1.	0.	0.	0.	1.	0.	0.	0.	0.	2.
[11]	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.	2.
[12]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[16]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	39.	84.	4.	21.	21.	8.	2.	8.	2.	9.	1.	1.	200

Real-> / Predict.	[1]	[2]	[3]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[16]	Total
[1]	31.	10.	0.	1.	3.	1.	0.	0.	5.	3.	0.	0.	54.
[2]	12.	61.	7.	1.	4.	1.	1.	2.	0.	10.	0.	1.	100.
[3]	0.	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	2.
[5]	0.	0.	0.	3.	2.	0.	0.	0.	1.	0.	0.	0.	6.
[6]	4.	7.	3.	4.	11.	3.	0.	0.	0.	0.	0.	0.	32.
[7]	1.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	2.
[8]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[9]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[10]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[11]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[12]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[16]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	48.	79.	10.	9.	21.	6.	1.	2.	6.	13.	0.	1.	196

Real-> / Predict.	[1]	[2]	[3]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[16]	Total
[1]	39.	9.	0.	0.	13.	2.	1.	2.	0.	2.	0.	0.	68.
[2]	9.	57.	0.	0.	7.	0.	0.	1.	0.	2.	2.	0.	78.
[3]	0.	1.	1.	0.	1.	0.	0.	0.	0.	0.	0.	0.	3.
[5]	1.	0.	0.	7.	2.	0.	0.	1.	0.	0.	0.	0.	11.
[6]	4.	8.	1.	3.	12.	0.	1.	2.	0.	0.	0.	0.	31.
[7]	0.	0.	2.	0.	0.	1.	0.	0.	0.	0.	0.	0.	3.
[8]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[9]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[10]	1.	0.	0.	0.	1.	0.	0.	0.	1.	0.	0.	0.	3.
[11]	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	2.
[12]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[16]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	55.	75.	4.	10.	36.	3.	2.	6.	1.	5.	2.	0.	199

Real-> / Predict.	[1]	[2]	[3]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[16]	Total
[1]	6.	2.	0.	0.	1.	1.	0.	0.	1.	0.	0.	0.	11.
[2]	6.	12.	0.	0.	2.	0.	2.	1.	0.	0.	0.	0.	23.
[3]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[5]	0.	1.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	2.
[6]	0.	0.	1.	0.	0.	0.	0.	1.	0.	0.	0.	0.	2.
[7]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[8]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[9]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[10]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[11]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[12]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[16]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	12.	15.	1.	1.	3.	1.	2.	2.	1.	0.	0.	0.	38

Continued Learning Model

Humans Learn from every experience. Let us replicate the same in machines too- Continued training and evaluation.

Advantages

- The learning will progress with time – the key features required for correct identification will be exposed by the failing candidates – feed back.
- Prediction accuracy will asymptotically improve until the system replaces human expert.

Latest Status

Real-> / Predict.	[1] .	[2] .	[3] .	[5] .	[6] .	[7] .	[8] .	[9] .	[10] .	[11] .	[12] .	[16] .	Total
[1] .	272.	4.	7.	1.	1.	0.	1.	4.	3.	2.	0.	1.	296.
[2] .	4.	404.	4.	0.	4.	1.	3.	2.	0.	2.	1.	0.	425.
[3] .	0.	1.	34.	0.	0.	0.	0.	0.	0.	0.	0.	0.	35.
[5] .	0.	0.	1.	60.	0.	0.	0.	0.	1.	0.	0.	0.	62.
[6] .	1.	0.	0.	1.	126.	0.	0.	0.	0.	0.	0.	0.	128.
[7] .	0.	0.	0.	0.	0.	32.	0.	0.	0.	0.	0.	0.	32.
[8] .	0.	0.	0.	0.	0.	0.	6.	0.	0.	0.	0.	0.	6.
[9] .	0.	0.	0.	0.	0.	0.	0.	18.	0.	0.	0.	0.	18.
[10] .	0.	0.	0.	0.	0.	0.	0.	0.	12.	0.	0.	0.	12.
[11] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.	0.	0.	44.
[12] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.	0.	5.
[16] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
Total	277.	409.	46.	62.	131.	33.	10.	24.	16.	48.	6.	2.	1064

Real-> / Predict.	[1] .	[2] .	[3] .	[5] .	[6] .	[7] .	[8] .	[9] .	[10] .	[11] .	[12] .	[16] .	Total
[1] .	1589.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1589.
[2] .	0.	1776.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1776.
[3] .	0.	0.	268.	0.	0.	0.	0.	0.	0.	0.	0.	0.	268.
[5] .	0.	0.	0.	94.	0.	0.	0.	0.	0.	0.	0.	0.	94.
[6] .	0.	0.	0.	0.	603.	0.	0.	0.	0.	0.	0.	0.	603.
[7] .	0.	0.	0.	0.	0.	83.	0.	0.	0.	0.	0.	0.	83.
[8] .	0.	0.	0.	0.	0.	0.	8.	0.	0.	0.	0.	0.	8.
[9] .	0.	0.	0.	0.	0.	0.	0.	24.	0.	0.	0.	0.	24.
[10] .	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	23.
[11] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	67.	0.	0.	67.
[12] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	14.	0.	14.
[16] .	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
Total	1589.	1776.	268.	94.	603.	83.	8.	24.	23.	67.	14.	1.	4550

*Total No.	Success in Ist Choice	Success in 2nd Choice	Non classified items	Real success in two chances
* 1092	1019	3	20	95.3358 %