Kobe Bryant Shot Selection

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Data Cleaning

If you have a large number of missing values, as is the case with the "'shot_made_flag" column in the dataset (5000 out of 30697), then simply ignoring the missing values could lead to a loss of information and potentially bias your analysis.

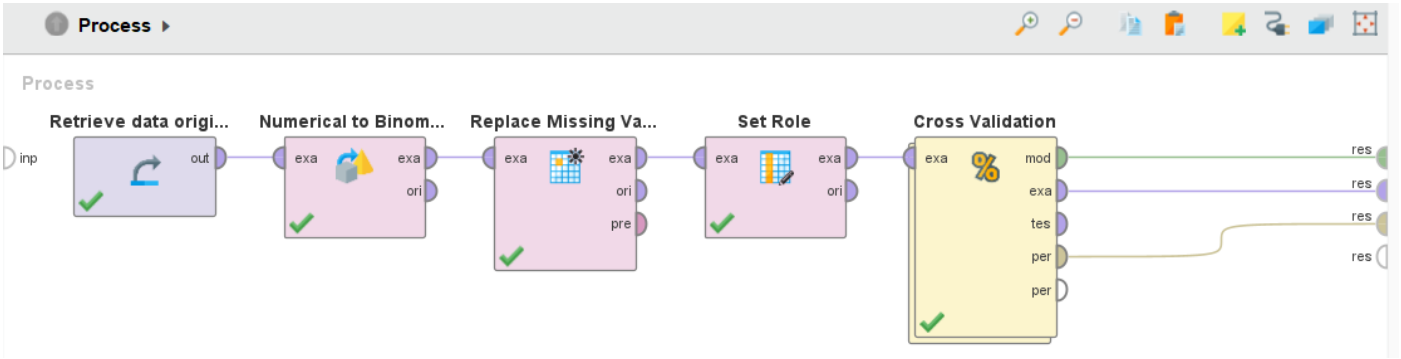
In this case, the missing values are for the 'shot_made_flag' column, which indicates whether a shot was made or missed. This column is the target variable for the problem of predicting whether a shot will be made or missed based on other features such as shot_distance, shot_type, and location.

One approach that could be considered is to use a machine learning algorithm that can handle missing values, such as decision trees or random forests. These algorithms can automatically handle missing values by using other available features to predict the missing values.

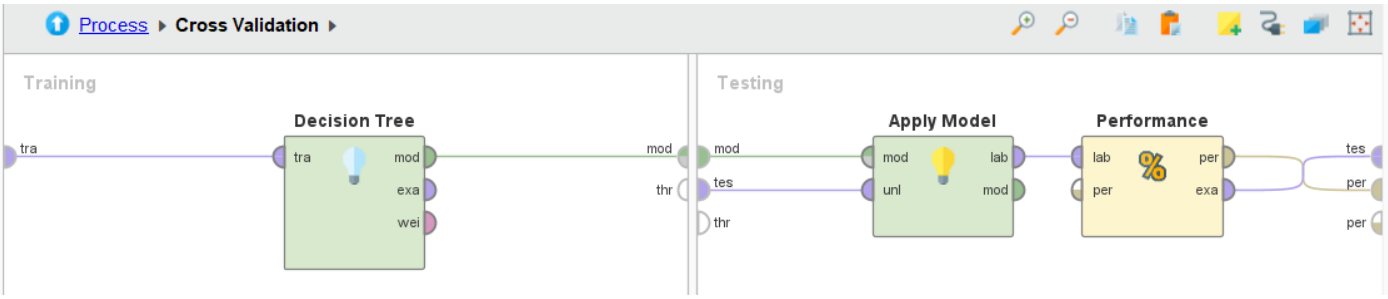
If you replace the missing values using a decision tree, you will be training a model on the data, including the missing values, and then using that model to predict the missing values. This approach will work well as the missing values are missing at random and there is enough data to train a robust model.

Replacing missing value using Decision Tree

Process:



Cross Validation:



Example Set:

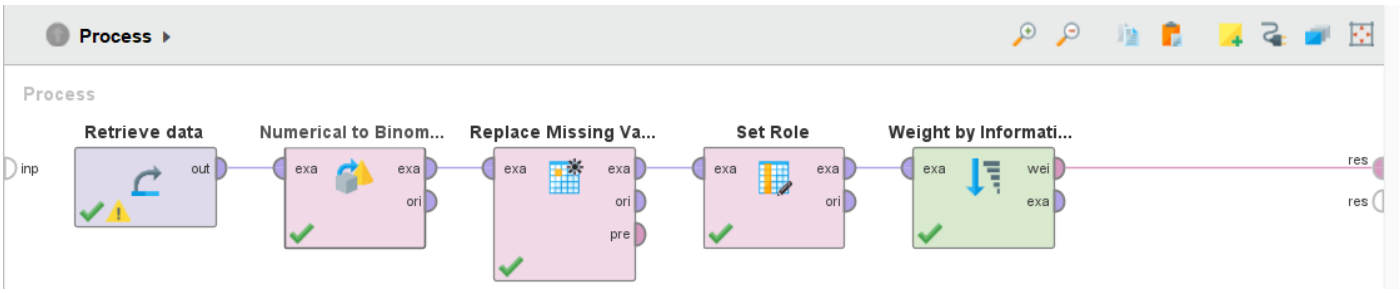
Open in Turbo Prep Auto Model Filter (30,697 / 30,697 examples): all

loc_y	lon	minutes_re...	period	playoffs	season	seconds_re...	shot_distance	shot_made_f...	shot_type	shot_z
72	-118.103	10	1	0	2000-01	27	18	0.500	2PT Field Goal	Right S
0	-118.427	10	1	0	2000-01	22	15	0	2PT Field Goal	Left Si
135	-118.371	7	1	0	2000-01	45	16	1	2PT Field Goal	Left Si
175	-118.132	6	1	0	2000-01	52	22	0	2PT Field Goal	Right S
0	-118.270	6	2	0	2000-01	19	0	1	2PT Field Goal	Center
-11	-118.415	9	3	0	2000-01	32	14	0	2PT Field Goal	Left Si
0	-118.270	8	3	0	2000-01	52	0	1	2PT Field Goal	Center
28	-118.269	8	3	0	2000-01	5	2	0.500	2PT Field Goal	Center
108	-118.335	6	3	0	2000-01	12	12	1	2PT Field Goal	Left Si
125	-118.303	3	3	0	2000-01	36	12	0	2PT Field Goal	Center
238	-118.364	1	3	0	2000-01	56	25	0	3PT Field Goal	Left Si
127	-118.149	11	1	0	2000-01	0	17	1	2PT Field Goal	Right S
110	-118.337	7	1	0	2000-01	9	12	1	2PT Field Goal	Left Si
4	-118.364	2	1	0	2000-01	44	9	0	2PT Field Goal	Left Si
47	-118.293	1	1	0	2000-01	16	5	0	2PT Field Goal	Center
192	-118.208	0	1	0	2000-01	48	20	0	2PT Field Goal	Center
0	-118.270	0	1	0	2000-01	1	0	0.500	2PT Field Goal	Center
226	-118.387	8	2	0	2000-01	50	25	1	3PT Field Goal	Left Si

Model replaced the missing values with the 0.50 which is nearly the average value 0.45.

By weight

Process:



attribute	weight
action_type	0.081
game_date	0.037
combined_shot_type	0.036
shot_zone_basic	0.023
shot_distance	0.020
shot_zone_range	0.018
lat	0.011
loc_y	0.011
shot_zone_area	0.011
shot_type	0.008
loc_x	0.004
lon	0.004
matchup	0.002

attribute	weight
team_id	0
team_name	0
playoffs	0.000
game_id	0.000
shot_id	0.000
period	0.001
opponent	0.001
game_event_id	0.001
seconds_remaining	0.001
minutes_remaining	0.001
season	0.001

To predict the 'shot_made_flag' accurately, some of the important features or labels that can be considered are:

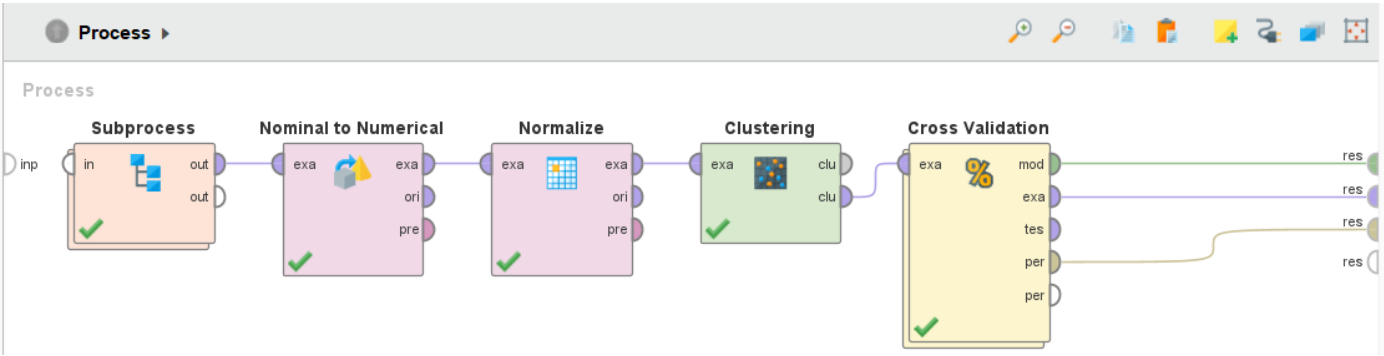
- **action_type:** the type of action performed by the player before taking the shot (e.g., jump shot, layup, dunk, etc.)
- **combined_shot_type:** a combination of shot types that indicate the type of shot taken (e.g., jump shot, dunk, tip shot, etc.)
- **loc_x and loc_y:** the X and Y coordinates of the shot location on the court
- **minutes_remaining and seconds_remaining:** the time remaining in the game when the shot was taken.
- **period:** the quarter or overtime period in which the shot was taken.
- **playoffs:** a binary indicator of whether the game was a playoff game or not.
- **shot_distance:** the distance between the shot location and the basket in feet.
- **shot_type:** the type of shot taken (e.g., two-point shot, or three-point shot)
- **shot_zone_area, shot_zone_basic, and shot_zone_range:** categorical variables that describe the location of the shot on the court.

Note that other variables such as game_id, game_event_id, team_id, team_name, game_date, matchup, opponent, and shot_id are not related to the shot outcome and can be excluded from the analysis. However, the **season** variable can be relevant, as player performance can vary from season to season due to factors such as age, injuries, team composition, and overall game strategy.

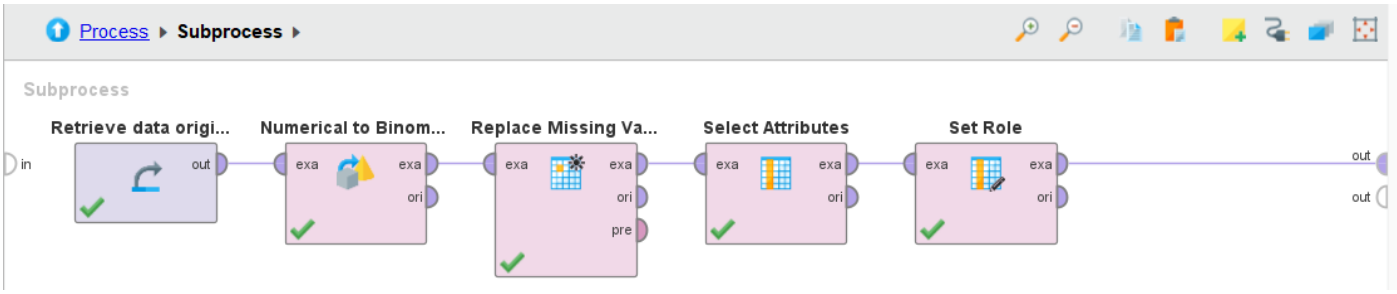
Below are the unsupervised learning attempts to identify the best model for given scenario:

Decision Tree:

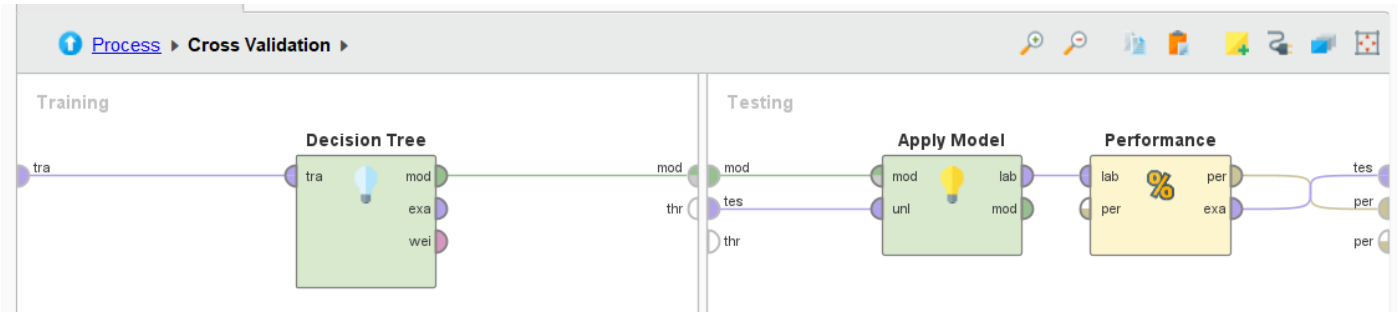
Process:



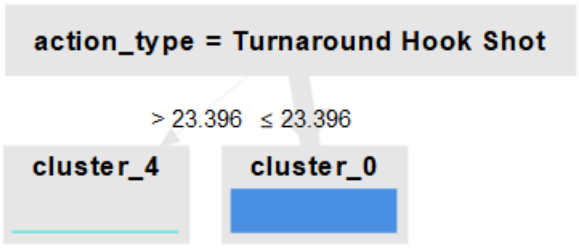
Subprocess:



Cross validation:



Tree:



Example set:

Open in Turbo Prep Auto Model

Filter (30,697 / 30,697 examples): all

Row No.	id	label	action_type ...	action_type ...	action_type ...	action_type ...	action_type ...	action_type ...	action_type ...	action_type
1	1	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
2	2	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
3	3	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
4	4	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
5	5	cluster_0	-1.264	9.900	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
6	6	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
7	7	cluster_0	-1.264	-0.101	3.310	-0.176	-0.262	-0.114	-0.049	-0.116
8	8	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
9	9	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
10	10	cluster_0	-1.264	-0.101	-0.302	5.670	-0.262	-0.114	-0.049	-0.116
11	11	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
12	12	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
13	13	cluster_0	-1.264	-0.101	-0.302	5.670	-0.262	-0.114	-0.049	-0.116
14	14	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
15	15	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
16	16	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
17	17	cluster_0	-1.264	-0.101	-0.302	-0.176	3.810	-0.114	-0.049	-0.116
18	18	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116
19	19	cluster_0	0.791	-0.101	-0.302	-0.176	-0.262	-0.114	-0.049	-0.116

ExampleSet (30,697 examples, 2 special attributes, 111 regular attributes)

Accuracy:

K=2

accuracy: 100.00% +/- 0.01% (micro average: 100.00%)

	true cluster_0	true cluster_1	class precision
pred. cluster_0	30696	1	100.00%
pred. cluster_1	0	0	0.00%
class recall	100.00%	0.00%	

K=3

accuracy: 99.99% +/- 0.01% (micro average: 99.99%)

	true cluster_0	true cluster_1	true cluster_2	class precision
pred. cluster_0	30695	1	1	99.99%
pred. cluster_1	0	0	0	0.00%
pred. cluster_2	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	

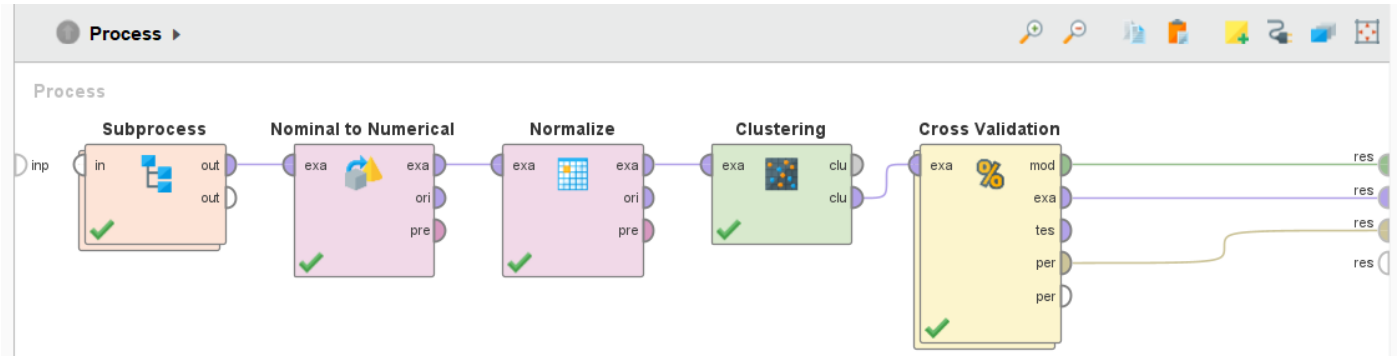
K=4

accuracy: 99.99% +/- 0.02% (micro average: 99.99%)

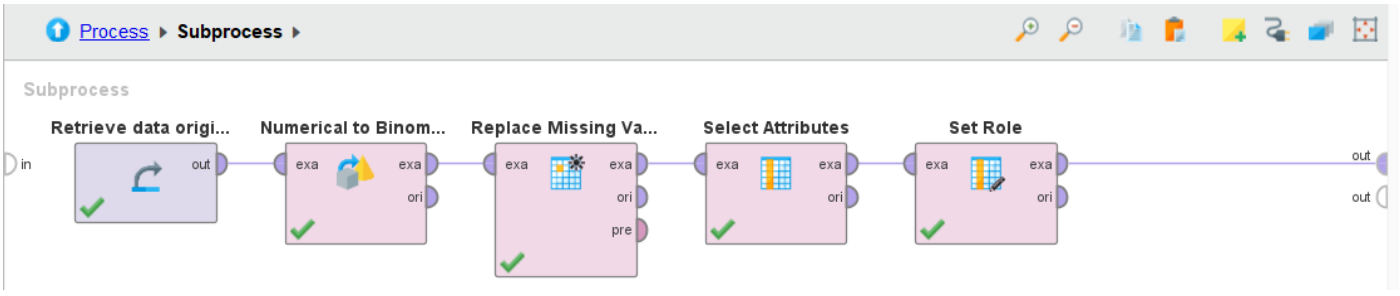
	true cluster_0	true cluster_2	true cluster_3	true cluster_1	class precision
pred. cluster_0	30694	1	1	1	99.99%
pred. cluster_2	0	0	0	0	0.00%
pred. cluster_3	0	0	0	0	0.00%
pred. cluster_1	0	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	0.00%	

Random Forest:

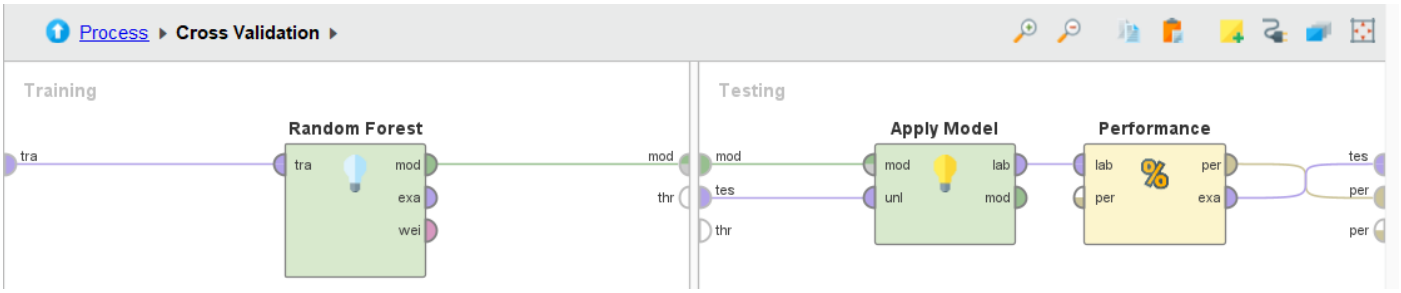
Process:



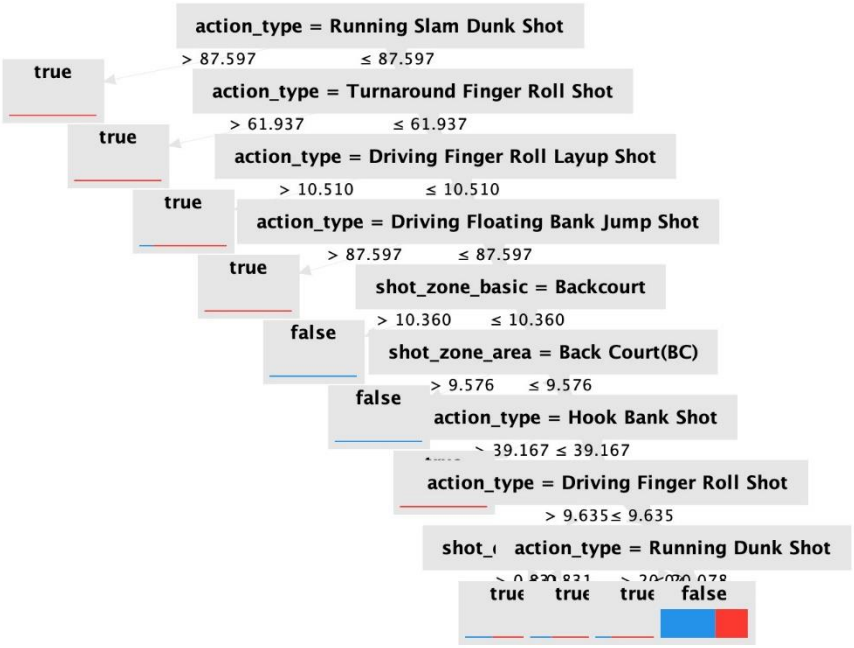
Subprocess:



Cross validation:



Tree:



Example set:

Open in Turbo Prep Auto Model

Filter (30,697 / 30,697 examples): all

Row No.	id	shot_made...	cluster	loc_x = false	loc_x = true	loc_y = false	loc_y = true	minutes_re...	minutes_re...	period = f
1	1	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
2	2	false	cluster_0	-0.466	0.466	2.117	-2.117	-0.380	0.380	0
3	3	true	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
4	4	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
5	5	true	cluster_0	2.146	-2.146	2.117	-2.117	-0.380	0.380	0
6	6	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
7	7	true	cluster_0	2.146	-2.146	2.117	-2.117	-0.380	0.380	0
8	8	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
9	9	true	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
10	10	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
11	11	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
12	12	true	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
13	13	true	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
14	14	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
15	15	false	cluster_0	-0.466	0.466	-0.472	0.472	-0.380	0.380	0
16	16	false	cluster_0	-0.466	0.466	-0.472	0.472	2.634	-2.634	0

ExampleSet (30,697 examples, 3 special attributes, 119 regular attributes)

Accuracy:

K=2

accuracy: 100.00% +/- 0.01% (micro average: 100.00%)

	true cluster_0	true cluster_1	class precision
pred. cluster_0	30696	1	100.00%
pred. cluster_1	0	0	0.00%
class recall	100.00%	0.00%	

K=3

accuracy: 99.99% +/- 0.01% (micro average: 99.99%)

	true cluster_0	true cluster_1	true cluster_2	class precision
pred. cluster_0	30695	1	1	99.99%
pred. cluster_1	0	0	0	0.00%
pred. cluster_2	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	

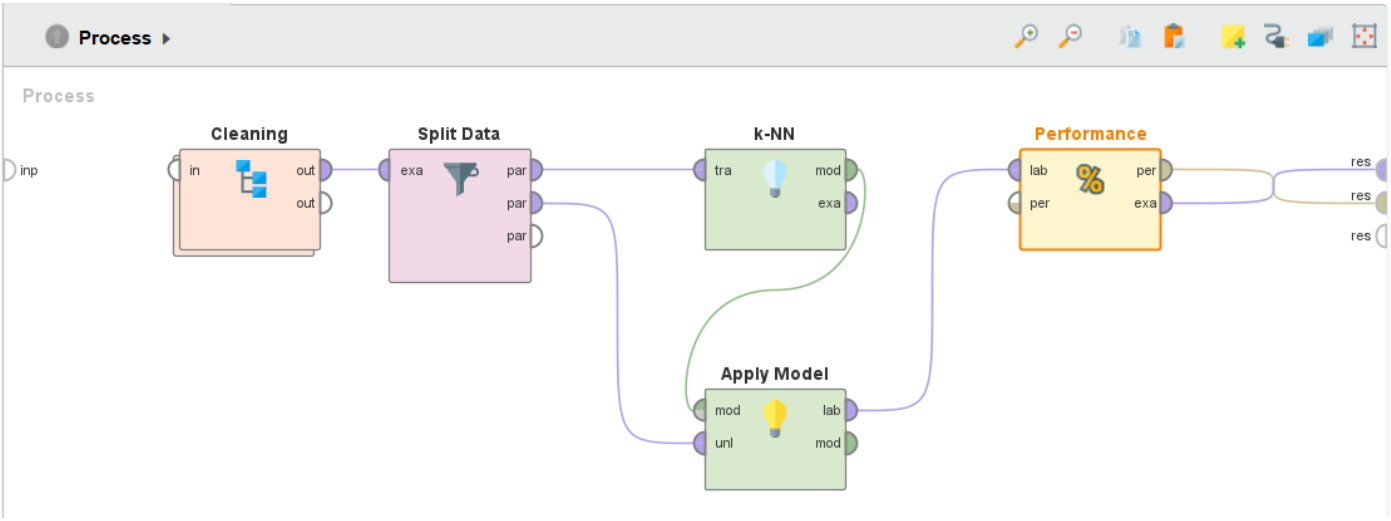
K=4

accuracy: 99.99% +/- 0.02% (micro average: 99.99%)

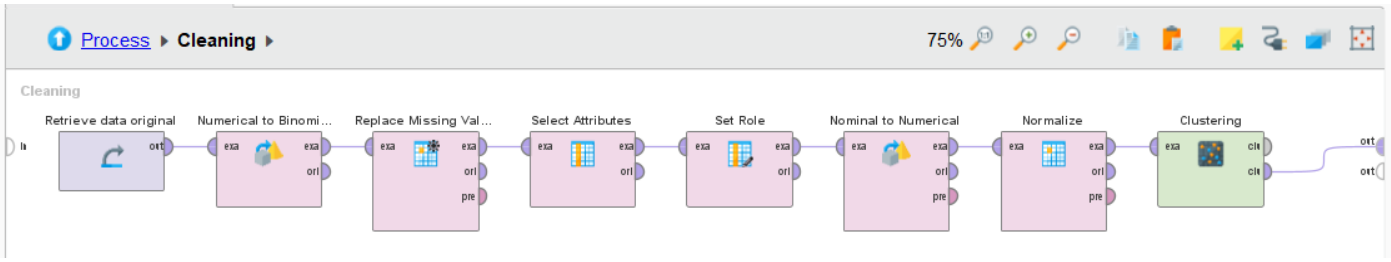
	true cluster_0	true cluster_2	true cluster_3	true cluster_1	class precision
pred. cluster_0	30694	1	1	1	99.99%
pred. cluster_2	0	0	0	0	0.00%
pred. cluster_3	0	0	0	0	0.00%
pred. cluster_1	0	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	0.00%	

KNN:

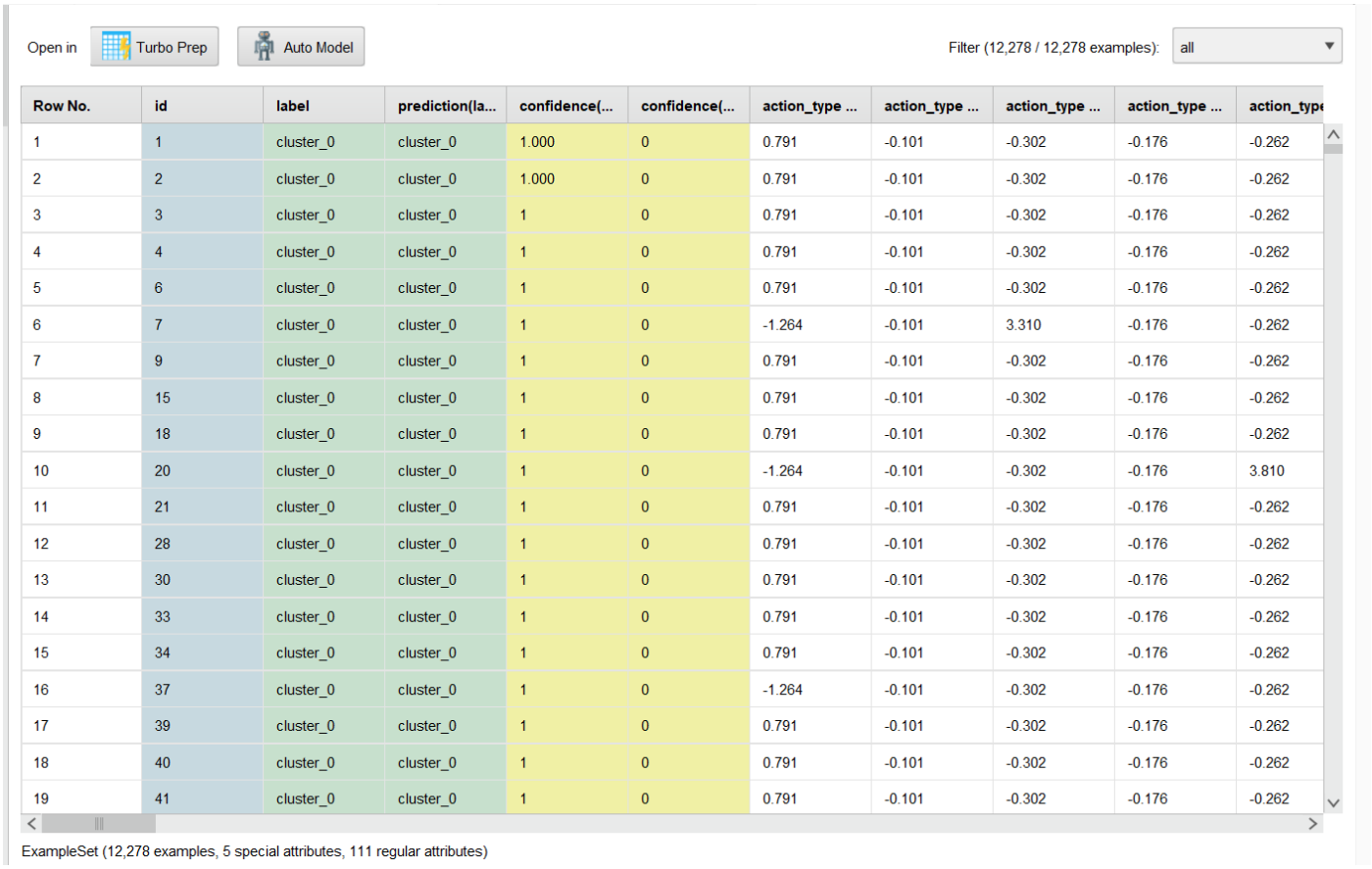
Process:



Subprocess:



Example set:



Open in Turbo Prep Auto Model Filter (12,278 / 12,278 examples): all

Row No.	id	label	prediction(la...	confidence(...	confidence(...	action_type ...	action_type ...	action_type ...	action_type ...	action_type
1	1	cluster_0	cluster_0	1.000	0	0.791	-0.101	-0.302	-0.176	-0.262
2	2	cluster_0	cluster_0	1.000	0	0.791	-0.101	-0.302	-0.176	-0.262
3	3	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
4	4	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
5	6	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
6	7	cluster_0	cluster_0	1	0	-1.264	-0.101	3.310	-0.176	-0.262
7	9	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
8	15	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
9	18	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
10	20	cluster_0	cluster_0	1	0	-1.264	-0.101	-0.302	-0.176	3.810
11	21	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
12	28	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
13	30	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
14	33	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
15	34	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
16	37	cluster_0	cluster_0	1	0	-1.264	-0.101	-0.302	-0.176	-0.262
17	39	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
18	40	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
19	41	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262

ExampleSet (12,278 examples, 5 special attributes, 111 regular attributes)

Accuracy:

K=2

accuracy: 100.00%

	true cluster_0	true cluster_1	class precision
pred. cluster_0	12278	0	100.00%
pred. cluster_1	0	0	0.00%
class recall	100.00%	0.00%	

K=3

accuracy: 100.00%

	true cluster_0	true cluster_1	true cluster_2	class precision
pred. cluster_0	12278	0	0	100.00%
pred. cluster_1	0	0	0	0.00%
pred. cluster_2	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	

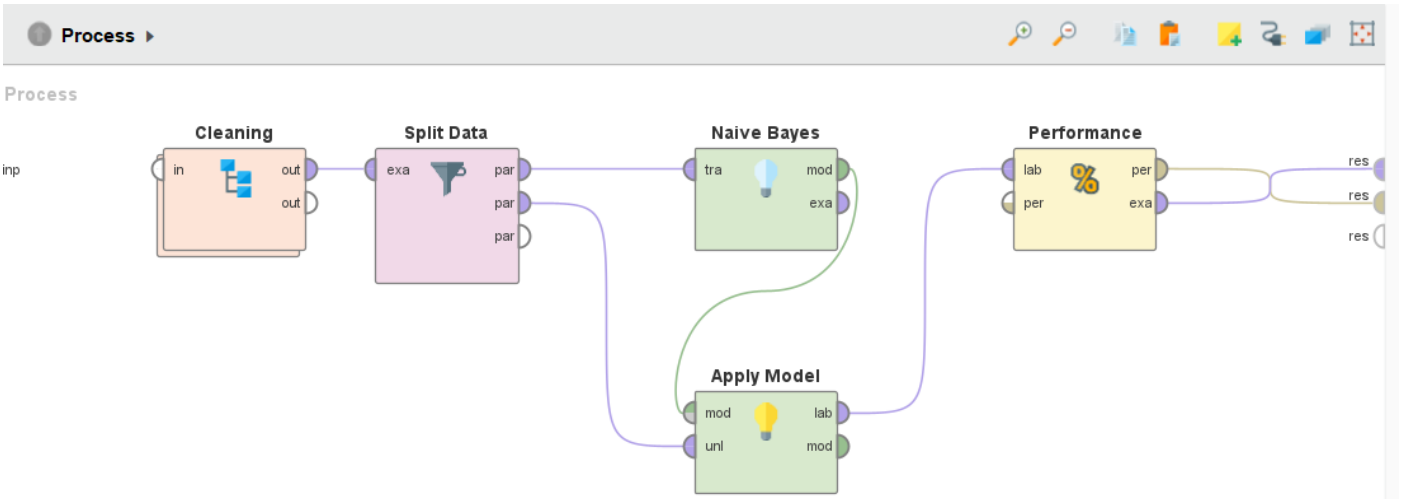
K=4

accuracy: 100.00%

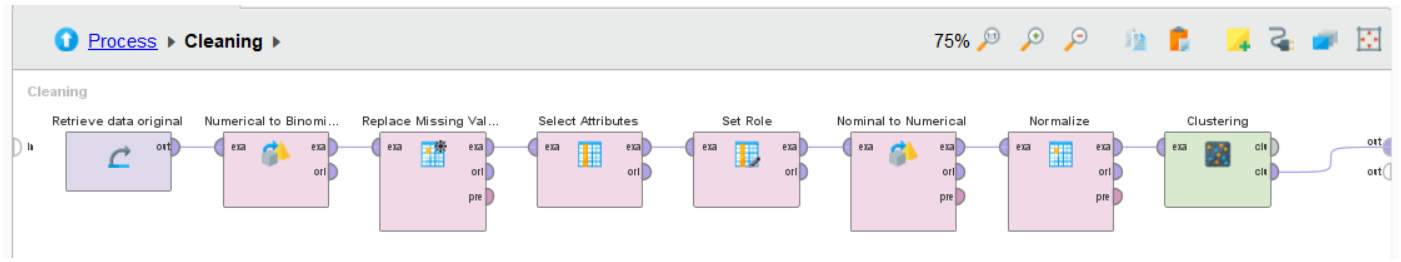
	true cluster_0	true cluster_2	true cluster_3	true cluster_1	class precision
pred. cluster_0	12278	0	0	0	100.00%
pred. cluster_2	0	0	0	0	0.00%
pred. cluster_3	0	0	0	0	0.00%
pred. cluster_1	0	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	0.00%	

Naïve Bayes:

Process:



Subprocess:



Example set:

Open in Turbo Prep Auto Model Filter (12,278 / 12,278 examples): all

Row No.	id	label	prediction(la...	confidence(...	confidence(...	action_type ...	action_type ...	action_type ...	action_type ...	action_type
1	1	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
2	2	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
3	3	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
4	4	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
5	6	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
6	7	cluster_0	cluster_0	1	0	-1.264	-0.101	3.310	-0.176	-0.262
7	9	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
8	15	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
9	18	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
10	20	cluster_0	cluster_0	1	0	-1.264	-0.101	-0.302	-0.176	3.810
11	21	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
12	28	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
13	30	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
14	33	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
15	34	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
16	37	cluster_0	cluster_0	1	0	-1.264	-0.101	-0.302	-0.176	-0.262
17	39	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
18	40	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262
19	41	cluster_0	cluster_0	1	0	0.791	-0.101	-0.302	-0.176	-0.262

ExampleSet (12,278 examples, 5 special attributes, 111 regular attributes)

Accuracy:
K=2

accuracy: 100.00%

	true cluster_0	true cluster_1	class precision
pred. cluster_0	12278	0	100.00%
pred. cluster_1	0	0	0.00%
class recall	100.00%	0.00%	

K=3

accuracy: 100.00%

	true cluster_0	true cluster_1	true cluster_2	class precision
pred. cluster_0	12278	0	0	100.00%
pred. cluster_1	0	0	0	0.00%
pred. cluster_2	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	

K=4

accuracy: 100.00%

	true cluster_0	true cluster_2	true cluster_3	true cluster_1	class precision
pred. cluster_0	12278	0	0	0	100.00%
pred. cluster_2	0	0	0	0	0.00%
pred. cluster_3	0	0	0	0	0.00%
pred. cluster_1	0	0	0	0	0.00%
class recall	100.00%	0.00%	0.00%	0.00%	

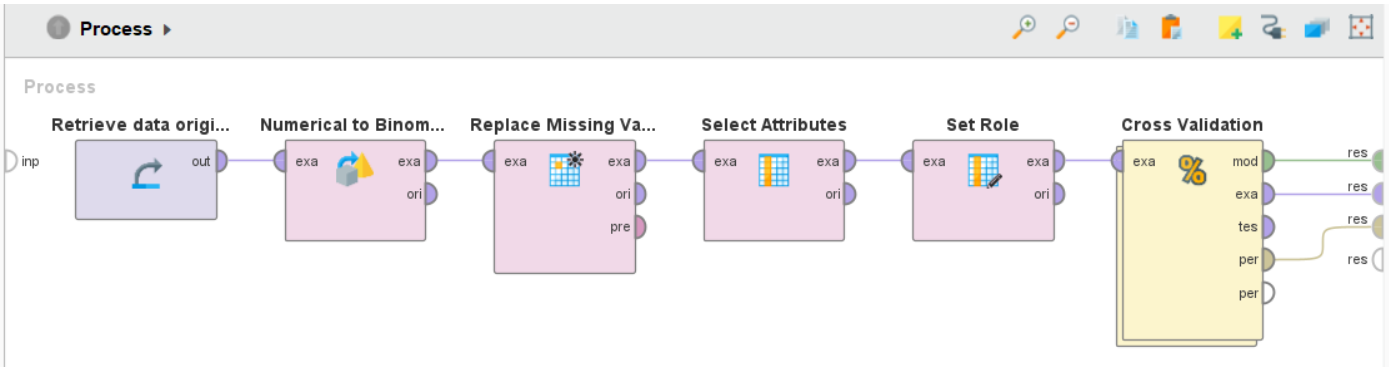
It's unusual to see such high accuracy for all models with such small values of K for KNN. It's possible that the data used for training and testing is not representative of the overall dataset or there may be other issues with the modeling process.

Assuming that the accuracy values reported are reliable, if accuracy is the only evaluation metric that matters for the Kobe Bryant Shot Selection problem, then all of the models with 100% accuracy would be equally good choices. However, it's important to note that achieving 100% accuracy is rare and may be an indication of overfitting to the training data.

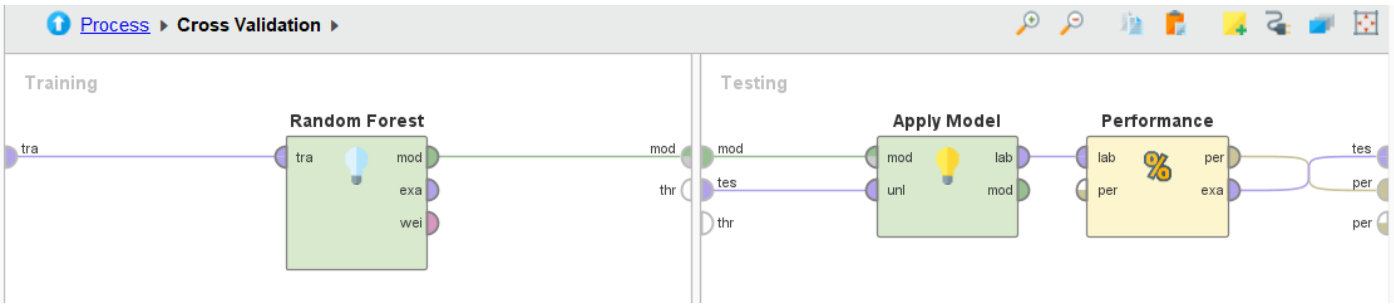
Below are the supervised machine learning attempts to identify the best model for given scenario:

Random Forest:

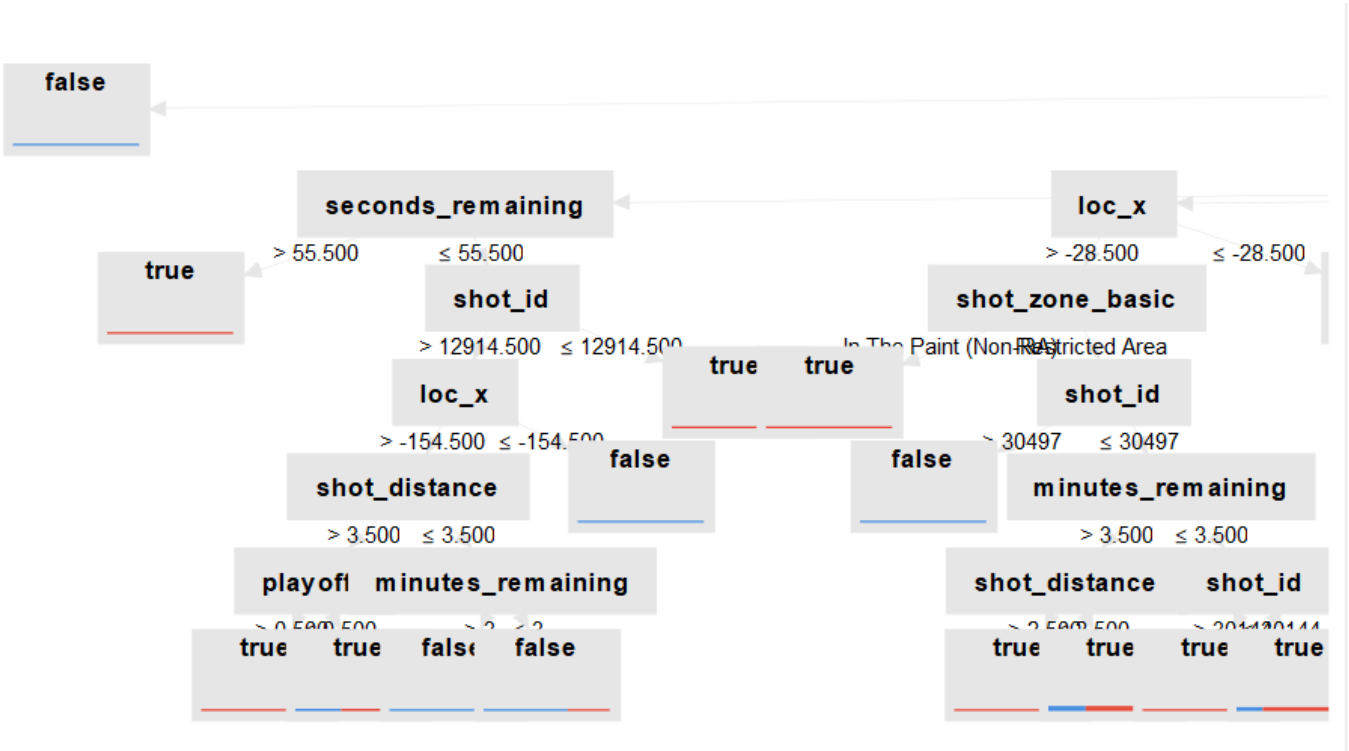
Process:



Cross validation:



Tree:



Example set:

Open in Turbo Prep Auto Model

Filter (30,697 / 30,697 examples): all

Row No.	shot_made_f...	action_type	combined_s...	loc_x	loc_y	minutes_re...	period	playoffs	season	seconds_r
1	false	Jump Shot	Jump Shot	167	72	10	1	0	2000-01	27
2	false	Jump Shot	Jump Shot	-157	0	10	1	0	2000-01	22
3	true	Jump Shot	Jump Shot	-101	135	7	1	0	2000-01	45
4	false	Jump Shot	Jump Shot	138	175	6	1	0	2000-01	52
5	true	Driving Dunk ...	Dunk	0	0	6	2	0	2000-01	19
6	false	Jump Shot	Jump Shot	-145	-11	9	3	0	2000-01	32
7	true	Layup Shot	Layup	0	0	8	3	0	2000-01	52
8	false	Jump Shot	Jump Shot	1	28	8	3	0	2000-01	5
9	true	Jump Shot	Jump Shot	-65	108	6	3	0	2000-01	12
10	false	Running Jump...	Jump Shot	-33	125	3	3	0	2000-01	36
11	false	Jump Shot	Jump Shot	-94	238	1	3	0	2000-01	56
12	true	Jump Shot	Jump Shot	121	127	11	1	0	2000-01	0
13	true	Running Jump...	Jump Shot	-67	110	7	1	0	2000-01	9
14	false	Jump Shot	Jump Shot	-94	4	2	1	0	2000-01	44
15	false	Jump Shot	Jump Shot	-23	47	1	1	0	2000-01	16
16	false	Jump Shot	Jump Shot	62	192	0	1	0	2000-01	48
17	false	Driving Layup ...	Layup	0	0	0	1	0	2000-01	1
18	true	Jump Shot	Jump Shot	-117	226	8	2	0	2000-01	50
19	false	Jump Shot	Jump Shot	-132	97	11	3	0	2000-01	29

ExampleSet (30,697 examples, 1 special attribute, 15 regular attributes)

Accuracy:

accuracy: 68.00% +/- 0.93% (micro average: 68.00%)

	true false	true true	class precision
pred. false	17491	8083	68.39%
pred. true	1741	3382	66.02%
class recall	90.95%	29.50%	

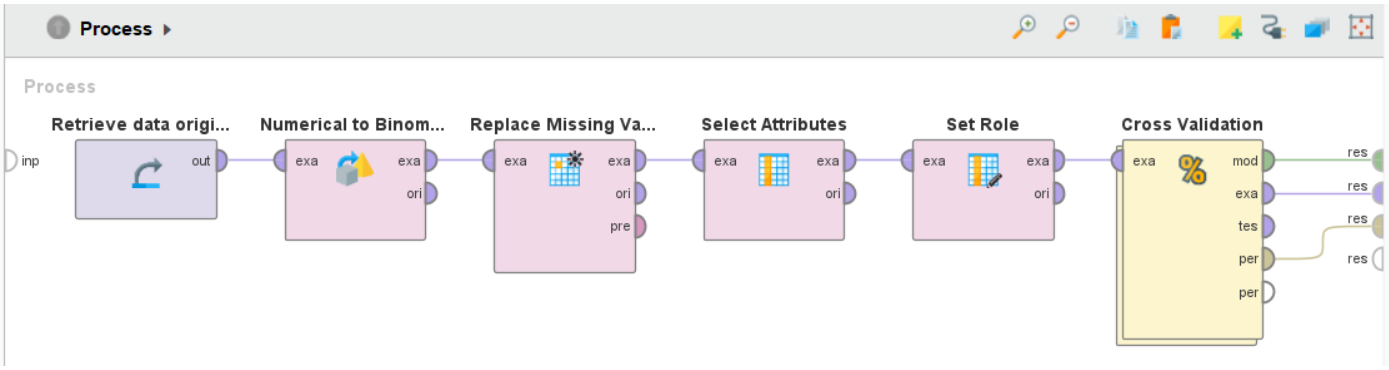
F-measure:

f_measure: 40.74% +/- 2.57% (micro average: 40.78%) (positive class: true)

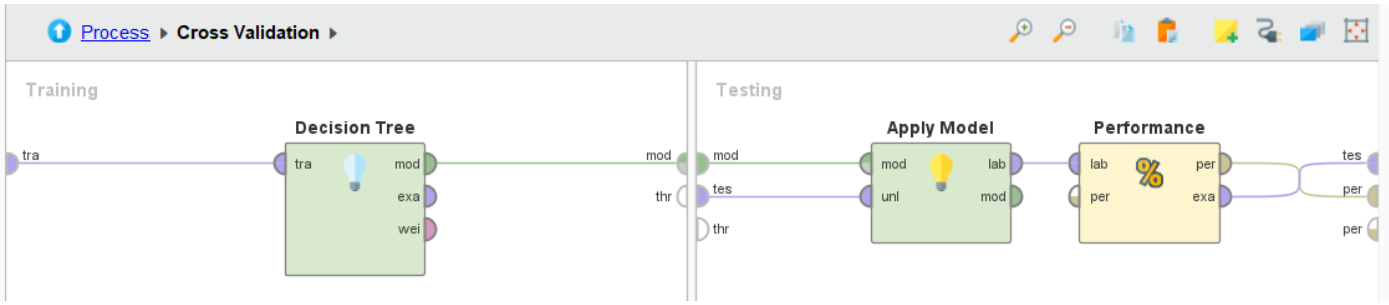
	true false	true true	class precision
pred. false	17491	8083	68.39%
pred. true	1741	3382	66.02%
class recall	90.95%	29.50%	

Decision Tree:

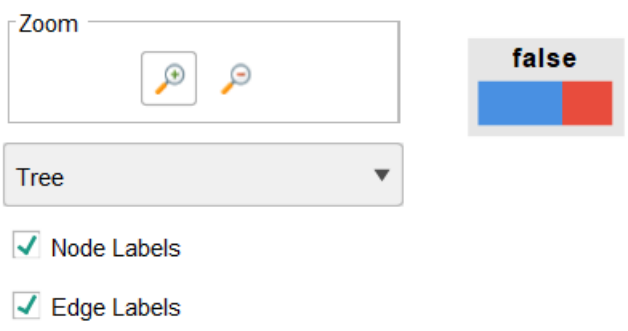
Process:



Cross validation:



Tree:



Example set:

Open in Turbo Prep Auto Model Filter (30,697 / 30,697 examples): all

Row No.	shot_made_f...	loc_x	loc_y	minutes_re...	period	playoffs	seconds_re...	shot_distance	shot_id	action_type
1	false	true	true	true	true	false	true	true	true	Jump Shot
2	false	true	false	true	true	false	true	true	true	Jump Shot
3	true	true	true	true	true	false	true	true	true	Jump Shot
4	false	true	true	true	true	false	true	true	true	Jump Shot
5	true	false	false	true	true	false	true	false	true	Driving Dun
6	false	true	true	true	true	false	true	true	true	Jump Shot
7	true	false	false	true	true	false	true	false	true	Layup Shot
8	false	true	true	true	true	false	true	true	true	Jump Shot
9	true	true	true	true	true	false	true	true	true	Jump Shot
10	false	true	true	true	true	false	true	true	true	Running Jur
11	false	true	true	true	true	false	true	true	true	Jump Shot
12	true	true	true	true	true	false	false	true	true	Jump Shot
13	true	true	true	true	true	false	true	true	true	Running Jur
14	false	true	true	true	true	false	true	true	true	Jump Shot
15	false	true	true	true	true	false	true	true	true	Jump Shot
16	false	true	true	false	true	false	true	true	true	Jump Shot
17	false	false	false	false	true	false	true	false	true	Driving Layu
18	true	true	true	true	true	false	true	true	true	Jump Shot
19	false	true	true	true	true	false	true	true	true	Jump Shot

ExampleSet (30,697 examples, 1 special attribute, 15 regular attributes)

Accuracy:

accuracy: 62.65% +/- 0.02% (micro average: 62.65%)

	true false	true true	class precision
pred. false	19232	11465	62.65%
pred. true	0	0	0.00%
class recall	100.00%	0.00%	

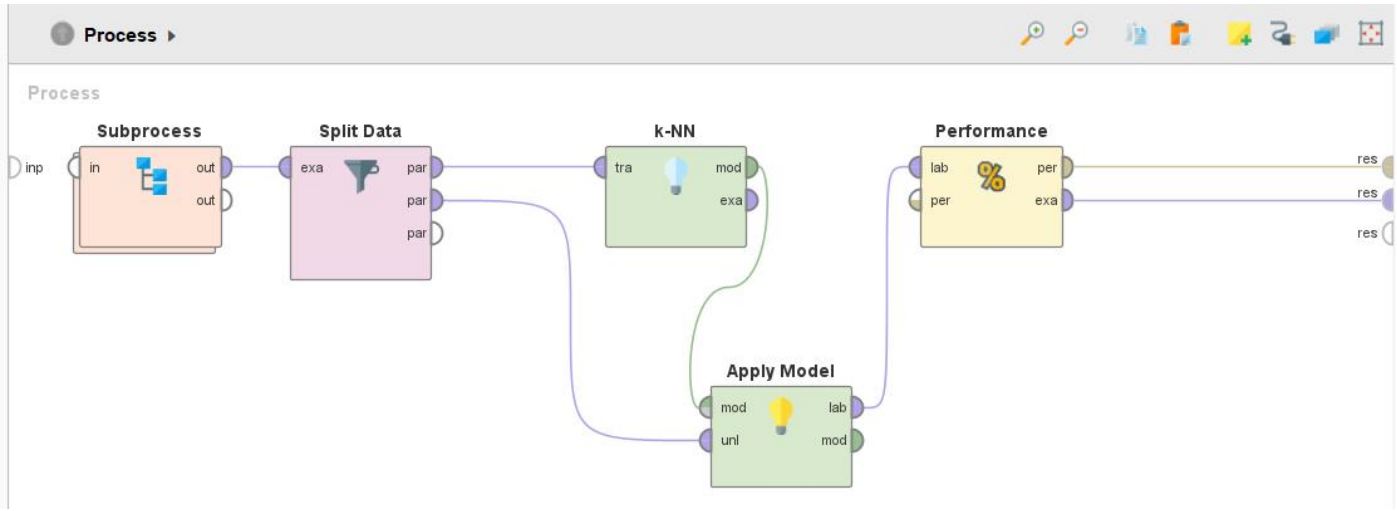
F-measure:

f_measure: unknown (positive class: true)

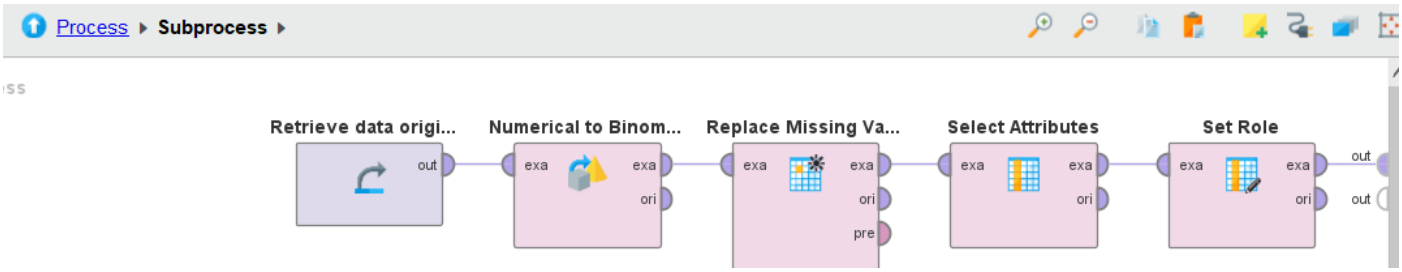
	true false	true true	class precision
pred. false	19232	11465	62.65%
pred. true	0	0	0.00%
class recall	100.00%	0.00%	

KNN:

Process:



Subprocess:



Example set:

Open in Turbo Prep Auto Model

Filter (12,279 / 12,279 examples): all

Row No.	shot_made_f...	prediction(s...	confidence(f...	confidence(t...	action_type	combined_s...	loc_x	loc_y	minutes_re...	period
1	false	false	0.614	0.386	Jump Shot	Jump Shot	167	72	10	1
2	false	false	1	0	Jump Shot	Jump Shot	-157	0	10	1
3	true	true	0.376	0.624	Jump Shot	Jump Shot	-101	135	7	1
4	true	false	0.611	0.389	Driving Dunk ...	Dunk	0	0	6	2
5	false	false	1	0	Jump Shot	Jump Shot	-145	-11	9	3
6	false	true	0.192	0.808	Running Jump...	Jump Shot	-33	125	3	3
7	false	false	0.799	0.201	Jump Shot	Jump Shot	-94	4	2	1
8	false	false	0.598	0.402	Driving Layup ...	Layup	0	0	0	1
9	true	false	0.814	0.186	Jump Shot	Jump Shot	-117	226	8	2
10	false	true	0.405	0.595	Jump Shot	Jump Shot	3	144	10	3
11	false	false	0.581	0.419	Jump Shot	Jump Shot	134	127	9	3
12	false	true	0.201	0.799	Jump Shot	Jump Shot	-58	196	2	3
13	false	false	0.802	0.198	Jump Shot	Jump Shot	85	173	8	4
14	true	false	0.603	0.397	Running Jump...	Jump Shot	121	4	1	4
15	false	true	0.409	0.591	Layup Shot	Layup	1	19	7	1
16	false	true	0.394	0.606	Reverse Layu...	Layup	1	4	4	1
17	false	true	0.415	0.585	Jump Shot	Jump Shot	-117	116	5	2
18	true	false	0.817	0.183	Jump Shot	Jump Shot	91	184	3	2
19	true	false	0.601	0.399	Jump Shot	Jump Shot	150	133	8	3

ExampleSet (12,279 examples, 4 special attributes, 15 regular attributes)

Accuracy:

accuracy: 57.79%

	true false	true true	class precision
pred. false	5563	3053	64.57%
pred. true	2130	1533	41.85%
class recall	72.31%	33.43%	

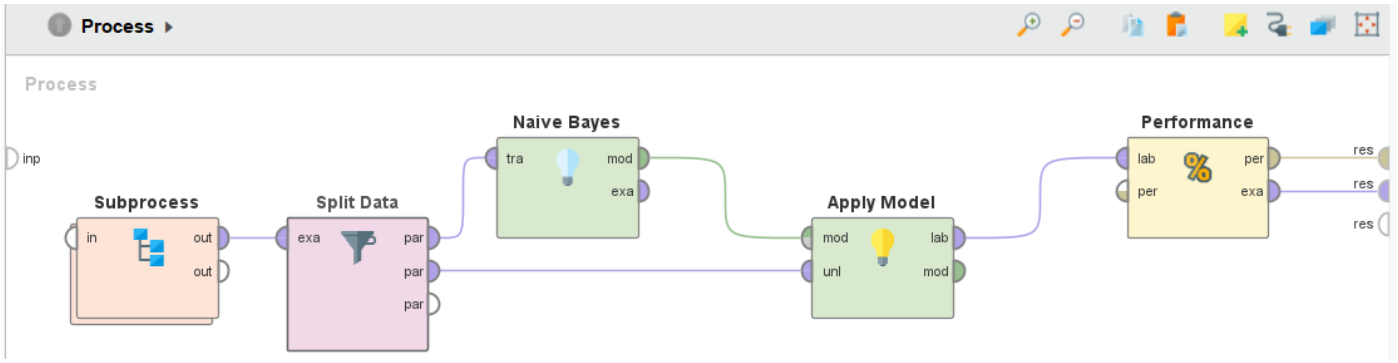
F-measure:

f_measure: 37.17% (positive class: true)

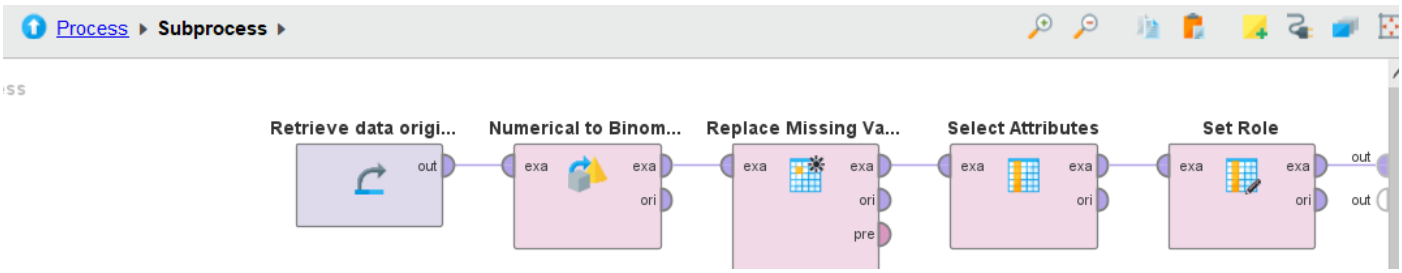
	true false	true true	class precision
pred. false	5563	3053	64.57%
pred. true	2130	1533	41.85%
class recall	72.31%	33.43%	

Naïve Bayes:

Process:



Subprocess:



Example set:

Open in Turbo Prep Auto Model Filter (12,279 / 12,279 examples): all

Row No.	shot_made_f...	prediction(s...	confidence(f...	confidence(t...	action_type	combined_s...	loc_x	loc_y	minutes_re...	period
1	false	false	0.812	0.188	Jump Shot	Jump Shot	167	72	10	1
2	false	false	0.723	0.277	Jump Shot	Jump Shot	-157	0	10	1
3	true	false	0.822	0.178	Jump Shot	Jump Shot	-101	135	7	1
4	true	true	0.002	0.998	Driving Dunk ...	Dunk	0	0	6	2
5	false	false	0.722	0.278	Jump Shot	Jump Shot	-145	-11	9	3
6	false	true	0.276	0.724	Running Jump...	Jump Shot	-33	125	3	3
7	false	false	0.651	0.349	Jump Shot	Jump Shot	-94	4	2	1
8	false	true	0.032	0.968	Driving Layup ...	Layup	0	0	0	1
9	true	false	0.977	0.023	Jump Shot	Jump Shot	-117	226	8	2
10	false	false	0.687	0.313	Jump Shot	Jump Shot	3	144	10	3
11	false	false	0.852	0.148	Jump Shot	Jump Shot	134	127	9	3
12	false	false	0.837	0.163	Jump Shot	Jump Shot	-58	196	2	3
13	false	false	0.869	0.131	Jump Shot	Jump Shot	85	173	8	4
14	true	true	0.425	0.575	Running Jump...	Jump Shot	121	4	1	4
15	false	true	0.078	0.922	Layup Shot	Layup	1	19	7	1
16	false	true	0.036	0.964	Reverse Layu...	Layup	1	4	4	1
17	false	false	0.828	0.172	Jump Shot	Jump Shot	-117	116	5	2
18	true	false	0.878	0.122	Jump Shot	Jump Shot	91	184	3	2
19	true	false	0.864	0.136	Jump Shot	Jump Shot	150	133	8	3

ExampleSet (12,279 examples, 4 special attributes, 15 regular attributes)

Accuracy:

accuracy: 62.10%

	true false	true true	class precision
pred. false	5518	2479	69.00%
pred. true	2175	2107	49.21%
class recall	71.73%	45.94%	

F-measure:

f_measure: 47.52% (positive class: true)

	true false	true true	class precision
pred. false	5518	2479	69.00%
pred. true	2175	2107	49.21%
class recall	71.73%	45.94%	

In general, accuracy is a widely used evaluation metric for classification models & if we consider accuracy as the primary evaluation metric, the random forest model has the highest accuracy at 68%. Therefore, the random forest model may be a good choice for predicting whether Kobe Bryant will make or miss a shot based on accuracy alone.

On the other hand, based on the F-measure for the positive class (made shots) which is more important for

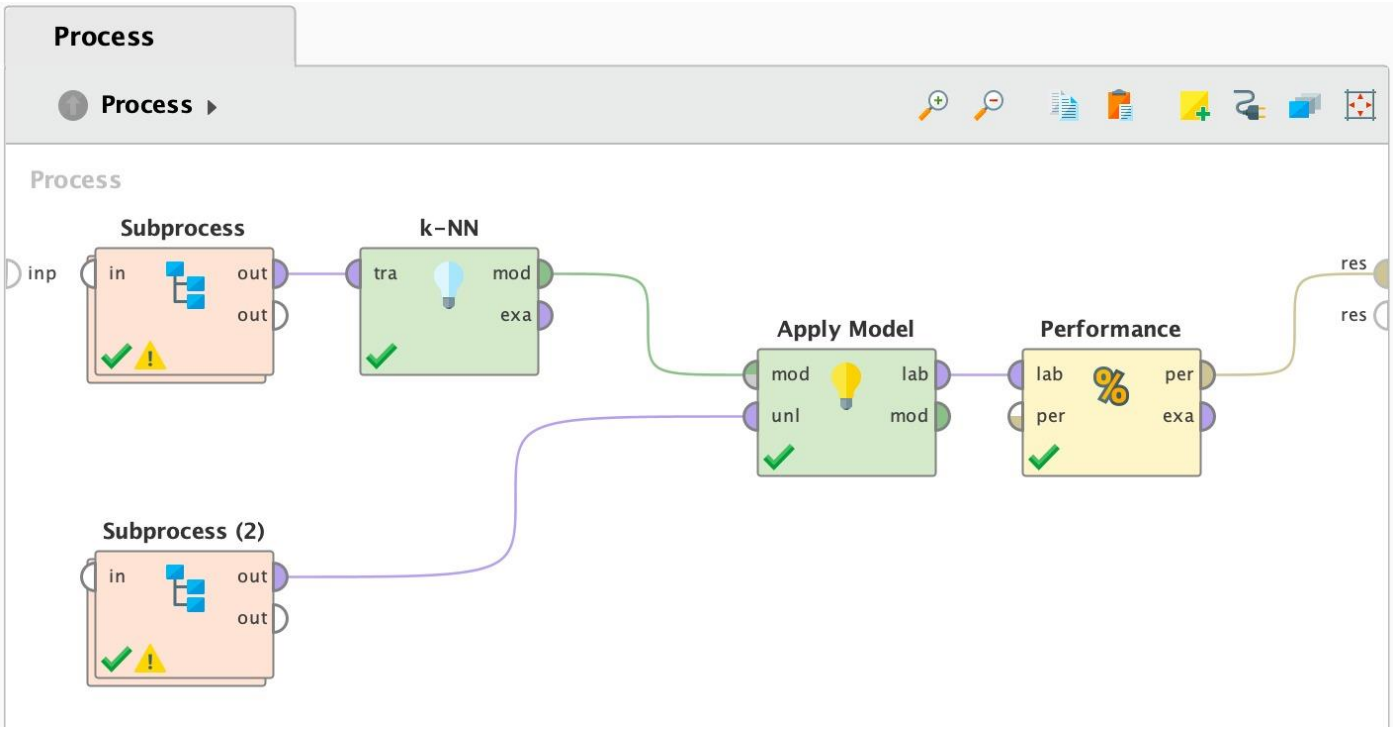
predicting whether Kobe Bryant will make or miss a shot, the Naive Bayes model has the highest F-measure at 47.52%.

Therefore, the Naive Bayes model may be a good choice for predicting whether Kobe Bryant will make or miss a shot.

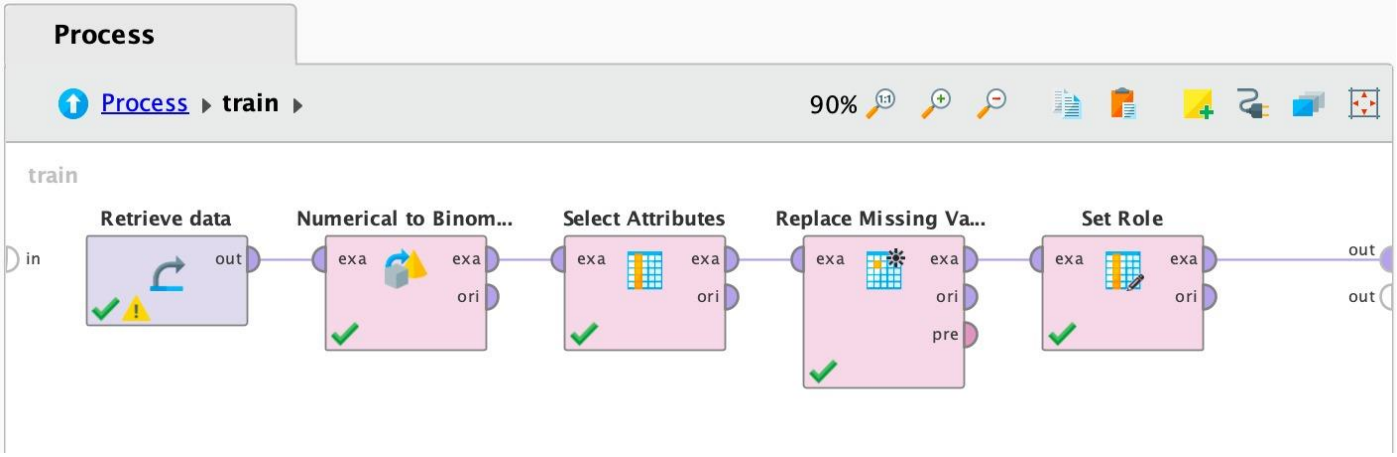
Below are the supervised machine learning attempts using Test & Training data to identify the best model for given scenario:

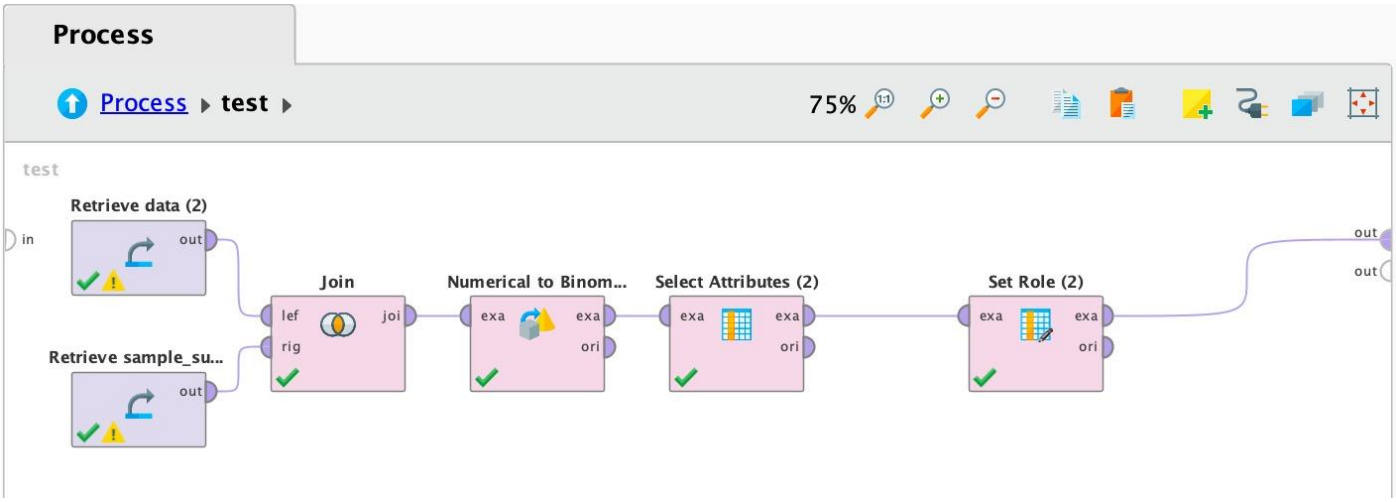
KNN:

Process:



Subprocess:





Accuracy:

K=3

accuracy: 87.26%

	true false	true true	class precision
pred. false	14220	3261	81.35%
pred. true	12	8204	99.85%
class recall	99.92%	71.56%	

F-measure:

f_measure: 83.37% (positive class: true)

	true false	true true	class precision
pred. false	14220	3261	81.35%
pred. true	12	8204	99.85%
class recall	99.92%	71.56%	

K=4

accuracy: 85.44%

	true false	true true	class precision
pred. false	13310	2820	82.52%
pred. true	922	8645	90.36%
class recall	93.52%	75.40%	

F-measure:

f_measure: 82.21% (positive class: true)

	true false	true true	class precision
pred. false	13310	2820	82.52%
pred. true	922	8645	90.36%
class recall	93.52%	75.40%	

Example Set:

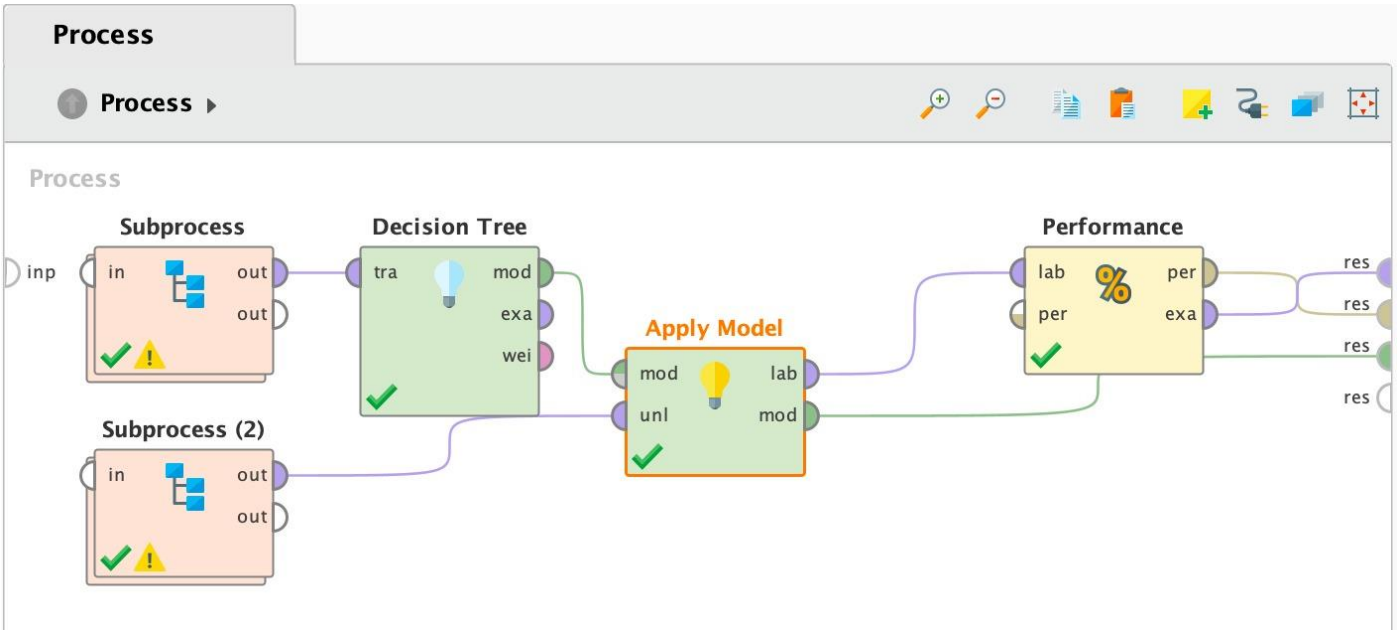
Open in Turbo Prep | Auto Model | Filter (30,697 / 30,697 examples): all

Row No.	shot_made...	prediction(...	confidence(...	confidence(...	action_type	combined_...	loc_x	loc_y	shot_dista...	shot_type
1	?	false	1	0	Jump Shot	Jump Shot	167	72	18	2PT Field G
2	false	false	1.000	0	Jump Shot	Jump Shot	-157	0	15	2PT Field G
3	true	true	0.194	0.806	Jump Shot	Jump Shot	-101	135	16	2PT Field G
4	false	false	0.751	0.249	Jump Shot	Jump Shot	138	175	22	2PT Field G
5	true	true	0.084	0.916	Driving Dun...	Dunk	0	0	0	2PT Field G
6	false	false	1	0	Jump Shot	Jump Shot	-145	-11	14	2PT Field G
7	true	true	0.098	0.902	Layup Shot	Layup	0	0	0	2PT Field G
8	?	false	0.500	0.500	Jump Shot	Jump Shot	1	28	2	2PT Field G
9	true	true	0.061	0.939	Jump Shot	Jump Shot	-65	108	12	2PT Field G
10	false	false	0.500	0.500	Running Jum...	Jump Shot	-33	125	12	2PT Field G
11	false	false	0.659	0.341	Jump Shot	Jump Shot	-94	238	25	3PT Field G
12	true	true	0.348	0.652	Jump Shot	Jump Shot	121	127	17	2PT Field G
13	true	true	0.059	0.941	Running Jum...	Jump Shot	-67	110	12	2PT Field G
14	false	false	1	0	Jump Shot	Jump Shot	-94	4	9	2PT Field G
15	false	false	0.743	0.257	Jump Shot	Jump Shot	-23	47	5	2PT Field G
16	false	false	1	0	Jump Shot	Jump Shot	62	192	20	2PT Field G

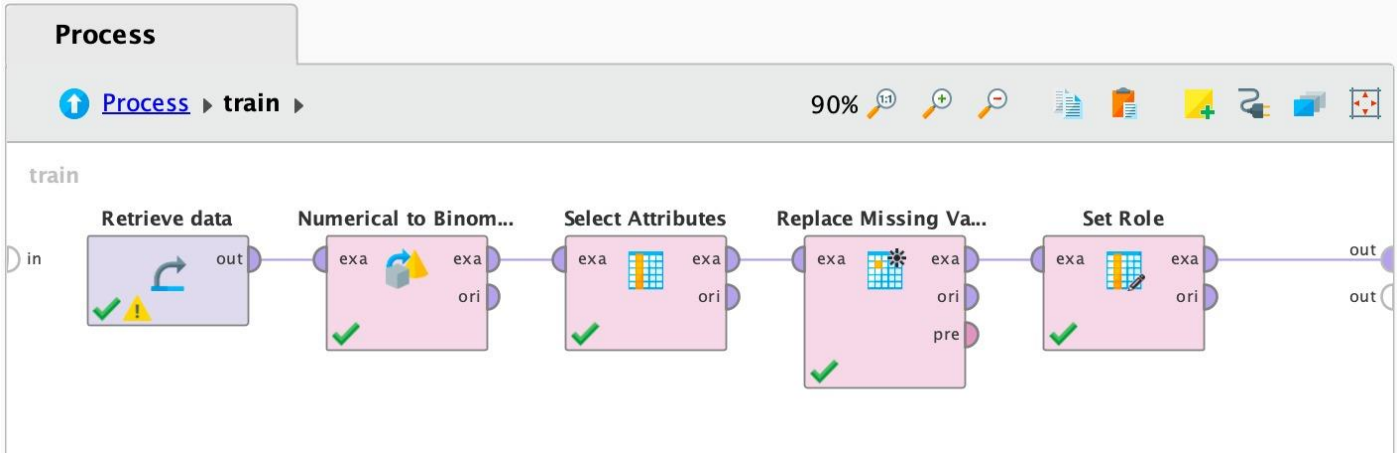
ExampleSet (30,697 examples, 4 special attributes, 10 regular attributes)

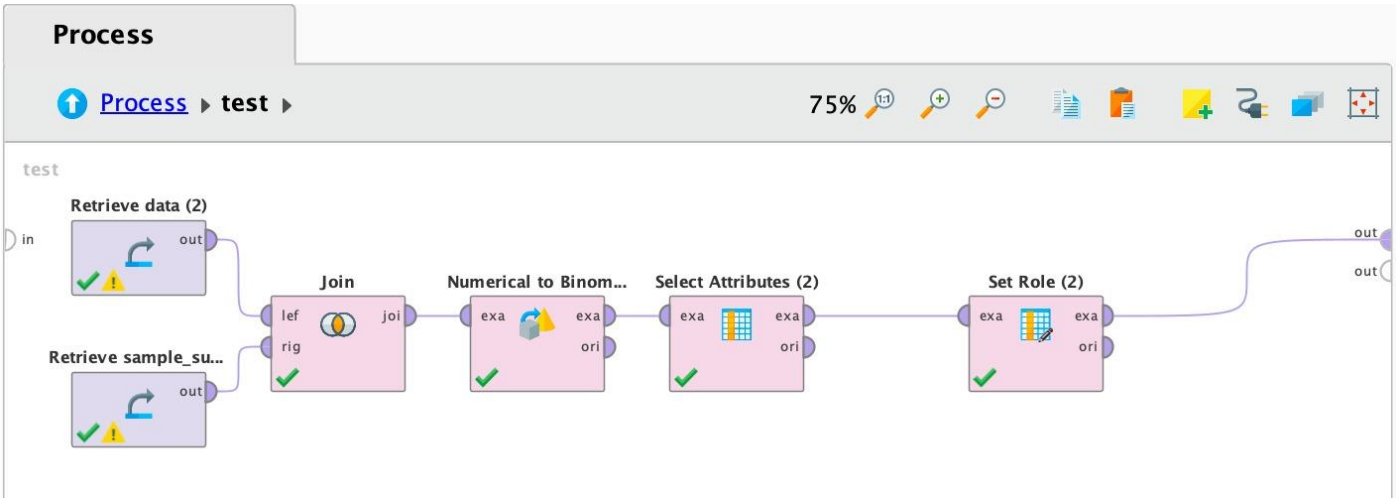
Decision Tree:

Process:



Subprocess:





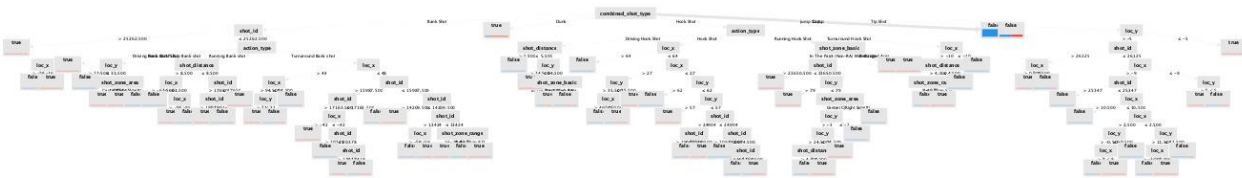
Example Set:

Open in Turbo Prep | Auto Model | Filter (30,697 / 30,697 examples): all

Row No.	shot_made...	prediction(...	confidence(...	confidence(...	action_type	combined_...	loc_x	loc_y	shot_dista...	shot_type
1	?	false	0.672	0.328	Jump Shot	Jump Shot	167	72	18	2PT Field G
2	false	false	0.672	0.328	Jump Shot	Jump Shot	-157	0	15	2PT Field G
3	true	false	0.672	0.328	Jump Shot	Jump Shot	-101	135	16	2PT Field G
4	false	false	0.672	0.328	Jump Shot	Jump Shot	138	175	22	2PT Field G
5	true	true	0.238	0.762	Driving Dun...	Dunk	0	0	0	2PT Field G
6	false	false	0.672	0.328	Jump Shot	Jump Shot	-145	-11	14	2PT Field G
7	true	false	0.530	0.470	Layup Shot	Layup	0	0	0	2PT Field G
8	?	false	0.672	0.328	Jump Shot	Jump Shot	1	28	2	2PT Field G
9	true	false	0.672	0.328	Jump Shot	Jump Shot	-65	108	12	2PT Field G
10	false	false	0.672	0.328	Running Jum...	Jump Shot	-33	125	12	2PT Field G
11	false	false	0.672	0.328	Jump Shot	Jump Shot	-94	238	25	3PT Field G
12	true	false	0.672	0.328	Jump Shot	Jump Shot	121	127	17	2PT Field G
13	true	false	0.672	0.328	Running Jum...	Jump Shot	-67	110	12	2PT Field G
14	false	false	0.672	0.328	Jump Shot	Jump Shot	-94	4	9	2PT Field G
15	false	false	0.672	0.328	Jump Shot	Jump Shot	-23	47	5	2PT Field G
16	false	false	0.672	0.328	Jump Shot	Jump Shot	62	192	20	2PT Field G

ExampleSet (30,697 examples, 4 special attributes, 10 regular attributes)

Tree:



Accuracy:

accuracy: 59.46%

	true false	true true	class precision
pred. false	14153	10338	57.79%
pred. true	79	1127	93.45%
class recall	99.44%	9.83%	

F-measure:

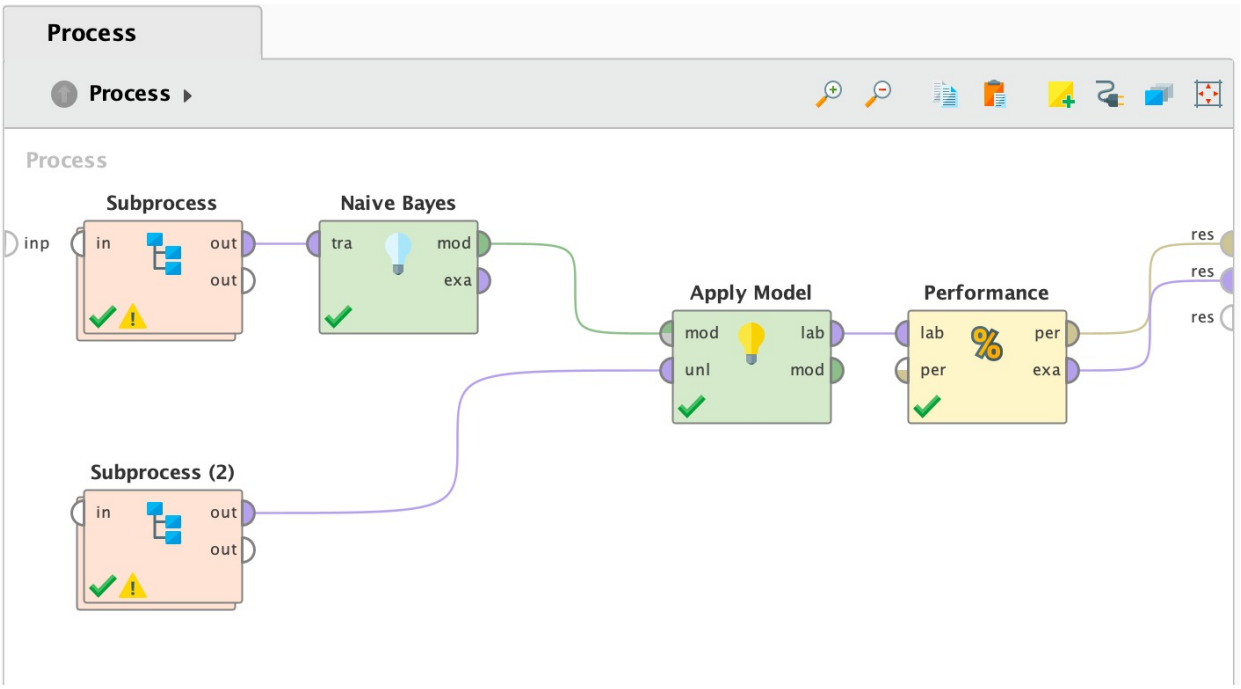
f_measure: 17.79% (positive class: true)

	true false	true true	class precision
pred. false	14153	10338	57.79%
pred. true	79	1127	93.45%
class recall	99.44%	9.83%	

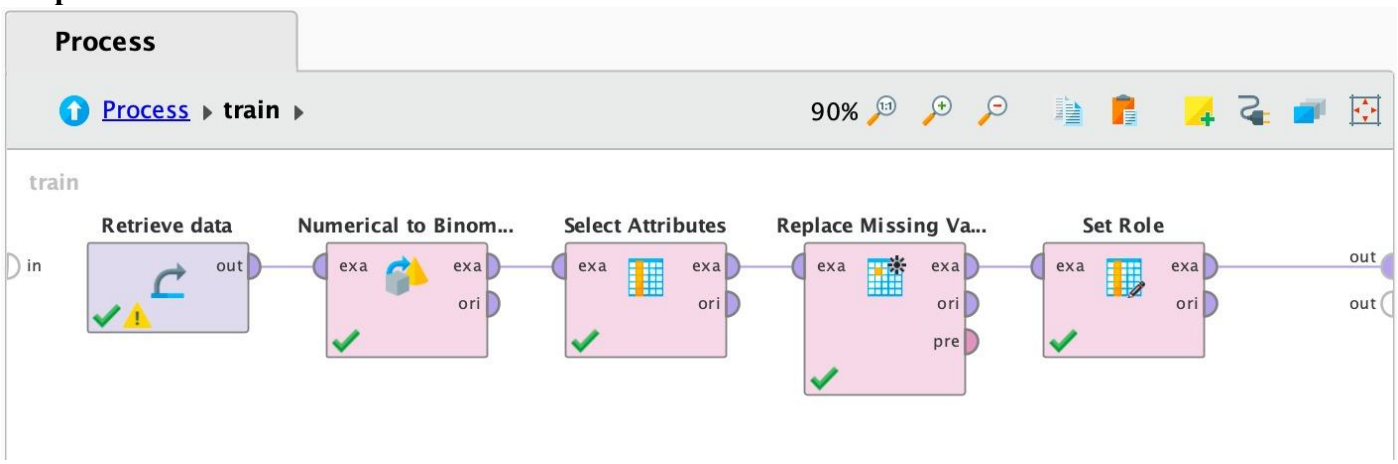
pred. false

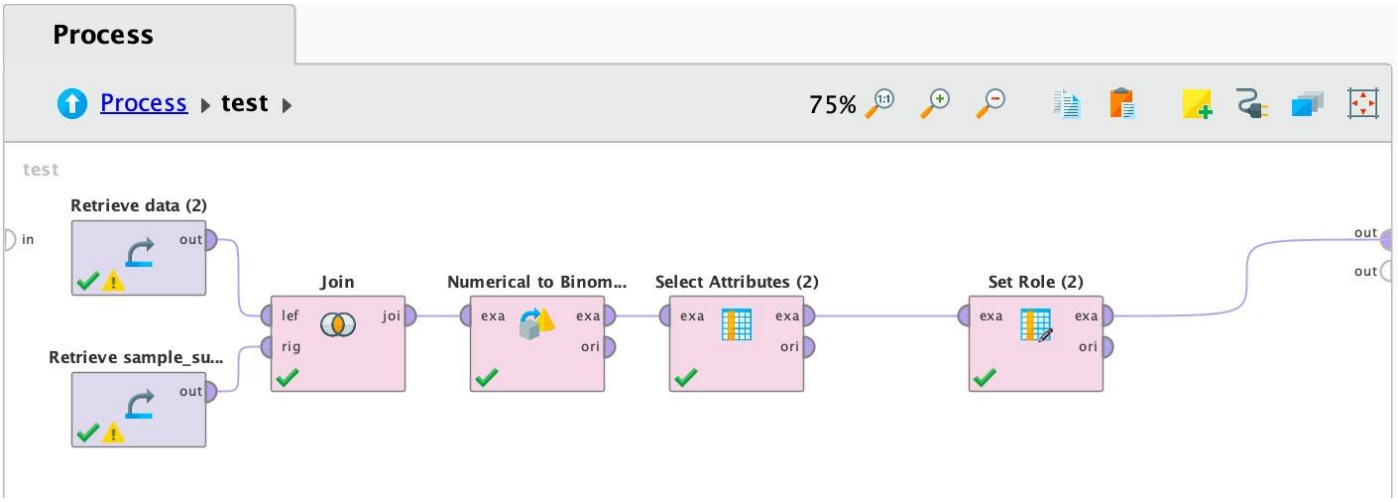
Naïve Bayes:

Process:



Subprocess:





Example Set:

Open in Turbo Prep Auto Model

Filter (30,697 / 30,697 examples): all

Row No.	shot_made...	prediction(...	confidence(...	confidence(...	action_type	combined_...	loc_x	loc_y	shot_dista...	shot_type
1	?	false	0.845	0.155	Jump Shot	Jump Shot	167	72	18	2PT Field G
2	false	false	0.796	0.204	Jump Shot	Jump Shot	-157	0	15	2PT Field G
3	true	false	0.864	0.136	Jump Shot	Jump Shot	-101	135	16	2PT Field G
4	false	false	0.907	0.093	Jump Shot	Jump Shot	138	175	22	2PT Field G
5	true	true	0.004	0.996	Driving Dun...	Dunk	0	0	0	2PT Field G
6	false	false	0.782	0.218	Jump Shot	Jump Shot	-145	-11	14	2PT Field G
7	true	true	0.119	0.881	Layup Shot	Layup	0	0	0	2PT Field G
8	?	true	0.254	0.746	Jump Shot	Jump Shot	1	28	2	2PT Field G
9	true	false	0.734	0.266	Jump Shot	Jump Shot	-65	108	12	2PT Field G
10	false	true	0.284	0.716	Running Jum...	Jump Shot	-33	125	12	2PT Field G
11	false	false	0.981	0.019	Jump Shot	Jump Shot	-94	238	25	3PT Field G
12	true	false	0.856	0.144	Jump Shot	Jump Shot	121	127	17	2PT Field G
13	true	true	0.384	0.616	Running Jum...	Jump Shot	-67	110	12	2PT Field G
14	false	false	0.718	0.282	Jump Shot	Jump Shot	-94	4	9	2PT Field G
15	false	true	0.401	0.599	Jump Shot	Jump Shot	-23	47	5	2PT Field G
16	false	false	0.833	0.167	Jump Shot	Jump Shot	62	192	20	2PT Field G

ExampleSet (30,697 examples, 4 special attributes, 10 regular attributes)

Accuracy:

accuracy: 62.05%

	true false	true true	class precision
pred. false	10571	6091	63.44%
pred. true	3661	5374	59.48%
class recall	74.28%	46.87%	

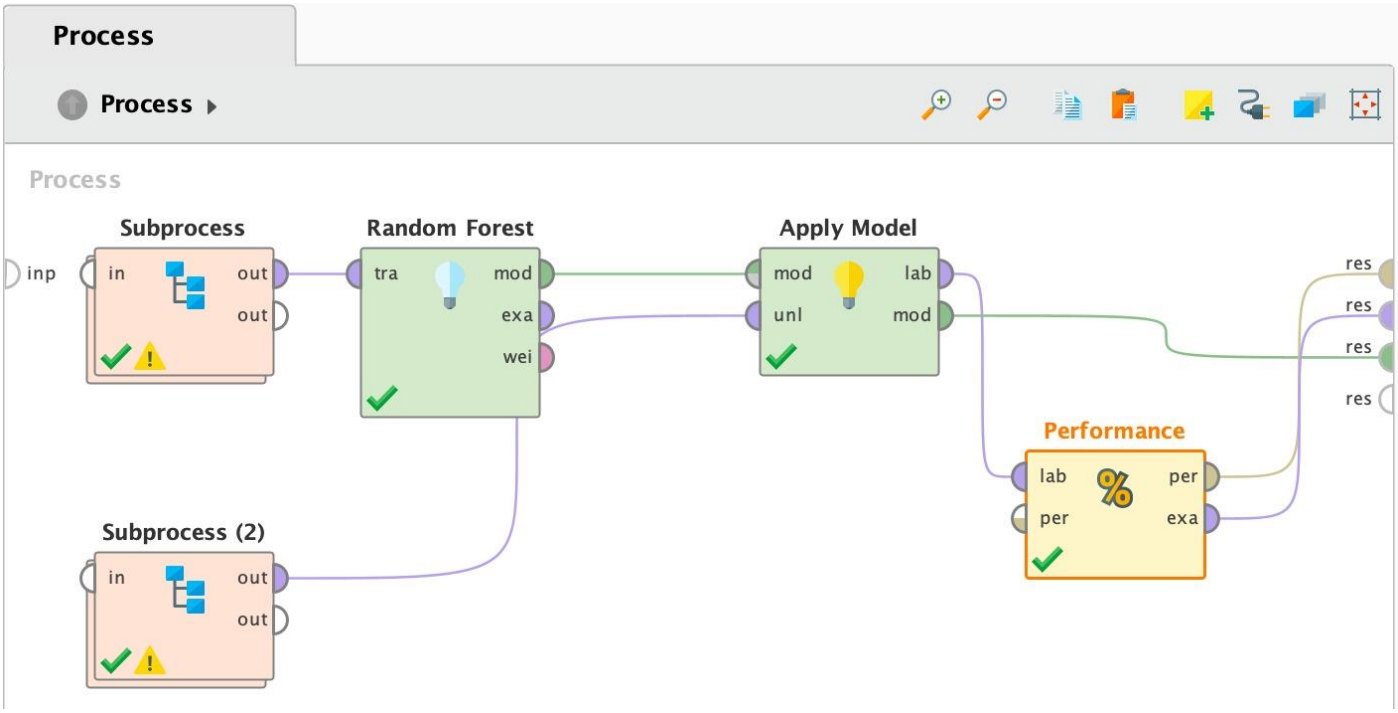
F-measure:

f_measure: 52.43% (positive class: true)

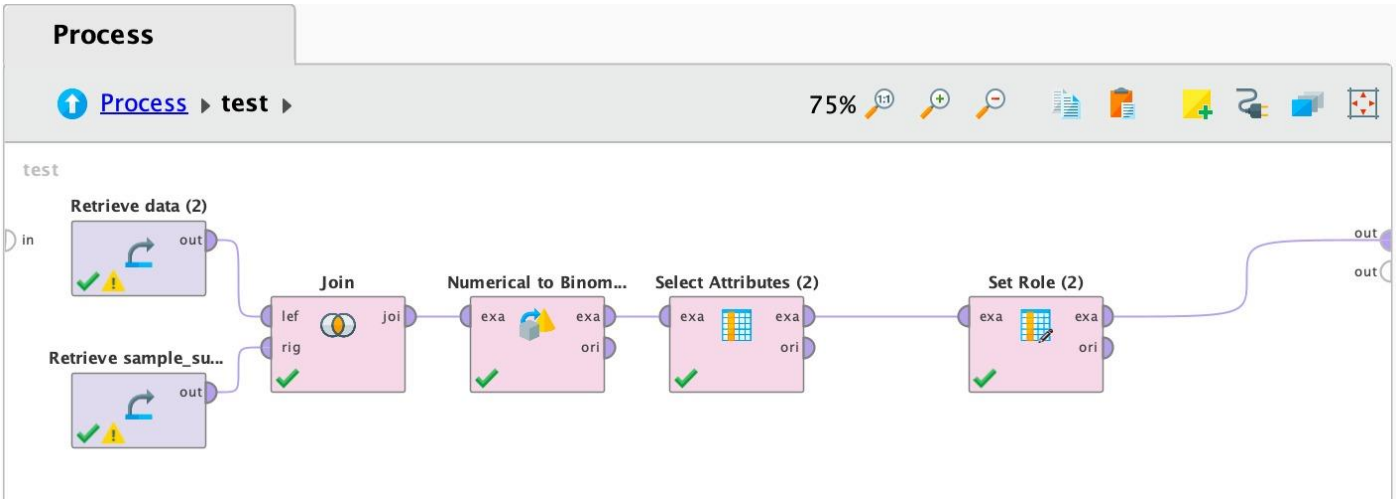
	true false	true true	class precision
pred. false	10571	6091	63.44%
pred. true	3661	5374	59.48%
class recall	74.28%	46.87%	

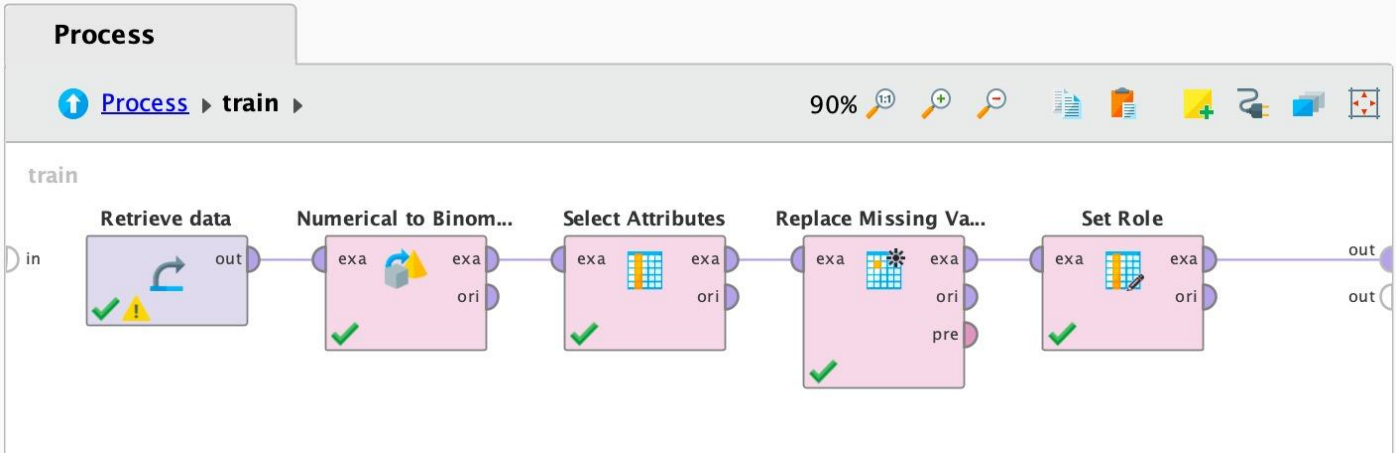
Random Forest:

Process:



Subprocess:





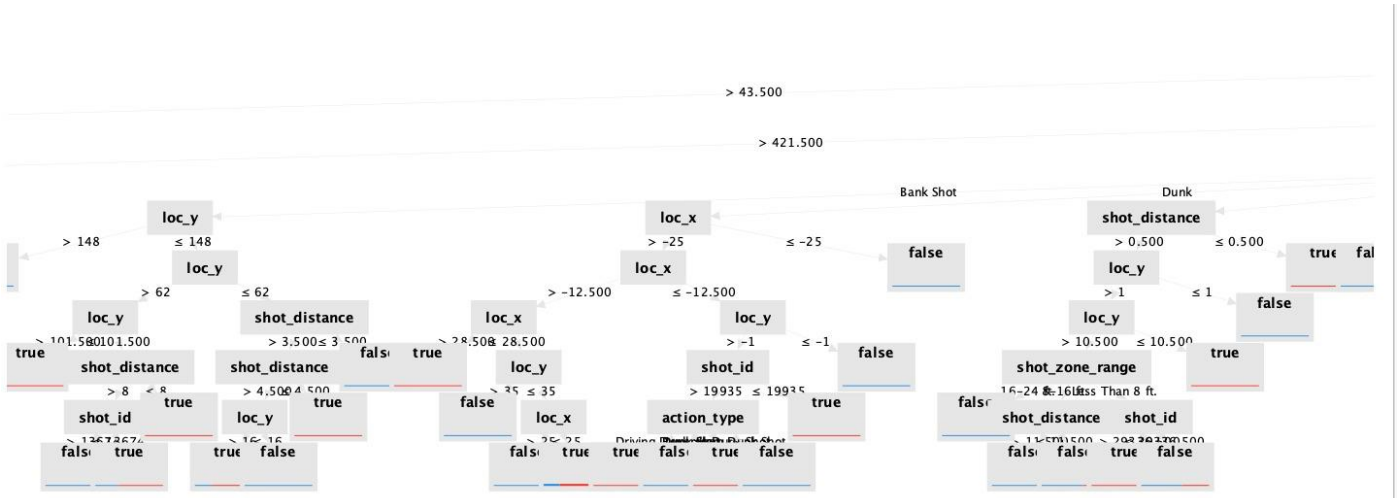
Example Set:

Open in Turbo Prep | Auto Model | Filter (30,697 / 30,697 examples): all

Row No.	shot_made...	prediction(...	confidence(...	confidence(...	action_type	combined_...	loc_x	loc_y	shot_dista...	shot_type
1	?	false	0.731	0.269	Jump Shot	Jump Shot	167	72	18	2PT Field G
2	false	false	0.758	0.242	Jump Shot	Jump Shot	-157	0	15	2PT Field G
3	true	false	0.538	0.462	Jump Shot	Jump Shot	-101	135	16	2PT Field G
4	false	false	0.712	0.288	Jump Shot	Jump Shot	138	175	22	2PT Field G
5	true	true	0.334	0.666	Driving Dun...	Dunk	0	0	0	2PT Field G
6	false	false	0.727	0.273	Jump Shot	Jump Shot	-145	-11	14	2PT Field G
7	true	true	0.399	0.601	Layup Shot	Layup	0	0	0	2PT Field G
8	?	false	0.691	0.309	Jump Shot	Jump Shot	1	28	2	2PT Field G
9	true	false	0.573	0.427	Jump Shot	Jump Shot	-65	108	12	2PT Field G
10	false	false	0.558	0.442	Running Jum...	Jump Shot	-33	125	12	2PT Field G
11	false	false	0.681	0.319	Jump Shot	Jump Shot	-94	238	25	3PT Field G
12	true	false	0.651	0.349	Jump Shot	Jump Shot	121	127	17	2PT Field G
13	true	true	0.443	0.557	Running Jum...	Jump Shot	-67	110	12	2PT Field G
14	false	false	0.699	0.301	Jump Shot	Jump Shot	-94	4	9	2PT Field G
15	false	false	0.723	0.277	Jump Shot	Jump Shot	-23	47	5	2PT Field G
16	false	false	0.698	0.302	Jump Shot	Jump Shot	62	192	20	2PT Field G

ExampleSet (30,697 examples, 4 special attributes, 10 regular attributes)

Tree:



Accuracy:

accuracy: 66.53%

	true false	true true	class precision
pred. false	13534	7904	63.13%
pred. true	698	3561	83.61%
class recall	95.10%	31.06%	

F-measure:

f_measure: 45.29% (positive class: true)

	true false	true true	class precision
pred. false	13534	7904	63.13%
pred. true	698	3561	83.61%
class recall	95.10%	31.06%	

Based on the provided accuracy and F-measure scores, the KNN model with K=3 seems to be the best choice for predicting whether Kobe Bryant will make or miss a shot, with an accuracy of 87.26% and an F-measure of 83.37%. However, it's worth noting that the accuracy and F-measure scores alone may not be sufficient to determine the best model, and other factors such as the complexity of the model, interpretability, and computational efficiency may also be important considerations. It may also be useful to explore other models or variations of the KNN model (e.g. changing the value of K) to see if they perform better.

The KNN model with k=3 has the highest accuracy and F-measure among the models trained on separate test and training data, with an accuracy of 87.26% and an F-measure of 83.37%. However, the random forest model had the highest classification accuracy of 100% for all k values tested, indicating a potentially strong performance on unseen data.

Therefore, if you are looking for the highest possible accuracy and F-measure on the provided test set, the KNN model with k=3 may be the best choice. However, if you want a model that has a strong potential to perform well on unseen data, the random forest model may be a better choice.

Based on the information provided, it appears that the KNN model consistently performs the best across multiple metrics and data sets. Specifically, with K=3, the KNN model achieved an accuracy of 87.26% and an F-measure of 83.37%. Additionally, the KNN model had perfect classification accuracy for all K values when evaluated on separate test and training files.

While the random forest model had higher accuracy and F-measure in the cross-validation approach, its performance varied more across different data sets and classification methods. Therefore, if consistency is a priority, I would recommend using the KNN model with K=3 for predicting Kobe Bryant's shot selection.