sklearn.impute.SimpleImputer

class sklearn.impute.**SimpleImputer**(*, *missing_values=nan*, *strategy='mean'*, *fill_value=None*, *copy=True*, *add_indicator=False*, *keep_empty_features=False*) [source]

Univariate imputer for completing missing values with simple strategies.

Replace missing values using a descriptive statistic (e.g. mean, median, or most frequent) along each column, or using a constant value.

Read more in the User Guide.

New in version 0.20: `SimpleImputer` replaces the previous `sklearn.preprocessing.Imputer` estimator which is now removed.

Parameters:

missing_values : *int, float, str, np.nan, None or pandas.NA, default=np.nan*
The placeholder for the missing values. All occurrences of `missing_values` will be imputed. For pandas' dataframes with nullable integer dtypes with missing values, `missing_values` can be set to either `np.nan` or `pd.NA`.

strategy : *str, default='mean'*
The imputation strategy.

- If "mean", then replace missing values using the mean along each column. Can only be used with numeric data.
- If "median", then replace missing values using the median along each column. Can only be used with numeric data.
- If "most_frequent", then replace missing using the most frequent value along each column. Can be used with strings or numeric data. If there is more than one such value, only the smallest is returned.
- If "constant", then replace missing values with fill_value. Can be used with strings or numeric data.

New in version 0.20: strategy="constant" for fixed value imputation.

fill_value : *str or numerical value, default=None*
When strategy == "constant", `fill_value` is used to replace all occurrences of missing_values. For string or object data types, `fill_value` must be a string. If `None`, `fill_value` will be 0 when imputing numerical data and "missing_value" for strings or object data types.

copy : *bool, default=True*
If True, a copy of X will be created. If False, imputation will be done in-place whenever possible. Note that, in the following cases, a new copy will always be made, even if `copy=False`:

- If `X` is not an array of floating values;
- If `X` is encoded as a CSR matrix;
- If `add_indicator=True`.

add_indicator : *bool, default=False*
If True, a `MissingIndicator` transform will stack onto output of the imputer's transform. This allows a predictive estimator to account for missingness despite imputation. If a feature has no missing values at fit/train time, the feature won't appear on the missing indicator even if there are missing values at transform/test time.

keep_empty_features : *bool, default=False*
If True, features that consist exclusively of missing values when `fit` is called are returned in results when `transform` is called. The imputed value is always `0` except when `strategy="constant"` in which case `fill_value` will be used instead.

New in version 1.2.

Attributes:

statistics_ : *array of shape (n_features,)*
The imputation fill value for each feature. Computing statistics can result in `np.nan` values. During `transform`, features corresponding to `np.nan` statistics will be discarded.

indicator_ : *MissingIndicator*
Indicator used to add binary indicators for missing values. `None` if `add_indicator=False`.

n_features_in_ : *int*
Number of features seen during fit.

New in version 0.24.

feature_names_in_ : *ndarray of shape (`n_features_in_`,)*
Names of features seen during fit. Defined only when `X` has feature names that are all strings.

New in version 1.0.

See also:

`IterativeImputer`
Multivariate imputer that estimates values to impute for each feature with missing values from all the others.

`KNNImputer`
Multivariate imputer that estimates missing features using nearest samples.

Notes

Columns which only contained missing values at `fit` are discarded upon `transform` if strategy is not `"constant"`.

In a prediction context, simple imputation usually performs poorly when associated with a weak learner. However, with a powerful learner, it can lead to as good or better performance than complex imputation such as `IterativeImputer` or `KNNImputer`.

Examples

```
>>> import numpy as np
>>> from sklearn.impute import SimpleImputer
>>> imp_mean = SimpleImputer(missing_values=np.nan, strategy='mean')
>>> imp_mean.fit([[7, 2, 3], [4, np.nan, 6], [10, 5, 9]])
SimpleImputer()
>>> X = [[np.nan, 2, 3], [4, np.nan, 6], [10, np.nan, 9]]
>>> print(imp_mean.transform(X))
[[ 7.   2.   3. ]
 [ 4.   3.5  6. ]
 [10.   3.5  9. ]]
```

For a more detailed example see Imputing missing values before building an estimator.

Methods

`fit`(X[, y])	Fit the imputer on `X`.
`fit_transform`(X[, y])	Fit to data, then transform it.
`get_feature_names_out`([input_features])	Get output feature names for transformation.
`get_metadata_routing`()	Get metadata routing of this object.
`get_params`([deep])	Get parameters for this estimator.
`inverse_transform`(X)	Convert the data back to the original representation.
`set_output`(*[, transform])	Set output container.
`set_params`(**params)	Set the parameters of this estimator.
`transform`(X)	Impute all missing values in `X`.

fit(*X*, *y=None*) [source]

Fit the imputer on `X`.

Parameters:

X : *{array-like, sparse matrix}, shape (n_samples, n_features)*
Input data, where `n_samples` is the number of samples and `n_features` is the number of features.

y : *Ignored*
Not used, present here for API consistency by convention.

Returns:

self : *object*
Fitted estimator.

fit_transform(*X*, *y=None*, ***fit_params*) [source]

Fit to data, then transform it.

Fits transformer to `X` and `y` with optional parameters `fit_params` and returns a transformed version of `X`.

Parameters:

X : *array-like of shape (n_samples, n_features)*
Input samples.

y : *array-like of shape (n_samples,) or (n_samples, n_outputs), default=None*
Target values (None for unsupervised transformations).

****fit_params : *dict***
Additional fit parameters.

Returns:

X_new : *ndarray array of shape (n_samples, n_features_new)*
Transformed array.

`get_feature_names_out`(*input_features=None*) [source]

Get output feature names for transformation.

Parameters:

input_features : *array-like of str or None, default=None*
Input features.

- If `input_features` is `None`, then `feature_names_in_` is used as feature names in. If `feature_names_in_` is not defined, then the following input feature names are generated: `["x0", "x1", ..., "x(n_features_in_ - 1)"]`.
- If `input_features` is an array-like, then `input_features` must match `feature_names_in_` if `feature_names_in_` is defined.

Returns:

feature_names_out : *ndarray of str objects*
Transformed feature names.

`get_metadata_routing`() [source]

Get metadata routing of this object.

Please check User Guide on how the routing mechanism works.

Returns:

routing : *MetadataRequest*
A **`MetadataRequest`** encapsulating routing information.

`get_params`(*deep=True*) [source]

Get parameters for this estimator.

Parameters:

deep : *bool, default=True*
If True, will return the parameters for this estimator and contained subobjects that are estimators.

Returns:

params : *dict*
Parameter names mapped to their values.

`inverse_transform`(*X*) [source]

Convert the data back to the original representation.

Inverts the `transform` operation performed on an array. This operation can only be performed after **`SimpleImputer`** is instantiated with `add_indicator=True`.

Note that `inverse_transform` can only invert the transform in features that have binary indicators for missing values. If a feature has no missing values at `fit` time, the feature won't have a binary indicator, and the imputation done at `transform` time won't be inverted.

New in version 0.24.

Parameters:

X : *array-like of shape (n_samples, n_features + n_features_missing_indicator)*
The imputed data to be reverted to original data. It has to be an augmented array of imputed data and the missing indicator mask.

Returns:

X_original : *ndarray of shape (n_samples, n_features)*
The original `X` with missing values as it was prior to imputation.

`set_output`(**, transform=None*) [source]

Set output container.

See Introducing the set_output API for an example on how to use the API.

Parameters:

transform : *{"default", "pandas"}, default=None*
Configure output of `transform` and `fit_transform`.

- `"default"`: Default output format of a transformer
- `"pandas"`: DataFrame output
- `None`: Transform configuration is unchanged

Returns:

self : *estimator instance*
Estimator instance.

`set_params`(***params*) [source]

Set the parameters of this estimator.

The method works on simple estimators as well as on nested objects (such as **`Pipeline`**). The latter have parameters of the form `<component>__<parameter>` so that it's possible to update each component of a nested object.

Parameters:

****params : *dict***
Estimator parameters.

Returns:

self : *estimator instance*
Estimator instance.

`transform`(*X*) [source]

Impute all missing values in `X`.

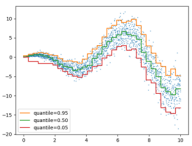
Parameters:

X : *{array-like, sparse matrix}, shape (n_samples, n_features)*
The input data to complete.

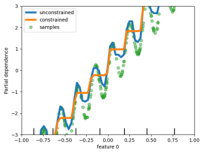
Returns:

X_imputed : *{ndarray, sparse matrix} of shape (n_samples, n_features_out)*
`X` with imputed values.

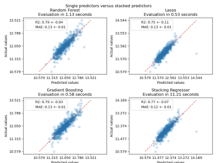
Examples using `sklearn.impute.SimpleImputer`



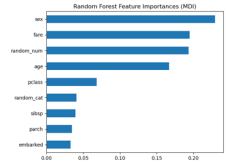
Release Highlights for scikit-learn 1.1



Release Highlights for scikit-learn 0.23



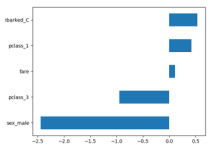
Combine predictors using stacking



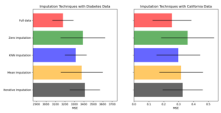
Permutation Importance vs Random Forest Feature Importance (MDI)

Displaying Pipelines

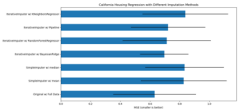
Displaying estimators and complex pipelines



Introducing the set_output API



Imputing missing values before building an estimator



Imputing missing values with variants of IterativeImputer

Column Transformer with Mixed Types