
interpret-community

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Microsoft

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The code is available from [GitHub](#).

API REFERENCE

1.1 interpret_community package

1.1.1 Subpackages

`interpret_community.adapter` package

Submodules

`interpret_community.adapter.explanation_adapter` module

`interpret_community.common` package

Common infrastructure, class hierarchy and utilities for model explanations.

class `interpret_community.common.ModelSummary`

Bases: `object`

A structure for gathering and storing the parts of an explanation asset.

add_from_get_model_summary(*name*, *artifact_metadata_tuple*)

Update artifacts and metadata with new information.

Parameters

- **name** (`str`) – The name the new data should be associated with.
- **artifact_metadata_tuple** (`(list[dict], dict)`) – The tuple of artifacts and metadata to add to existing.

get_artifacts()

Get the list of artifacts.

Returns Artifact list.

Return type `list[list[dict]]`

get_metadata_dictionary()

Get the combined dictionary of metadata.

Returns Metadata dictionary.

Return type `dict`

Subpackages

`interpret_community.common.model_wrapper` package

Submodules

`interpret_community.common.aggregate` module

`interpret_community.common.base_explainer` module

Defines the base explainer API to create explanations.

```
class interpret_community.common.base_explainer.BaseExplainer(*args, **kwargs)
    Bases: interpret_community.common.base_explainer.GlobalExplainer, interpret_community.common.base_explainer.LocalExplainer
```

The base class for explainers that create global and local explanations.

```
class interpret_community.common.base_explainer.GlobalExplainer(*args, **kwargs)
    Bases: abc.ABC, interpret_community.common.chained_identity.ChainedIdentity
```

The base class for explainers that create global explanations.

```
abstract explain_global(*args, **kwargs)
    Abstract method to globally explain the given model.
```

Note evaluation examples can be optional on derived classes since some explainers don't support it, for example MimicExplainer.

Returns A model explanation object containing the global explanation.

Return type GlobalExplanation

```
class interpret_community.common.base_explainer.LocalExplainer(*args, **kwargs)
    Bases: abc.ABC, interpret_community.common.chained_identity.ChainedIdentity
```

The base class for explainers that create local explanations.

```
abstract explain_local(evaluation_examples, **kwargs)
    Abstract method to explain local instances.
```

Parameters `evaluation_examples` (*object*) – The evaluation examples.

Returns A model explanation object containing the local explanation.

Return type LocalExplanation

`interpret_community.common.blackbox_explainer` module

`interpret_community.common.chained_identity` module

Defines a light-weight chained identity for logging.

```
class interpret_community.common.chained_identity.ChainedIdentity(**kwargs)
    Bases: object
```

The base class for logging information.

interpret_community.common.constants module

Defines constants for interpret community.

class interpret_community.common.constants.Attributes

Bases: `object`

Provide constants for attributes.

EXPECTED_VALUE = 'expected_value'

class interpret_community.common.constants.DNNFramework

Bases: `object`

Provide DNN framework constants.

PYTORCH = 'pytorch'

TENSORFLOW = 'tensorflow'

class interpret_community.common.constants.Defaults

Bases: `object`

Provide constants for default values to explain methods.

AUTO = 'auto'

DEFAULT_BATCH_SIZE = 100

HDBSCAN = 'hdbscan'

MAX_DIM = 50

class interpret_community.common.constants.Dynamic

Bases: `object`

Provide constants for dynamically generated classes.

GLOBAL_EXPLANATION = 'DynamicGlobalExplanation'

LOCAL_EXPLANATION = 'DynamicLocalExplanation'

class interpret_community.common.constants.ExplainParams

Bases: `object`

Provide constants for interpret community (init, explain_local and explain_global) parameters.

BATCH_SIZE = 'batch_size'

CLASSES = 'classes'

CLASSIFICATION = 'classification'

EVAL_DATA = 'eval_data'

EVAL_Y_PRED = 'eval_y_predicted'

EVAL_Y_PRED_PROBA = 'eval_y_predicted_proba'

EXPECTED_VALUES = 'expected_values'

EXPLAIN_SUBSET = 'explain_subset'

EXPLANATION_ID = 'explanation_id'

FEATURES = 'features'

GLOBAL_IMPORTANCE_NAMES = 'global_importance_names'

```
GLOBAL_IMPORTANCE_RANK = 'global_importance_rank'
GLOBAL_IMPORTANCE_VALUES = 'global_importance_values'
GLOBAL_NAMES = 'global_names'
GLOBAL_RANK = 'global_rank'
GLOBAL_VALUES = 'global_values'
ID = 'id'
INCLUDE_LOCAL = 'include_local'
INIT_DATA = 'init_data'
IS_ENG = 'is_engineered'
IS_LOCAL_SPARSE = 'is_local_sparse'
IS_RAW = 'is_raw'
LOCAL_EXPLANATION = 'local_explanation'
LOCAL_IMPORTANCE_VALUES = 'local_importance_values'
METHOD = 'method'
MODEL_ID = 'model_id'
MODEL_TASK = 'model_task'
MODEL_TYPE = 'model_type'
NUM_CLASSES = 'num_classes'
NUM_EXAMPLES = 'num_examples'
NUM_FEATURES = 'num_features'
PER_CLASS_NAMES = 'per_class_names'
PER_CLASS_RANK = 'per_class_rank'
PER_CLASS_VALUES = 'per_class_values'
PROBABILITIES = 'probabilities'
SAMPLING_POLICY = 'sampling_policy'
SHAP_VALUES_OUTPUT = 'shap_values_output'
```

```
classmethod get_private(explain_param)
```

Return the private version of the ExplainParams property.

Parameters

- **cls** ([ExplainParams](#)) – ExplainParams input class.
- **explain_param** (*str*) – The ExplainParams property to get private version of.

Returns The private version of the property.

Return type *str*

```
classmethod get_serializable()
```

Return only the ExplainParams properties that have meaningful data values for serialization.

Parameters **cls** ([ExplainParams](#)) – ExplainParams input class.

Returns A set of property names, e.g., 'GLOBAL_IMPORTANCE_VALUES', 'MODEL_TYPE', etc.

Return type `set[str]`

class `interpret_community.common.constants.ExplainType`

Bases: `object`

Provide constants for model and explainer type information, useful for visualization.

CLASSIFICATION = 'classification'

DATA = 'data_type'

EXPLAIN = 'explain_type'

EXPLAINER = 'explainer'

FUNCTION = 'function'

GLOBAL = 'global'

HAN = 'han'

IS_ENG = 'is_engineered'

IS_RAW = 'is_raw'

LIME = 'lime'

LOCAL = 'local'

METHOD = 'method'

MIMIC = 'mimic'

MODEL = 'model_type'

MODEL_CLASS = 'model_class'

MODEL_TASK = 'model_task'

PFI = 'pfi'

REGRESSION = 'regression'

SHAP = 'shap'

SHAP_DEEP = 'shap_deep'

SHAP_GPU_KERNEL = 'shap_gpu_kernel'

SHAP_KERNEL = 'shap_kernel'

SHAP_LINEAR = 'shap_linear'

SHAP_TREE = 'shap_tree'

TABULAR = 'tabular'

class `interpret_community.common.constants.ExplainableModelType(value)`

Bases: `str, enum.Enum`

Provide constants for the explainable model type.

LINEAR_EXPLAINABLE_MODEL_TYPE = 'linear_explainable_model_type'

TREE_EXPLAINABLE_MODEL_TYPE = 'tree_explainable_model_type'

```
class interpret_community.common.constants.ExplanationParams
    Bases: object

    Provide constants for explanation parameters.

    CLASSES = 'classes'

    EXPECTED_VALUES = 'expected_values'

class interpret_community.common.constants.Extension
    Bases: object

    Provide constants for extensions to interpret package.

    BLACKBOX = 'blackbox'

    GLASSBOX = 'model'

    GLOBAL = 'global'

    GREYBOX = 'specific'

    LOCAL = 'local'

class interpret_community.common.constants.InterpretData
    Bases: object

    Provide Data and Visualize constants for interpret core.

    BASE_VALUE = 'Base Value'

    EXPLANATION_CLASS_DIMENSION = 'explanation_class_dimension'

    EXPLANATION_TYPE = 'explanation_type'

    EXTRA = 'extra'

    FEATURE_LIST = 'feature_list'

    GLOBAL_FEATURE_IMPORTANCE = 'global_feature_importance'

    INTERCEPT = 'intercept'

    LOCAL_FEATURE_IMPORTANCE = 'local_feature_importance'

    MLI = 'mli'

    MULTICLASS = 'multiclass'

    NAMES = 'names'

    OVERALL = 'overall'

    PERF = 'perf'

    SCORES = 'scores'

    SINGLE = 'single'

    SPECIFIC = 'specific'

    TYPE = 'type'

    UNIVARIATE = 'univariate'

    VALUE = 'value'

    VALUES = 'values'
```

```

class interpret_community.common.constants.LightGBMParams
    Bases: object

    Provide constants for LightGBM.

    CATEGORICAL_FEATURE = 'categorical_feature'

class interpret_community.common.constants.LightGBMSerializationConstants
    Bases: object

    Provide internal class that defines fields used for MimicExplainer serialization.

    IDENTITY = '_identity'
    LOGGER = '_logger'
    MODEL_STR = 'model_str'
    MULTICLASS = 'multiclass'
    OBJECTIVE = 'objective'
    REGRESSION = 'regression'
    TREE_EXPLAINER = '_tree_explainer'
    enum_properties = ['_shap_values_output']
    nonify_properties = ['_logger', '_tree_explainer']
    save_properties = ['_lgbm']

class interpret_community.common.constants.MimicSerializationConstants
    Bases: object

    Provide internal class that defines fields used for MimicExplainer serialization.

    ALLOW_ALL_TRANSFORMATIONS = '_allow_all_transformations'
    FUNCTION = 'function'
    IDENTITY = '_identity'
    INITIALIZATION_EXAMPLES = 'initialization_examples'
    LOGGER = '_logger'
    MODEL = 'model'
    ORIGINAL_EVAL_EXAMPLES = '_original_eval_examples'
    PREDICT_PROBA_FLAG = 'predict_proba_flag'
    RESET_INDEX = 'reset_index'
    TIMESTAMP_FEATURIZER = '_timestamp_featurizer'
    enum_properties = ['_shap_values_output']
    nonify_properties = ['_logger', 'model', 'function', 'initialization_examples',
                        '_original_eval_examples', '_timestamp_featurizer']
    save_properties = ['surrogate_model']

class interpret_community.common.constants.ModelTask(value)
    Bases: str, enum.Enum

    Provide model task constants. Can be 'classification', 'regression', or 'unknown'.

```

By default the model domain is inferred if 'unknown', but this can be overridden if you specify 'classification' or 'regression'.

Classification = 'classification'

Regression = 'regression'

Unknown = 'unknown'

class interpret_community.common.constants.**ResetIndex**(value)

Bases: `str`, `enum.Enum`

Provide index column handling constants. Can be 'ignore', 'reset' or 'reset_teacher'.

By default the index column is ignored, but you can override to reset it and make it a feature column that is then featurized to numeric, or reset it and ignore it during featurization but set it as the index when calling predict on the original model.

Ignore = 'ignore'

Reset = 'reset'

ResetTeacher = 'reset_teacher'

class interpret_community.common.constants.**SHAPDefaults**

Bases: `object`

Provide constants for default values to SHAP.

INDEPENDENT = 'independent'

class interpret_community.common.constants.**SKLearn**

Bases: `object`

Provide scikit-learn related constants.

EXAMPLES = 'examples'

LABELS = 'labels'

PREDICTIONS = 'predictions'

PREDICT_PROBA = 'predict_proba'

class interpret_community.common.constants.**Scipy**

Bases: `object`

Provide scipy related constants.

CSR_FORMAT = 'csr'

class interpret_community.common.constants.**ShapValuesOutput**(value)

Bases: `str`, `enum.Enum`

Provide constants for the SHAP values output from the explainer.

Can be 'default', 'probability' or 'teacher_probability'. If 'teacher_probability' is specified, we use the probabilities from the teacher model.

DEFAULT = 'default'

PROBABILITY = 'probability'

TEACHER_PROBABILITY = 'teacher_probability'

```

class interpret_community.common.constants.Spacy
    Bases: object
    Provide spaCy related constants.
    EN = 'en'
    NER = 'ner'
    TAGGER = 'tagger'

class interpret_community.common.constants.Tensorflow
    Bases: object
    Provide TensorFlow and TensorBoard related constants.
    CPU0 = '/CPU:0'
    TFLOG = 'tflog'

```

interpret_community.common.error_handling module

Defines error handling utilities.

interpret_community.common.exception module

Defines different types of exceptions that this package can raise.

```

exception interpret_community.common.exception.ScenarioNotSupportedException
    Bases: Exception
    An exception indicating that some scenario is not supported.
    Parameters exception_message (str) – A message describing the error.

```

interpret_community.common.explanation_utils module

Defines helpful utilities for summarizing and uploading data.

interpret_community.common.gpu_kmeans module

The code is based on the similar utility function from SHAP: https://github.com/slundberg/shap/blob/9411b68e8057a6c6f3621765b89b24d82bee13d4/shap/utils/_legacy.py This version makes use of cuml kmeans instead of sklearn for speed.

```

class interpret_community.common.gpu_kmeans.Data
    Bases: object

class interpret_community.common.gpu_kmeans.DenseData(data, group_names, *args)
    Bases: interpret_community.common.gpu_kmeans.Data

interpret_community.common.gpu_kmeans.kmeans(X, k, round_values=True)
    Summarize a dataset with k mean samples weighted by the number of data points they each represent. Parameters
    ——— X : numpy.array or pandas.DataFrame or any scipy.sparse matrix
        Matrix of data samples to summarize (# samples x # features)

```

k [int] Number of means to use for approximation.

round_values [bool] For all i, round the ith dimension of each mean sample to match the nearest value from X[:,i]. This ensures discrete features always get a valid value.

DenseData object.

interpret_community.common.metrics module

Defines metrics for validating model explanations.

`interpret_community.common.metrics.dcg(validate_order, ground_truth_order_relevance, top_values=10)`
Compute the discounted cumulative gain (DCG).

Compute the DCG as the sum of relevance scores penalized by the logarithmic position of the result. See https://en.wikipedia.org/wiki/Discounted_cumulative_gain for reference.

Parameters

- **validate_order** (*list*) – The order to validate.
- **ground_truth_order_relevance** (*list*) – The ground truth relevancy of the documents to compare to.
- **top_values** (*int*) – Specifies the top values to compute the DCG for. The default is 10.

`interpret_community.common.metrics.ndcg(validate_order, ground_truth_order, top_values=10)`
Compute the normalized discounted cumulative gain (NDCG).

Compute the NDCG as the ratio of the DCG for the validation order compared to the maximum DCG possible for the ground truth order. If the validation order is the same as the ground truth the NDCG will be the maximum of 1.0, and the least possible NDCG is 0.0. See https://en.wikipedia.org/wiki/Discounted_cumulative_gain for reference.

Parameters

- **validate_order** (*list*) – The order to validate for the documents. The values should be unique.
- **ground_truth_order** (*list*) – The true order of the documents. The values should be unique.
- **top_values** (*int*) – Specifies the top values to compute the NDCG for. The default is 10.

interpret_community.common.model_summary module

Defines a structure for gathering and storing the parts of an explanation asset.

class `interpret_community.common.model_summary.ModelSummary`
Bases: `object`

A structure for gathering and storing the parts of an explanation asset.

add_from_get_model_summary(*name, artifact_metadata_tuple*)
Update artifacts and metadata with new information.

Parameters

- **name** (*str*) – The name the new data should be associated with.

- **artifact_metadata_tuple** (*(list[dict], dict)*) – The tuple of artifacts and meta-data to add to existing.

get_artifacts()

Get the list of artifacts.

Returns Artifact list.

Return type *list[list[dict]]*

get_metadata_dictionary()

Get the combined dictionary of metadata.

Returns Metadata dictionary.

Return type *dict*

interpret_community.common.policy module

Defines explanation policies.

```
class interpret_community.common.policy.SamplingPolicy(allow_eval_sampling=False,  
                                                    max_dim_clustering=50,  
                                                    sampling_method='hdbscan', **kwargs)
```

Bases: *interpret_community.common.chained_identity.ChainedIdentity*

Defines the sampling policy for downsampling the evaluation examples.

The policy is a set of parameters that can be tuned to speed up or improve the accuracy of the explain_model function during sampling.

Parameters

- **allow_eval_sampling** (*bool*) – Default to 'False'. Specify whether to allow sampling of evaluation data. If 'True', cluster the evaluation data and determine the optimal number of points for sampling. Set to 'True' to speed up the process when the evaluation data set is large and you only want to generate model summary info.
- **max_dim_clustering** (*int*) – Default to 50 and only take effect when 'allow_eval_sampling' is set to 'True'. Specify the dimensionality to reduce the evaluation data before clustering for sampling. When doing sampling to determine how aggressively to downsample without getting poor explanation results uses a heuristic to find the optimal number of clusters. Since KMeans performs poorly on high dimensional data PCA or Truncated SVD is first run to reduce the dimensionality, which is followed by finding the optimal k by running KMeans until a local minimum is reached as determined by computing the silhouette score, reducing k each time.
- **sampling_method** (*str*) – The sampling method for determining how much to downsample the evaluation data by. If allow_eval_sampling is True, the evaluation data is downsampled to a max_threshold, and then this heuristic is used to determine how much more to downsample the evaluation data without losing accuracy on the calculated feature importance values. By default, this is set to hdbscan, but you can also specify kmeans. With hdbscan the number of clusters is automatically determined and multiplied by a threshold. With kmeans, the optimal number of clusters is found by running KMeans until the maximum silhouette score is calculated, with k halved each time.

Return type *dict*

Returns The arguments for the sampling policy

property allow_eval_sampling

Get whether to allow sampling of evaluation data.

Returns Whether to allow sampling of evaluation data.

Return type `bool`

property max_dim_clustering

Get the dimensionality to reduce the evaluation data before clustering for sampling.

Returns The dimensionality to reduce the evaluation data before clustering for sampling.

Return type `int`

property sampling_method

Get the sampling method for determining how much to downsample the evaluation data by.

Returns The sampling method for determining how much to downsample the evaluation data by.

Return type `str`

interpret_community.common.progress module

Defines utilities for getting progress status for explanation.

`interpret_community.common.progress.get_tqdm(logger, show_progress)`

Get the tqdm progress bar function.

Parameters

- **logger** (*logger*) – The logger for logging info messages.
- **show_progress** (*bool*) – Default to ‘True’. Determines whether to display the explanation status bar when using PFIExplainer.

Returns The tqdm (<https://github.com/tqdm/tqdm>) progress bar.

Return type `function`

interpret_community.common.serialization_utils module

Defines utility functions for serialization of data.

interpret_community.common.structured_model_explainer module

Defines the structured model based APIs for explainers used on specific types of models.

class `interpret_community.common.structured_model_explainer.PureStructuredModelExplainer`(*model*,
***kwargs*)

Bases: `interpret_community.common.base_explainer.BaseExplainer`

The base PureStructuredModelExplainer API for explainers used on specific models.

Parameters **model** (*object*) – The white box model to explain.

```
class interpret_community.common.structured_model_explainer.StructuredInitModelExplainer(model,
                                                                                          ini-
                                                                                          tial-
                                                                                          iza-
                                                                                          tion_examples,
                                                                                          **kwargs)
```

Bases: `interpret_community.common.base_explainer.BaseExplainer`

The base StructuredInitModelExplainer API for explainers.

Used on specific models that require initialization examples.

Parameters

- **model** (*object*) – The white box model to explain.
- **initialization_examples** (*numpy.array or pandas.DataFrame or scipy.sparse.csr_matrix*) – A matrix of feature vector examples (# examples x # features) for initializing the explainer.

interpret_community.common.warnings_suppressor module

Suppresses warnings on imports.

```
class interpret_community.common.warnings_suppressor.shap_warnings_suppressor
```

Bases: `object`

Context manager to suppress warnings from shap.

```
class interpret_community.common.warnings_suppressor.tf_warnings_suppressor
```

Bases: `object`

Context manager to suppress warnings from tensorflow.

interpret_community.dataset package

Defines a common dataset wrapper and common functions for data manipulation.

Subpackages

`interpret_community.dataset.dataset_wrapper` package

Submodules

`interpret_community.dataset.decorator` module

`interpret_community.explanation` package

Submodules

`interpret_community.explanation.explanation` module

`interpret_community.explanation.serialization` module

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1.1.2 Submodules

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