Bayesian Linear Regression

Updated: July 8, 2015

Creates a Bayesian linear regression model

Category: Machine Learning / Initialize Model / Regression (https://msdn.microsoft.com/en-us/library/azure/dn905922.aspx)

Module Overview

You can use the **Bayesian Linear Regression** module to create a regression model based on Bayesian statistics.

After you have configured the model, you must train the model using a tagged dataset and the Train Model (https://msdn.microsoft.com/en-us/library/azure/dn906044.aspx) module. The trained model can then be used to make predictions. Alternatively, the untrained model can be passed to Cross-Validate Model (https://msdn.microsoft.com/en-us/library/azure/dn905852.aspx) for cross-validation against a labeled data set.

Understanding Bayesian Regression

In statistics, the *Bayesian* approach to regression is often contrasted with the *frequentist* approach.

The Bayesian approach uses linear regression supplemented by additional information in the form of a prior probability distribution. Prior information about the parameters is combined with a likelihood function to generate estimates for the parameters.

In contrast, the frequentist approach, represented by standard least-square linear regression, assumes that the data contains sufficient measurements to create a meaningful model.

How to Configure a Bayesian Regression Model

1. Add the **Bayesian Linear Regression** model to your experiment.

   Add a training dataset containing a tagged (label) column with numerical values.

2. Set other parameters that affect the behavior of the regression model. See the section for details.Bookmark link 'bkmk_Options' is broken in topic '{"project_id":"37f8d135-1f1d-4e57-9b7d-b084770c6bf5","entity_id":"ee12de50-2b34-4145-aec0-23e0485da308","entity_type":"Article","locale":"en-US"}'. Rebuilding the topic

'{"project_id":"37f8d135-1f1d-4e57-9b7d-b084770c6bf5","entity_id":"ee12de50-2b34-4145-aec0-23e0485da308","entity_type":"Article","locale":"en-US"}' may solve the problem.

3. Add the Train Model (https://msdn.microsoft.com/en-us/library/azure/dn906044.aspx) or Sweep Parameters (https://msdn.microsoft.com/en-us/library/azure/dn905810.aspx) module.

4. Run the experiment.

   The module returns a trained model that you can use to make predictions. Or, you can right-click the output of the module and select **Save as trained model** to re-use the trained model in another experiment.

Options

You can customize the model by using these parameters:

Regularization weight
   Specify a value to use for regularization. Regularization is used to prevent overfitting.

Allow unknown categorical levels
   When this option is selected, the model will create a grouping for Unknown values. If you deselect it, the model can accept only the values contained in the training data. In the former case, the model might be less precise on known values but provide better predictions for new (unknown) values.

Examples

For examples of regression models, see these sample experiments in the Model Gallery (http://gallery.azureml.net/):

- The Compare Regression Models sample (http://go.microsoft.com/fwlink/?LinkId=525731) contrasts several different kinds of regression models.

Module Parameters

Name	Range	Type	Default	Description
	>=double.Epsilon	Float	1.0	

				Type a constant to use in regularization. The constant represents the ratio of the precision of weight prior to the precision of noise.
Regularization weight				
Allow unknown categorical levels	Any	Boolean	true	If true creates an additional level for each categorical column. Any levels in the test dataset not available in the training dataset are mapped to this additional level.

Outputs

Name	Type	Description
Untrained model	ILearner interface (https://msdn.microsoft.com/en-us/library/azure/dn905938.aspx)	An untrained Bayesian linear regression model

See Also

A-Z List of Machine Learning Studio Modules (https://msdn.microsoft.com/en-us/library/azure/dn906033.aspx)
Machine Learning / Initialize Model / Regression (https://msdn.microsoft.com/en-us/library/azure/dn905922.aspx)