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# **KNIME Python Script (Labs) API**

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This document lists the API of the module `knime_io` that functions as the main contact point between KNIME and Python in the [KNIME Python Script \(Labs\) node](#). Please refer to the [KNIME Python Integration Guide](#) for more details on how to set up and use the node.



## CONTENTS

### 1.1 Inputs and outputs

These properties can be used to retrieve data from or pass data back to KNIME Analytics Platform. The length of the input and output lists depends on the number of input and output ports of the node.

**Example:** If you have a Python Script (Labs) node configured with two input tables and one input object, you can access the two tables via `knime_io.input_tables[0]` and `knime_io.input_tables[1]`, and the input object via `knime_io.input_objects[0]`.

**knime\_io.flow\_variables:** Dict[str, Any] = {}

A dictionary of flow variables provided by the KNIME workflow. New flow variables can be added to the output of the node by adding them to the dictionary. Supported flow variable types are numbers, strings, booleans and lists thereof.

**knime\_io.input\_objects:** List = <knime\_table.\_FixedSizeListView object>

A list of input objects of this script node using zero-based indices. Input objects are Python objects that are passed in from another Python script node's `output_object` port. Use this for instance to pass trained models between Python nodes.

**knime\_io.input\_tables:** List[knime\_table.ReadTable] = <knime\_table.\_FixedSizeListView object>

The input tables of this script node. Tables are available in the same order as the port connectors are displayed alongside the node, using zero-based indexing.

**knime\_io.output\_images:** List = <knime\_table.\_FixedSizeListView object>

The output images of this script node.

**knime\_io.output\_objects:** List = <knime\_table.\_FixedSizeListView object>

The output objects of this script node. Each output object can be an arbitrary Python object as long as it can be *pickled*. Use this to pass e.g. a trained model to another Python script node.

**knime\_io.output\_tables:** List[knime\_table.WriteTable] = <knime\_table.\_FixedSizeListView object>

The output tables of this script node. You should assign a `WriteTable` or `BatchWriteTable` to each output port of this node. See the factory methods `knime_io.write_table()` and `knime_io.batch_write_table()` below.

**Example:**

```
knime_io.output_tables[0] = knime_io.write_table(my_pandas_df)
```

## 1.2 Factory methods

Use these methods to fill the `knime_io.output_tables`.

`knime_io.batch_write_table()` → `knime_table.BatchWriteTable`

Factory method to create an empty `BatchWriteTable` that can be filled batch by batch.

**Example:**

```
table = knime_io.batch_write_table()
table.append(df_1)
table.append(df_2)
knime_io.output_tables[0] = table
```

`knime_io.write_table(data: Union[knime_table.ReadTable, pandas.DataFrame, pyarrow.Table], sentinel: Optional[Union[str, int]] = None)` → `knime_table.WriteTable`

Factory method to create a `WriteTable` given a `pandas.DataFrame` or a `pyarrow.Table`. If the input is a `pyarrow.Table`, its first column must contain unique row identifiers of type 'string'.

**Example:**

```
knime_io.output_tables[0] = knime_io.write_table(my_pandas_df, sentinel="min")
```

### Parameters

- **data** – A `ReadTable`, `pandas.DataFrame` or a `pyarrow.Table`
- **sentinel** – Interpret the following values in integral columns as missing value:
  - "min" min int32 or min int64 depending on the type of the column
  - "max" max int32 or max int64 depending on the type of the column
  - a special integer value that should be interpreted as missing value

## 1.3 Classes

**class** `knime_table.Batch`

A batch is a part of a table containing data. A batch should always fit into system memory, thus all methods accessing the data will be processed immediately and synchronously.

It can be sliced before the data is accessed as `pandas.DataFrame` or `pyarrow.RecordBatch`.

`__getitem__`(*slicing: Union[slice, Tuple[slice, Union[slice, List[int], List[str]]]]*) → `knime_table.SlicedDataView`

Creates a view of this batch by slicing specific rows and columns. The slicing syntax is similar to that of numpy arrays, but columns can also be addressed as index lists or via a list of column names.

### Parameters

- **row\_slice** – A slice object describing which rows to use.
- **column\_slice** – Optional. A slice object, a list of column indices, or a list of column names.

**Returns** A `SlicedDataView` that can be converted to `pandas` or `pyarrow`.



**Examples:**

Get the full batch: `full_batch = batch[:]`

Get the first 100 rows of columns 1,2,3,4: `sliced_batch = batch[:100, 1:5]`

Get all rows of the columns "name" and "age": `sliced_batch = batch[:, ["name", "age"]]`

The returned *sliced\_batches* cannot be sliced further. But they can be converted to pandas or pyarrow.

**abstract property column\_names:** `Tuple[str, ...]`

Returns the list of column names.

**abstract property num\_columns:** `int`

Returns the number of columns in the table.

**abstract property num\_rows:** `int`

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property shape:** `Tuple[int, int]`

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

**abstract to\_pandas**(*sentinel: Optional[Union[str, int]] = None*) → `pandas.DataFrame`

Access the batch or table as a `pandas.DataFrame`.

**Parameters sentinel** – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column
- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises IndexError** – If rows or columns were requested outside of the available shape

**abstract to\_pyarrow**(*sentinel: Optional[Union[str, int]] = None*) → `Union[pyarrow.RecordBatch, pyarrow.Table]`

Access this batch or table as a `pyarrow.RecordBatch` or `pyarrow.table`. The returned type depends on the type of the underlying object. When called on a `ReadTable`, returns a `pyarrow.Table`.

**Parameters sentinel** – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column
- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises IndexError** – If rows or columns were requested outside of the available shape

**class knime\_table.ReadTable**

A KNIME `ReadTable` provides access to the data provided from KNIME, either in full (must fit into memory) or split into row-wise batches.

**\_\_getitem\_\_**(*slicing: Union[slice, Tuple[slice, Union[slice, List[int], List[str]]]]*) → `knime_table.SlicedDataView`

Creates a view of this `ReadTable` by slicing rows and columns. The slicing syntax is similar to that of numpy arrays, but columns can also be addressed as index lists or via a list of column names.

**Parameters**

- **row\_slice** – A slice object describing which rows to use.
- **column\_slice** – Optional. A slice object, a list of column indices, or a list of column names.

**Returns** a SlicedDataView that can be converted to pandas or pyarrow.

**Examples:**

Get the first 100 rows of columns 1,2,3,4: `sliced_table = table[:100, 1:5]`

Get all rows of the columns “name” and “age”: `sliced_table = table[:, ["name", "age"]]`

The returned *sliced\_tables* cannot be sliced further. But they can be converted to pandas or pyarrow.

`__len__()` → int

Returns the number of batches of this table

**abstract batches()** → Iterator[knime\_table.Batch]

Returns an generator for the batches in this table. If the generator is advanced to a batch that is not available yet, it will block until the data is present. `len(my_read_table)` gives the static amount of batches within the table, which is not updated.

**Example:**

```
processed_table = knime_io.batch_write_table()
for batch in knime_io.input_tables[0].batches():
    input_batch = batch.to_pandas()
    # process the batch
    processed_table.append(input_batch)
```

**abstract property column\_names:** Tuple[str, ...]

Returns the list of column names.

**abstract property num\_batches:** int

Returns the number of batches in this table.

If the table is not completely available yet because batches are still appended to it, querying the number of batches blocks until all data is available.

**abstract property num\_columns:** int

Returns the number of columns in the table.

**abstract property num\_rows:** int

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property shape:** Tuple[int, int]

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

**abstract to\_pandas**(*sentinel: Optional[Union[str, int]] = None*) → pandas.DataFrame

Access the batch or table as a pandas.DataFrame.

**Parameters sentinel** – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column
- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises `IndexError`** – If rows or columns were requested outside of the available shape

**abstract to\_pyarrow**(*sentinel: Optional[Union[str, int]] = None*) → Union[pyarrow.RecordBatch, pyarrow.Table]

Access this batch or table as a pyarrow.RecordBatch or pyarrow.table. The returned type depends on the type of the underlying object. When called on a ReadTable, returns a pyarrow.Table.

**Parameters `sentinel`** – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column
- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises `IndexError`** – If rows or columns were requested outside of the available shape

**class knime\_table.WriteTable**

A table that can be filled as a whole.

**abstract property `column_names`:** Tuple[str, ...]

Returns the list of column names.

**abstract property `num_batches`:** int

Returns the number of batches in this table.

If the table is not completely available yet because batches are still appended to it, querying the number of batches blocks until all data is available.

**abstract property `num_columns`:** int

Returns the number of columns in the table.

**abstract property `num_rows`:** int

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property `shape`:** Tuple[int, int]

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

**class knime\_table.BatchWriteTable**

A table that can be filled batch by batch.

**abstract `append`**(*data: Union[knime\_table.Batch, pandas.DataFrame, pyarrow.RecordBatch], sentinel: Optional[Union[str, int]] = None*)

Appends a batch with the given data to the end of this table. The number of columns, as well as their data types, must match that of the previous batches in this table. Note that this cannot take a pyarrow.Table as input. With pyarrow, it can only process batches, which can be created as follows from some input table.

**Example:**

```
processed_table = knime_io.batch_write_table()
for batch in knime_io.input_tables[0].batches():
    input_batch = batch.to_pandas()
    # process the batch
    processed_table.append(input_batch)
```

### Parameters

- **data** – A batch, a pandas.DataFrame or a pyarrow.RecordBatch
- **sentinel** – Only if data is a pandas.DataFrame or pyarrow.RecordBatch. Interpret the following values in integral columns as missing value:
  - "min" min int32 or min int64 depending on the type of the column
  - "max" max int32 or max int64 depending on the type of the column
  - a special integer value that should be interpreted as missing value

**Raises ValueError** – If the new batch does not have the same columns as previous batches in this Writetable.

**abstract property column\_names:** Tuple[str, ...]

Returns the list of column names.

**static create()** → knime\_table.BatchWriteTable

Create an empty BatchWriteTable

**abstract property num\_batches:** int

Returns the number of batches in this table.

If the table is not completely available yet because batches are still appended to it, querying the number of batches blocks until all data is available.

**abstract property num\_columns:** int

Returns the number of columns in the table.

**abstract property num\_rows:** int

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property shape:** Tuple[int, int]

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

### 1.3.1 Contents

#### Inputs and outputs

These properties can be used to retrieve data from or pass data back to KNIME Analytics Platform. The length of the input and output lists depends on the number of input and output ports of the node.

**Example:** If you have a Python Script (Labs) node configured with two input tables and one input object, you can access the two tables via `knime_io.input_tables[0]` and `knime_io.input_tables[1]`, and the input object via `knime_io.input_objects[0]`.

**knime\_io.flow\_variables:** Dict[str, Any] = {}

A dictionary of flow variables provided by the KNIME workflow. New flow variables can be added to the output of the node by adding them to the dictionary. Supported flow variable types are numbers, strings, booleans and lists thereof.

**knime\_io.input\_objects:** List = <knime\_table.\_FixedSizeListView object>

A list of input objects of this script node using zero-based indices. Input objects are Python objects that are passed in from another Python script node's `output_object` port. Use this for instance to pass trained models between Python nodes.

**knime\_io.input\_tables:** List[knime\_table.ReadTable] = <knime\_table.\_FixedSizeListView object>

The input tables of this script node. Tables are available in the same order as the port connectors are displayed alongside the node, using zero-based indexing.

**knime\_io.output\_images:** List = <knime\_table.\_FixedSizeListView object>

The output images of this script node.

**knime\_io.output\_objects:** List = <knime\_table.\_FixedSizeListView object>

The output objects of this script node. Each output object can be an arbitrary Python object as long as it can be *pickled*. Use this to pass e.g. a trained model to another Python script node.

**knime\_io.output\_tables:** List[knime\_table.WriteTable] = <knime\_table.\_FixedSizeListView object>

The output tables of this script node. You should assign a `WriteTable` or `BatchWriteTable` to each output port of this node. See the factory methods `knime_io.write_table()` and `knime_io.batch_write_table()` below.

**Example:**

```
knime_io.output_tables[0] = knime_io.write_table(my_pandas_df)
```

#### Factory methods

Use these methods to fill the `knime_io.output_tables`.

**knime\_io.batch\_write\_table()** → `knime_table.BatchWriteTable`

Factory method to create an empty `BatchWriteTable` that can be filled batch by batch.

**Example:**

```
table = knime_io.batch_write_table()
table.append(df_1)
table.append(df_2)
knime_io.output_tables[0] = table
```

```
knime_io.write_table(data: Union[knime_table.ReadTable, pandas.DataFrame, pyarrow.Table], sentinel:  
    Optional[Union[str, int]] = None) → knime_table.WriteTable
```

Factory method to create a WriteTable given a pandas.DataFrame or a pyarrow.Table. If the input is a pyarrow.Table, its first column must contain unique row identifiers of type 'string'.

**Example:**

```
knime_io.output_tables[0] = knime_io.write_table(my_pandas_df, sentinel="min")
```

#### Parameters

- **data** – A ReadTable, pandas.DataFrame or a pyarrow.Table
- **sentinel** – Interpret the following values in integral columns as missing value:
  - "min" min int32 or min int64 depending on the type of the column
  - "max" max int32 or max int64 depending on the type of the column
  - a special integer value that should be interpreted as missing value

## Classes

### class knime\_table.Batch

A batch is a part of a table containing data. A batch should always fit into system memory, thus all methods accessing the data will be processed immediately and synchronously.

It can be sliced before the data is accessed as pandas.DataFrame or pyarrow.RecordBatch.

```
__getitem__(slicing: Union[slice, Tuple[slice, Union[slice, List[int], List[str]]]]) →  
    knime_table.SlicedDataView
```

Creates a view of this batch by slicing specific rows and columns. The slicing syntax is similar to that of numpy arrays, but columns can also be addressed as index lists or via a list of column names.

#### Parameters

- **row\_slice** – A slice object describing which rows to use.
- **column\_slice** – Optional. A slice object, a list of column indices, or a list of column names.

**Returns** A SlicedDataView that can be converted to pandas or pyarrow.

#### Examples:

Get the full batch: `full_batch = batch[:]`

Get the first 100 rows of columns 1,2,3,4: `sliced_batch = batch[:100, 1:5]`

Get all rows of the columns "name" and "age": `sliced_batch = batch[:, ["name", "age"]]`

The returned *sliced\_batches* cannot be sliced further. But they can be converted to pandas or pyarrow.

```
abstract property column_names: Tuple[str, ...]
```

Returns the list of column names.

```
abstract property num_columns: int
```

Returns the number of columns in the table.

**abstract property num\_rows:** int

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property shape:** Tuple[int, int]

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

**abstract to\_pandas**(*sentinel: Optional[Union[str, int]] = None*) → pandas.DataFrame

Access the batch or table as a pandas.DataFrame.

**Parameters sentinel** – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column
- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises IndexError** – If rows or columns were requested outside of the available shape

**abstract to\_pyarrow**(*sentinel: Optional[Union[str, int]] = None*) → Union[pyarrow.RecordBatch, pyarrow.Table]

Access this batch or table as a pyarrow.RecordBatch or pyarrow.table. The returned type depends on the type of the underlying object. When called on a ReadTable, returns a pyarrow.Table.

**Parameters sentinel** – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column
- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises IndexError** – If rows or columns were requested outside of the available shape

**class knime\_table.ReadTable**

A KNIME ReadTable provides access to the data provided from KNIME, either in full (must fit into memory) or split into row-wise batches.

**\_\_getitem\_\_**(*slicing: Union[slice, Tuple[slice, Union[slice, List[int], List[str]]]]*) → knime\_table.SlicedDataView

Creates a view of this ReadTable by slicing rows and columns. The slicing syntax is similar to that of numpy arrays, but columns can also be addressed as index lists or via a list of column names.

**Parameters**

- **row\_slice** – A slice object describing which rows to use.
- **column\_slice** – Optional. A slice object, a list of column indices, or a list of column names.

**Returns** a SlicedDataView that can be converted to pandas or pyarrow.

**Examples:**

Get the first 100 rows of columns 1,2,3,4: `sliced_table = table[:100, 1:5]`

Get all rows of the columns "name" and "age": `sliced_table = table[:, ["name", "age"]]`

The returned *sliced\_tables* cannot be sliced further. But they can be converted to pandas or pyarrow.

`__len__()` → int

Returns the number of batches of this table

**abstract** `batches()` → Iterator[knime\_table.Batch]

Returns an generator for the batches in this table. If the generator is advanced to a batch that is not available yet, it will block until the data is present. `len(my_read_table)` gives the static amount of batches within the table, which is not updated.

**Example:**

```
processed_table = knime_io.batch_write_table()
for batch in knime_io.input_tables[0].batches():
    input_batch = batch.to_pandas()
    # process the batch
    processed_table.append(input_batch)
```

**abstract property** `column_names:` Tuple[str, ...]

Returns the list of column names.

**abstract property** `num_batches:` int

Returns the number of batches in this table.

If the table is not completely available yet because batches are still appended to it, querying the number of batches blocks until all data is available.

**abstract property** `num_columns:` int

Returns the number of columns in the table.

**abstract property** `num_rows:` int

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property** `shape:` Tuple[int, int]

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

**abstract** `to_pandas(sentinel: Optional[Union[str, int]] = None)` → pandas.DataFrame

Access the batch or table as a pandas.DataFrame.

**Parameters** `sentinel` – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column
- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises** `IndexError` – If rows or columns were requested outside of the available shape

**abstract** `to_pyarrow(sentinel: Optional[Union[str, int]] = None)` → Union[pyarrow.RecordBatch, pyarrow.Table]

Access this batch or table as a pyarrow.RecordBatch or pyarrow.table. The returned type depends on the type of the underlying object. When called on a ReadTable, returns a pyarrow.Table.

**Parameters** `sentinel` – Replace missing values in integral columns by the given value, one of:

- "min" min int32 or min int64 depending on the type of the column



- "max" max int32 or max int64 depending on the type of the column
- An integer value that should be inserted for each missing value

**Raises `IndexError`** – If rows or columns were requested outside of the available shape

#### **class `knime_table.WriteTable`**

A table that can be filled as a whole.

**abstract property `column_names`:** `Tuple[str, ...]`

Returns the list of column names.

**abstract property `num_batches`:** `int`

Returns the number of batches in this table.

If the table is not completely available yet because batches are still appended to it, querying the number of batches blocks until all data is available.

**abstract property `num_columns`:** `int`

Returns the number of columns in the table.

**abstract property `num_rows`:** `int`

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property `shape`:** `Tuple[int, int]`

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

#### **class `knime_table.BatchWriteTable`**

A table that can be filled batch by batch.

**abstract `append`**(*data*: `Union[knime_table.Batch, pandas.DataFrame, pyarrow.RecordBatch]`, *sentinel*: `Optional[Union[str, int]] = None`)

Appends a batch with the given data to the end of this table. The number of columns, as well as their data types, must match that of the previous batches in this table. Note that this cannot take a `pyarrow.Table` as input. With `pyarrow`, it can only process batches, which can be created as follows from some input table.

**Example:**

```
processed_table = knime_io.batch_write_table()
for batch in knime_io.input_tables[0].batches():
    input_batch = batch.to_pandas()
    # process the batch
    processed_table.append(input_batch)
```

#### **Parameters**

- **data** – A batch, a `pandas.DataFrame` or a `pyarrow.RecordBatch`
- **sentinel** – Only if data is a `pandas.DataFrame` or `pyarrow.RecordBatch`. Interpret the following values in integral columns as missing value:
  - "min" min int32 or min int64 depending on the type of the column
  - "max" max int32 or max int64 depending on the type of the column

– a special integer value that should be interpreted as missing value

**Raises ValueError** – If the new batch does not have the same columns as previous batches in this Writetable.

**abstract property column\_names:** Tuple[str, ...]

Returns the list of column names.

**static create()** → knime\_table.BatchWriteTable

Create an empty BatchWriteTable

**abstract property num\_batches:** int

Returns the number of batches in this table.

If the table is not completely available yet because batches are still appended to it, querying the number of batches blocks until all data is available.

**abstract property num\_columns:** int

Returns the number of columns in the table.

**abstract property num\_rows:** int

Returns the number of rows in the table.

If the table is not completely available yet because batches are still appended to it, querying the number of rows blocks until all data is available.

**property shape:** Tuple[int, int]

Returns a tuple in the form (numRows, numColumns) representing the shape of this table.

If the table is not completely available yet because batches are still appended to it, querying the shape blocks until all data is available.

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