

root

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Name	SupportVectorMachines
Version	1.1
Description	Support Vector Machines Bundle
License	http://www.apache.org/licenses/LICENSE-2.0
Copyright	Copyright (C) 2017 HPCC Systems
Authors	HPCCSystems
DependsOn	ML_Core, PBblas
Platform	6.2.0

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DESCRIPTIONS

SVC SVC

SVC
<pre>(Types.SVM_Type svmType = LibSVM_Types.LibSVM_Type.C_SVC, Types.Kernel_Type kernelType = LibSVM_Types.LibSVM_Kernel.RBF, REAL8 gamma = 0.05, REAL8 C = 1, INTEGER4 degree = 3, REAL8 coef0 = 0.0, REAL8 eps = 0.001, REAL8 nu = 0.5, REAL8 p = 0.1, BOOLEAN shrinking = true, BOOLEAN prob_est = true, BOOLEAN scale = true, INTEGER4 nr_weight = 0, DATASET(Types.I4Entry) lbl = DATASET([], Types.I4Entry), DATASET(Types.R8Entry) weight = DATASET([], Types.R8Entry))</pre>

Support vector machine classification.

Utilizes the open-source libSVM under the hood.

This module is appropriate for small to medium sized Machine Learning problems or multitudes of small-to-medium problems using the Myriad interface.

This is due to both scaling limitations endemic to SVM, as well as the fact that libSVM runs independently on each node, and cannot, therefore scale to very large single problems.

Other techniques should be employed for Machine Learning with more than 10,000 data points.

This module also provides a mechanism for doing a grid search for regularization parameters using the full resources of the HPCC cluster rather than searching sequentially (see `GridSearch.ecl`).

PARAMETER svmType ||| UNSIGNED2 — The SVC type, which may be one of 0 (C_SVC, default), 1 (NU_SVC), or 2 (ONE_CLASS).

PARAMETER kernelType ||| UNSIGNED2 — The kernel used in training and predicting, which may be one of 0 (LINEAR), 1 (POLY), 2 (RBF, default), 3 (SIGMOID), or 4 (PRECOMPUTED).

PARAMETER gamma ||| REAL8 — Parameter needed for all kernels except LINEAR (default: 0.05).

PARAMETER C ||| REAL8 — Cost of constraint violation (default: 1).

PARAMETER degree ||| INTEGER4 — Parameter needed for kernel of type POLY (default: 3).

PARAMETER coef0 ||| REAL8 — Parameter needed for kernels of type POLY and SIGMOID (default: 0).

PARAMETER eps ||| REAL8 — Tolerance of termination criterion (default: 0.001).

PARAMETER nu ||| REAL8 — Parameter needed for NU_SVC and ONE_CLASS (default: 0.5).

PARAMETER p ||| REAL8 — Epsilon in the insensitive-loss function (default: 0.1).

PARAMETER shrinking ||| BOOLEAN — Flag indicating the use of shrinking-heuristics (default: true).

PARAMETER prob_est ||| BOOLEAN — Whether to train for probability estimates (default true).

PARAMETER scale ||| BOOLEAN — Whether to standardize the data (subtract mean, divide by sd) before fitting.

PARAMETER nr_weight ||| INTEGER4 — The number of elements in the 'lbl' parameter (default: 0).

PARAMETER lbl ||| TABLE (I4Entry) — Labels to indicate classes, used with the 'weight' parameter (default: []).

PARAMETER weight ||| TABLE (R8Entry) — Class weights, assigned to classes using the 'lbl' parameter (default: []).

PARENT _versions.ML_Core.V3_2_2.ML_Core.Interfaces.IClassify
</home/lily/.HPCCSystems/bundles/_versions/ML_Core/V3_2_2/ML_Core/Interfaces/IClassify.ecl>

Children

1. [GetModel](#) : Calculate a model to fit the observation data to the observed classes
2. [Classify](#) : Classify the values for new observations using models trained by the GetModel function
3. [Report](#) : Report the confusion matrix for the classifier and training data

4. [Tune](#) : Perform a regularization tuning in order to align the granularity of the algorithm with the complexity of the data
5. [GetTunedModel](#) : Choose the best set of regularization parameters and use it to train the models
6. [CrossValidate](#) : Perform n-fold cross-validation of a given model for each work-item
7. [ModelSummary](#) : Generate human-readable model summary of trained SVM model(s)

GETMODEL GetModel

[SVC](#) \

DATASET(Layout_Model)	GetModel
(DATASET(NumericField) observations, DATASET(DiscreteField) classifications)	

Calculate a model to fit the observation data to the observed classes. For a single given set of model parameters, models can be fit to a number of datasets by concatenating multiple datasets into single 'observations' and 'classifications' datasets, with separate datasets being identified by a work-item number ('wi'), in the NumericField and DiscreteField datasets.

PARAMETER observations ||| TABLE (NumericField) — The observed explanatory values in NumericField format.

PARAMETER classifications ||| TABLE (DiscreteField) — The observed classification used to build the model in DiscreteField format.

RETURN TABLE ({ UNSIGNED2 wi , UNSIGNED8 id , UNSIGNED4 number , REAL8 value }) — The encoded models in Layout_Model format.

SEE ML_Core.Types.NumericField

SEE ML_Core.Types.DiscreteField

SEE ML_Core.Types.Layout_Model

OVERRIDE

CLASSIFY Classify

SVC \

<code>DATASET(ML_Types.Classify_Result)</code>	Classify
<code>(DATASET(Layout_Model) model, DATASET(NumericField) new_observations)</code>	

Classify the values for new observations using models trained by the GetModel function.

PARAMETER model ||| TABLE (Layout_Model) — The models, which should be produced by a corresponding GetModel function.

PARAMETER new_observations ||| TABLE (NumericField) — Observations to be classified in NumericField format.

RETURN TABLE ({ UNSIGNED2 wi , UNSIGNED8 id , UNSIGNED4 number ,
INTEGER4 value , REAL8 conf }) — Classifications with a probability value in Classify_Results format.

SEE ML_Core.Types.NumericField

SEE ML_Core.Types.Classify_Results

OVERRIDE

REPORT Report

SVC \

<code>DATASET(ML_Types.Confusion_Detail)</code>	Report
<code>(DATASET(Layout_Model) model, DATASET(NumericField) observations, DATASET(DiscreteField) classifications)</code>	

Report the confusion matrix for the classifier and training data.

PARAMETER model ||| TABLE (Layout_Model) — The models, which should be produced by a corresponding GetModel function.

PARAMETER observations ||| TABLE (NumericField) — The explanatory values in NumericField format.

PARAMETER classifications ||| TABLE (DiscreteField) — The classifications associated with the observations in DiscreteField format.

RETURN TABLE ({ UNSIGNED2 wi , UNSIGNED4 classifier , INTEGER4 actual_class , INTEGER4 predict_class , UNSIGNED4 occurs , BOOLEAN correct , REAL8 pctActual , REAL8 pctPred }) — The confusion matrix showing correct and incorrect results in Confusion_Detail format.

SEE ML_Core.Types.NumericField

SEE ML_Core.Types.DiscreteField

SEE ML_Core.Types.Confusion_Detail

OVERLOAD

TUNE Tune

SVC \

<code>DATASET(Types.GridSearch_Result)</code>	Tune
<pre>(INTEGER4 folds = 10, REAL8 start_log2C = -5, REAL8 stop_log2C = 15, REAL8 maxIncr_log2C = 2, REAL8 start_log2gamma = -15, REAL8 stop_log2gamma = 3, REAL8 maxIncr_log2gamma = 2, DATASET(NumericField) observations, DATASET(DiscreteField) classifications)</pre>	

Perform a regularization tuning in order to align the granularity of the algorithm with the complexity of the data. This is to avoid under or over fitting of the data.

Finds a reasonable setting for the regularization parameters gamma and C by performing a grid search over them and testing each using cross-validation. The parameters that provide the lowest out-of-sample error (i.e. when tested on data not in the training set) are the ones chosen.

Returns a set of training parameter combinations and their results that can then be passed to GetTunedModel below to acquire a model that has been properly regularized.

The grid resolution is increased automatically to utilize any otherwise idle nodes.

For a single given set of model parameters, models can be tuned to a number of datasets by concatenating multiple datasets into single 'observations' and 'classifications' datasets, with separate datasets being identified by a work ID column, 'wi'.

PARAMETER folds ||| INTEGER4 — The number of cross-validation folds for evaluating each candidate model.

PARAMETER start_log2C ||| REAL8 — The lower bound for $\log_2(C)$: $C \geq 2^{(\text{start_log2C})}$.

PARAMETER stop_log2C ||| REAL8 — The upper bound for $\log_2(C)$: $C \leq 2^{(\text{stop_log2C})}$.

PARAMETER maxIncr_log2C ||| REAL8 — Taximum allowable exponential increment for C.

PARAMETER start_log2gamma ||| REAL8 — The lower bound for $\log_2(\text{gamma})$: $\text{gamma} \geq 2^{(\text{start_log2gamma})}$.

PARAMETER stop_log2gamma ||| REAL8 — The upper bound for $\log_2(\text{gamma})$: $\text{gamma} \leq 2^{(\text{stop_log2gamma})}$.

PARAMETER maxIncr_log2gamma ||| REAL8 — Taximum allowable exponential increment for gamma.

PARAMETER observations ||| TABLE (NumericField) — The observed explanatory values in NumericField format.

PARAMETER classifications ||| TABLE (DiscreteField) — The observed classification used to build the model in DiscreteField format.

RETURN TABLE ({ UNSIGNED2 wi , INTEGER4 id , REAL8 correct , REAL8 mse , REAL8 r_sq , UNSIGNED2 svmType , UNSIGNED2 kernelType , INTEGER4 degree , REAL8 coef0 , REAL8 eps , REAL8 nu , REAL8 p , INTEGER4 nr_weight , BOOLEAN shrinking , BOOLEAN prob_est , BOOLEAN scale , TABLE (I4Entry) lbl , TABLE (R8Entry) weight , REAL8 gamma , REAL8 C }) — Dataset with sets of model parameters and corresponding cross-validated scores in GridSearch_Result format.

SEE GetTunedModel

SEE Types.GridSearch_Result

GETTUNEDMODEL GetTunedModel

SVC \

DATASET(Layout_Model)	GetTunedModel
<pre>(DATASET(Types.GridSearch_Result) tuneResult, DATASET(NumericField) observations, DATASET(DiscreteField) classifications)</pre>	

Choose the best set of regularization parameters and use it to train the models. Using the output of Tune(), find the best set of modeling parameters for each work id, and train the corresponding models. The the most regularized (i.e. coarsest) set of parameters that achieved near-maximum performance is used to create the models.

PARAMETER **tuneResult** ||| TABLE (GridSearch_Result) — The results of a grid search over C and gamma, produced by Tune().

PARAMETER **observations** ||| TABLE (NumericField) — The observed explanatory values in NumericField format.

PARAMETER **classifications** ||| TABLE (DiscreteField) — The observed classification used to build the model in DiscreteField format.

RETURN TABLE ({ UNSIGNED2 wi , UNSIGNED8 id , UNSIGNED4 number , REAL8 value }) — The encoded models in Layout_Model format.

SEE Tune

SEE ML_Core.Types.NumericField

SEE ML_Core.Types.DiscreteField

SEE ML_Core.Types.Layout_Model

CROSSVALIDATE CrossValidate

SVC \

DATASET(Types.CrossValidate_Result)	CrossValidate
<pre>(INTEGER4 folds = 10, DATASET(NumericField) observations, DATASET(DiscreteField) classifications)</pre>	

Perform n-fold cross-validation of a given model for each work-item.

For a single given set of model parameters, models can be cross-validated against a number of datasets by concatenating multiple datasets into single 'observations' and 'classifications' datasets, with separate datasets being identified by a work ID column, 'wi'.

PARAMETER folds ||| INTEGER4 — The number of cross-validation folds.

PARAMETER observations ||| TABLE (NumericField) — The observed explanatory values in NumericField format.

PARAMETER classifications ||| TABLE (DiscreteField) — The observed classification used to build in DiscreteField format.

RETURN TABLE ({ UNSIGNED2 wi , INTEGER4 id , REAL8 correct , REAL8 mse , REAL8 r_sq }) — Dataset of cross-validated scores in CrossValidate_Result format.

SEE ML_Core.NumericField

SEE ML_Core.DiscreteField

SEE Types.CrossValidate_Result

MODELSUMMARY ModelSummary

SVC \

DATASET ({ UNSIGNED4 r , STRING60 Txt })	ModelSummary
(DATASET(Layout_Model) model)	

Generate human-readable model summary of trained SVM model(s).

Multiple models can be simultaneously summarized by concatenating a number of models into a single 'model' object, with separate models being identified by a work ID column, 'wi'.

PARAMETER model ||| TABLE (Layout_Model) — The models, which should be produced by a corresponding GetModel function.

RETURN TABLE ({ UNSIGNED4 r , STRING60 txt }) — Single-column dataset with textual description of models.

SVR

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IMPORTS

Types | libsvm.Types | PBblas | __versions.ML_Core.V3_2_2.ML_Core |
__versions.ML_Core.V3_2_2.ML_Core.Types |
__versions.ML_Core.V3_2_2.ML_Core.Interfaces |

DESCRIPTIONS

SVR SVR

SVR
<pre>(DATASET(NumericField) X = DATASET([], NumericField), DATASET(NumericField) Y = DATASET([], NumericField), Types.SVM_Type svmType = LibSVM_Types.LibSVM_Type.C_SVC, Types.Kernel_Type kernelType = LibSVM_Types.LibSVM_Kernel.RBF, REAL8 gamma = 0.05, REAL8 C = 1, INTEGER4 degree = 3, REAL8 coef0 = 0.0, REAL8 eps = 0.001, REAL8 nu = 0.5, REAL8 p = 0.1, BOOLEAN shrinking = true, BOOLEAN prob_est = true, BOOLEAN scale = true, INTEGER4 nr_weight = 0, DATASET(Types.I4Entry) lbl = DATASET([], Types.I4Entry), DATASET(Types.R8Entry) weight = DATASET([], Types.R8Entry))</pre>

Support Vector Machine Regression.

Utilizes the open-source libSVM under the hood.

This module is appropriate for small to medium sized Machine Learning problems or multitudes of small-to-medium problems using the Myriad interface.

This is due to both scaling limitations endemic to SVM, as well as the fact that libSVM runs independently on each node, and cannot, therefore scale to very large single problems.

Other techniques should be employed for Machine Learning with more than 10,000 data points.

This module also provides a mechanism for doing a grid search for regularization parameters using the full resources of the HPCC cluster rather than searching sequentially (see GridSearch.ecl).

PARAMETER X ||| TABLE (NumericField) — The observed explanatory values in NumericField format.

PARAMETER Y ||| TABLE (NumericField) — The observed values the model aims to fit in NumericField format.

PARAMETER svmType ||| UNSIGNED2 — The SVR type, which may be one of 3 (EPSILON_SVR, default), or 4 (NU_SVR).

PARAMETER kernelType ||| UNSIGNED2 — The kernel used in training and predicting, which may be one of 0 (LINEAR), 1 (POLY), 2 (RBF, default), 3 (SIGMOID), or 4 (PRECOMPUTED).

PARAMETER gamma ||| REAL8 — regularization parameter needed for all kernels except LINEAR (default: 0.05).

PARAMETER C ||| REAL8 — Cost of constraint violation regularization parameter(default: 1).

PARAMETER degree ||| INTEGER4 — Parameter needed for kernel of type POLY (default: 3).

PARAMETER coef0 ||| REAL8 — Parameter needed for kernels of type POLY and SIGMOID (default: 0).

PARAMETER eps ||| REAL8 — Tolerance of termination criterion (default: 0.001).

PARAMETER nu ||| REAL8 — Parameter needed for NU_SVC and ONE_CLASS (default: 0.5).

PARAMETER p ||| REAL8 — Epsilon in the insensitive-loss function (default: 0.1).

PARAMETER shrinking ||| BOOLEAN — Flag indicating the use of shrinking-heuristics (default: true).

PARAMETER prob_est ||| BOOLEAN — Whether to train for probability estimates (default true).

PARAMETER scale ||| BOOLEAN — Whether to standardize the data (subtract mean, divide by sd) before fitting.

PARAMETER nr_weight ||| INTEGER4 — No Doc

PARAMETER lbl ||| TABLE (I4Entry) — No Doc

PARAMETER weight ||| TABLE (R8Entry) — No Doc

SEE ML_Core.Types.NumericField

PARENT _versions.ML_Core.V3_2_2.ML_Core.Interfaces.IRegression

</home/lily/.HPCCSystems/bundles/_versions/ML_Core/V3_2_2/ML_Core/Interfaces/IRegression.ecl

Children

1. [GetModel](#) : Train and return a model that fits the observation data to the observed values
 2. [Predict](#) : Predict values for the new observations using models trained by the GetModel function
 3. [Tune](#) : Perform a regularization tuning in order to align the granularity of the algorithm with the complexity of the data
 4. [GetTunedModel](#) : Choose the best set of regularization parameters and use it to train the models
 5. [CrossValidate](#) : Perform n-fold cross-validation of a given model for each work ID
 6. [ModelSummary](#) : Generate human-readable model summary of trained SVM model(s)
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GETMODEL GetModel

SVR \

<code>DATASET(Layout_Model)</code>	GetModel
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Train and return a model that fits the observation data to the observed values. For a single given set of model parameters, models can be fit to a number of datasets by concatenating multiple datasets into single 'X' and 'Y' datasets, with separate datasets being identified by a work-item column, 'wi'.

RETURN — The encoded models in Layout_Model format.

SEE ML_Core.Types.Layout_Model

OVERRIDE

PREDICT Predict

SVR \

<code>DATASET(NumericField)</code>	Predict
<code>(DATASET(NumericField) newX, DATASET(Layout_Model) model)</code>	

Predict values for the new observations using models trained by the GetModel function.

PARAMETER model ||| TABLE (Layout_Model) — The models, which should be produced by a corresponding GetModel function.

PARAMETER newX ||| TABLE (NumericField) — Observations to be classified in NumericField format.

RETURN TABLE ({ UNSIGNED2 wi , UNSIGNED8 id , UNSIGNED4 number , REAL8 value }) — Predictions in NumericField format.

SEE ML_Core.Types.NumericField

OVERRIDE

TUNE Tune

SVR \

<code>DATASET(Types.GridSearch_Result)</code>	Tune
<pre>(INTEGER4 folds = 10, REAL8 start_log2C = -5, REAL8 stop_log2C = 15, REAL8 maxIncr_log2C = 2, REAL8 start_log2gamma = -15, REAL8 stop_log2gamma = 3, REAL8 maxIncr_log2gamma = 2)</pre>	

Perform a regularization tuning in order to align the granularity of the algorithm with the complexity of the data. This is to avoid under or over fitting of the data.

Finds a reasonable setting for the regularization parameters gamma and C by performing a grid search over them and testing each using cross-validation. The parameters that provide the lowest out-of-sample error (i.e. when tested on data not in the training set) are the ones chosen.

Returns a set of training parameter combinations and their results that can then be passed to GetTunedModel below to acquire a model that has been properly regularized.

The grid resolution is increased automatically to utilize any otherwise idle nodes.

For a single given set of model parameters, models can be tuned to a number of datasets by concatenating multiple datasets into single 'observations' and 'classifications' datasets, with separate datasets being identified by a work ID column, 'wi'.

PARAMETER folds ||| INTEGER4 — The number of cross-validation folds for evaluating each candidate model.

PARAMETER start_log2C ||| REAL8 — The lower bound for $\log_2(C)$: $C \geq 2^{(\text{start_log2C})}$.

PARAMETER stop_log2C ||| REAL8 — The upper bound for $\log_2(C)$: $C \leq 2^{(\text{stop_log2C})}$.

PARAMETER maxIncr_log2C ||| REAL8 — Taximum allowable exponential increment for C.

PARAMETER start_log2gamma ||| REAL8 — The lower bound for $\log_2(\text{gamma})$: $\text{gamma} \geq 2^{(\text{start_log2gamma})}$.

PARAMETER stop_log2gamma ||| REAL8 — The upper bound for $\log_2(\text{gamma})$: $\text{gamma} \leq 2^{(\text{stop_log2gamma})}$.

PARAMETER maxIncr_log2gamma ||| REAL8 — Taximum allowable exponential increment for gamma.

RETURN TABLE ({ UNSIGNED2 wi , INTEGER4 id , REAL8 correct , REAL8 mse , REAL8 r_sq , UNSIGNED2 svmType , UNSIGNED2 kernelType , INTEGER4 degree , REAL8 coef0 , REAL8 eps , REAL8 nu , REAL8 p , INTEGER4 nr_weight , BOOLEAN shrinking , BOOLEAN prob_est , BOOLEAN scale , TABLE (I4Entry) lbl , TABLE (R8Entry) weight , REAL8 gamma , REAL8 C }) — Dataset with sets of model parameters and corresponding cross-validated scores in GridSearch_Result format.

SEE GetTunedModel

SEE Types.GridSearch_Result

GETTUNEDMODEL GetTunedModel

SVR \

DATASET(Layout_Model)	GetTunedModel
(DATASET(Types.GridSearch_Result) tuneResult)	

Choose the best set of regularization parameters and use it to train the models. Using the output of Tune(), find the best set of modeling parameters for each work id, and train the corresponding models. The the most regularized (i.e. coarsest) set of parameters that achieved near-maximum performance is used to create the models.

PARAMETER tuneResult ||| TABLE (GridSearch_Result) — The results of a grid search over C and gamma, produced by Tune().

RETURN TABLE ({ UNSIGNED2 wi , UNSIGNED8 id , UNSIGNED4 number , REAL8 value }) — The encoded models.

CROSSVALIDATE CrossValidate

SVR \

<code>DATASET(Types.CrossValidate_Result)</code>	CrossValidate
<code>(INTEGER4 folds = 10)</code>	

Perform n-fold cross-validation of a given model for each work ID. For a single given set of model parameters, models can be cross-validated against a number of datasets by concatenating multiple datasets into single 'X' and 'Y' datasets, with separate datasets being identified by a work ID column, 'wi'.

PARAMETER folds ||| INTEGER4 — The number of cross-validation folds.

RETURN TABLE ({ UNSIGNED2 wi , INTEGER4 id , REAL8 correct , REAL8 mse , REAL8 r_sq }) — Dataset of cross-validated scores i CrossValidate_Result format.

SEE Types.CrossValidate_Result

MODELSUMMARY ModelSummary

SVR \

<code>DATASET({UNSIGNED4 r, STRING60 Txt})</code>	ModelSummary
<code>(DATASET(Layout_Model) model)</code>	

Generate human-readable model summary of trained SVM model(s).

Multiple models can be simultaneously summarized by concatenating a number of models into a single 'model' object, with separate models being identified by a work ID column, 'wi'.

PARAMETER model ||| TABLE (Layout_Model) — The models, which should be produced by a corresponding GetModel function.

RETURN TABLE ({ UNSIGNED4 r , STRING60 txt }) — Single-column dataset with textual description of models.

Types

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IMPORTS

libsvm.Types |

DESCRIPTIONS

TYPES Types

	Types
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SupportVectorMachines type definitions.

Children

1. [CrossValidate_Result](#) : Record to hold the results of call to CrossValidate
2. [GridSearch_Result](#) : Record for the results of call to GridSearch Contains both CrossValidate_Result and Training_Parameters

CROSSVALIDATE_RESULT CrossValidate_Result

[Types](#) \

	CrossValidate_Result
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Record to hold the results of call to CrossValidate

- FIELD** wi ||| UNSIGNED2 — The work-item number.
 - FIELD** id ||| INTEGER4 — The id of the cross-validation set (i.e. fold).
 - FIELD** correct ||| REAL8 — The number of correct values.
 - FIELD** mse ||| REAL8 — The mean squared error of the regression
 - FIELD** r_sq ||| REAL8 — The R-squared value indicating the strength of the regression.
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GRIDSEARCH_RESULT GridSearch_Result

Types \

	GridSearch_Result
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Record for the results of call to GridSearch Contains both CrossValidate_Result and Training_Parameters.

- FIELD** wi ||| UNSIGNED2 — The work-item number.
- FIELD** id ||| INTEGER4 — The id of the cross-validation set (i.e. fold).
- FIELD** correct ||| REAL8 — The number of correct values.
- FIELD** mse ||| REAL8 — The mean squared error of the regression
- FIELD** r_sq ||| REAL8 — The R-squared value indicating the strength of the regression.
- FIELD** gamma ||| REAL8 — The gamma regularization parameter value.
- FIELD** C ||| REAL8 — The C regularization parameter value.
- FIELD** svmtype ||| UNSIGNED2 — No Doc
- FIELD** kerneltype ||| UNSIGNED2 — No Doc
- FIELD** degree ||| INTEGER4 — No Doc
- FIELD** coef0 ||| REAL8 — No Doc
- FIELD** eps ||| REAL8 — No Doc
- FIELD** nu ||| REAL8 — No Doc

FIELD p ||| REAL8 — No Doc

FIELD nr_weight ||| INTEGER4 — No Doc

FIELD shrinking ||| BOOLEAN — No Doc

FIELD prob_est ||| BOOLEAN — No Doc

FIELD scale ||| BOOLEAN — No Doc

FIELD lbl ||| TABLE (I4Entry) — No Doc

FIELD weight ||| TABLE (R8Entry) — No Doc
