K Nearest Neighbors

JMP PRO Use a proximity-based algorithm to predict a categorical outcome (classify) or prediction the value of a continuous outcome for new observations based upon the outcomes of similar observations (i.e., their nearest neighbors).

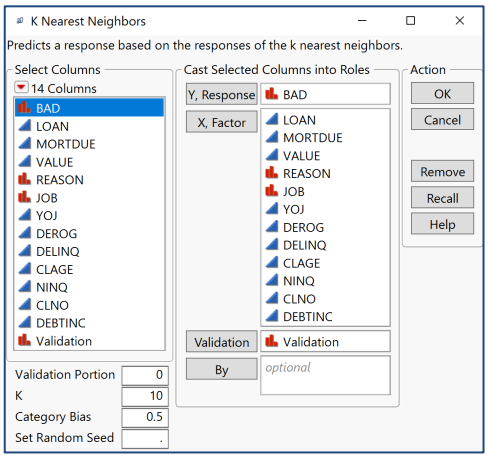
K Nearest Neighbors

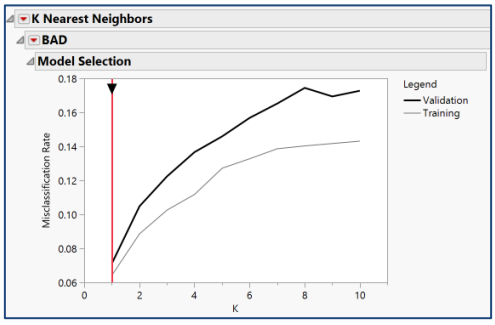
1. From an open JMP® table, select **Analyze > Predictive Modeling > K Nearest Neighbors.**
2. Select a categorical or continuous response variable from **Select Columns** and click **Y, Response**. Here, we illustrate using a categorial response variable.
3. Select candidate predictor variables and click **X, Factor**.
4. If desired, enter the **Validation Portion** or select a validation column and click **Validation**. Click **OK**.

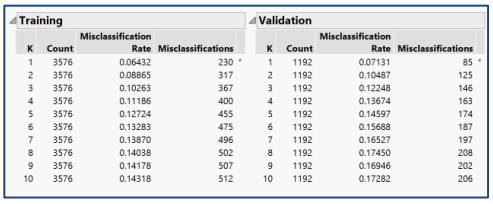
JMP displays:

- Graph and table showing the misclassification rates and counts across a range of values for K.
- Confusion Matrix detailing the classification performance for the value of K with the smallest misclassification rate.
- Mosaic plots (not shown here) which graphically shows the values in the confusion matrix.

Equity.jmp (Help > Sample Data Folder)





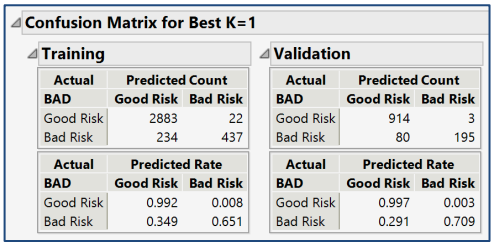


Training

K	Count	Misclassification Rate	Misclassifications
1	3576	0.06432	230 *
2	3576	0.08865	317
3	3576	0.10263	367
4	3576	0.11186	400
5	3576	0.12724	455
6	3576	0.13283	475
7	3576	0.13870	496
8	3576	0.14038	502
9	3576	0.14178	507
10	3576	0.14318	512

Validation

K	Count	Misclassification Rate	Misclassifications
1	1192	0.07131	85 *
2	1192	0.10487	125
3	1192	0.12248	146
4	1192	0.13674	163
5	1192	0.14597	174
6	1192	0.15688	187
7	1192	0.16527	197
8	1192	0.17450	208
9	1192	0.16946	202
10	1192	0.17282	206



Confusion Matrix for Best K=1

Training

Actual BAD	Predicted Count Good Risk	Bad Risk
Good Risk	2883	22
Bad Risk	234	437

Actual BAD	Predicted Rate Good Risk	Bad Risk
Good Risk	0.992	0.008
Bad Risk	0.349	0.651

Validation

Actual BAD	Predicted Count Good Risk	Bad Risk
Good Risk	914	3
Bad Risk	80	195

Actual BAD	Predicted Rate Good Risk	Bad Risk
Good Risk	0.997	0.003
Bad Risk	0.291	0.709

Resuts of the K Nearest Neighbors to predict the risk level (Bad/Good)

- There are 1,192 observations in the Validation Data. The misclassifcation rate is the lowest when the prediction is based on only 1 nearest neighbor: 85/1,192 (7.1%) were misclassified. Note that the misclassification rate increases as the number of nearest neighbors increase. Of these total misclassifications in the Validation Data, 3/(3+194) = 0.3% of the Good Risk observations were misclassified as Bad Risk. 80/(80+195) = 29% of the Bad Risk observations were misclassified as Good Risk.
- There were 1,192 observation set aside for the Test Data (Results not shown). The total misclassification rate for these observations using 1 nearest neighbor is 6.9%. 0.4% of the Good Risk observations were misclassifed as Bad Risk and 3.2% of the Bad Risk observations were misclassified as Good Risk. These results are often considered to produce the most accurate estimate of what the misclassification rate will be in future data as these observations were not part of the model training nor selection process.

Notes: Additional options, such as **Lift Curves**, **Saving Predicteds**, **Save Prediction Formula**, and **Publish Prediction Formula** are accessible from the **red triangle** near the top next to the response variable name.

Visit **Predictive and Specialized Models > K Nearest Neighbors** in **JMP Help** to learn more.