
petlx Documentation

Release 0.3

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CONTENTS

`petlx` is a collection of extensions to `petl`, a tentative Python module for extracting, transforming and loading tables of data.

- Documentation: <http://packages.python.org/petlx>
- Source Code: <https://github.com/alimanfoo/petlx>
- Download: <http://pypi.python.org/pypi/petlx>
- Mailing List: <http://groups.google.com/group/python-etl>

For an overview of all functions in the package, see the *genindex*.

INSTALLATION

This module is available from the [Python Package Index](#). On Linux distributions you should be able to do `easy_install petlx` or `pip install petlx`. On Windows or Mac you can download manually, extract and run `python setup.py install`.

MODULES

2.1 Excel files (openpyxl)

`petlx.xlsx.fromxlsx(filename, sheetname, checksumfun=None)`

Extract a table from a sheet in an Excel (.xlsx) file.

N.B., the sheet name is case sensitive, so watch out for, e.g., ‘Sheet1’.

The package `openpyxl` is required. Instructions for installation can be found at <https://bitbucket.org/ericgazoni/openpyxl/wiki/Home> or try `pip install openpyxl`.

2.2 Arrays (numpy)

`petlx.array.toarray(table, dtype=None, count=-1, sample=1000)`

Convenience function to load data from the given `table` into a numpy structured array. E.g.:

```
>>> from petl import look
>>> from petlx.array import toarray
>>> look(table)
+-----+-----+-----+
| 'foo' | 'bar' | 'baz' |
+=====+=====+=====+
| 'apples' | 1 | 2.5 |
+-----+-----+-----+
| 'oranges' | 3 | 4.4 |
+-----+-----+-----+
| 'pears' | 7 | 0.1 |
+-----+-----+-----+
>>> a = toarray(table)
>>> a
array([('apples', 1, 2.5), ('oranges', 3, 4.4), ('pears', 7, 0.1)],
      dtype=[('foo', '|S7'), ('bar', '<i8'), ('baz', '<f8')])
>>> a['foo']
array(['apples', 'oranges', 'pears'],
      dtype='|S7')
>>> a['bar']
array([1, 3, 7])
>>> a['baz']
array([ 2.5,  4.4,  0.1])
>>> a['foo'][0]
'apples'
```

```
>>> a['bar'][1]
3
>>> a['baz'][2]
0.10000000000000001
```

If no datatype is specified, *sample* rows will be examined to infer an appropriate datatype for each field.

The datatype can be specified as a string, e.g.:

```
>>> a = toarray(table, dtype='a4, i2, f4')
>>> a
array([('appl', 1, 2.5), ('oran', 3, 4.4), ('pear', 7, 0.1)],
      dtype=[('foo', '|S4'), ('bar', '<i2'), ('baz', '<f4')])
```

The datatype can also be partially specified, in which case datatypes will be inferred for other fields, e.g.:

```
>>> a = toarray(table, dtype={'foo': 'a4'})
>>> a
array([('appl', 1, 2.5), ('oran', 3, 4.4), ('pear', 7, 0.1)],
      dtype=[('foo', '|S4'), ('bar', '<i8'), ('baz', '<f8')])
```

2.3 Intervals (bx-python)

The package bx.intervals is required. Instructions for installation can be found at https://bitbucket.org/james_taylor/bx-python/wiki/Home or try pip install bx-python.

`petlx.interval.intervallookup(table, start='start', stop='stop', valuespec=None, proximity=0)`

Construct an interval lookup for the given table. E.g.:

```
>>> from petlx.interval import intervallookup
>>> table = [['start', 'stop', 'value'],
...           [1, 4, 'foo'],
...           [3, 7, 'bar'],
...           [4, 9, 'baz']]
>>> lkp = intervallookup(table, 'start', 'stop')
>>> lkp[1:2]
[(1, 4, 'foo')]
>>> lkp[2:4]
[(1, 4, 'foo'), (3, 7, 'bar')]
>>> lkp[2:5]
[(1, 4, 'foo'), (3, 7, 'bar'), (4, 9, 'baz')]
>>> lkp[9:14]
[]
>>> lkp[19:140]
[]
>>> lkp[1]
[]
>>> lkp[2]
[(1, 4, 'foo')]
>>> lkp[4]
[(3, 7, 'bar')]
>>> lkp[5]
[(3, 7, 'bar'), (4, 9, 'baz')]
```

Note that there must be a non-zero overlap between the query and the interval for the interval to be retrieved, hence `lkp[1]` returns nothing. Use the `proximity` keyword argument to find intervals within a given distance of

the query.

Some examples using the *proximity* and *valuespec* keyword arguments:

```
>>> table = [['start', 'stop', 'value'],
...             [1, 4, 'foo'],
...             [3, 7, 'bar'],
...             [4, 9, 'baz']]
>>> lkp = intervallookup(table, 'start', 'stop', valuespec='value', proximity=1)
>>> lkp[1:2]
['foo']
>>> lkp[2:4]
['foo', 'bar', 'baz']
>>> lkp[2:5]
['foo', 'bar', 'baz']
>>> lkp[9:14]
['baz']
>>> lkp[19:140]
[]
>>> lkp[1]
['foo']
>>> lkp[2]
['foo']
>>> lkp[4]
['foo', 'bar', 'baz']
>>> lkp[5]
['bar', 'baz']
>>> lkp[9]
['baz']
```

New in version 0.2.

`petlx.interval.intervallookupone`(*table*, *start*=*'start'*, *stop*=*'stop'*, *valuespec*=*None*, *proximity*=0, *strict*=True)

Construct an interval lookup for the given table, returning at most one result for each query. If *strict*=True is given, queries returning more than one result will raise a *DuplicateKeyError*. If *strict*=False is given, and there is more than one result, the first result is returned.

See also `intervallookup()`. New in version 0.2.

`petlx.interval.intervalrecordlookup`(*table*, *start*=*'start'*, *stop*=*'stop'*, *proximity*=0)

As `intervallookup()` but return records (dictionaries of values indexed by field name). New in version 0.2.

`petlx.interval.intervalrecordlookupone`(*table*, *start*=*'start'*, *stop*=*'stop'*, *proximity*=0, *strict*=True)

As `intervallookupone()` but return records (dictionaries of values indexed by field name). New in version 0.2.

`petlx.interval.facetintervallookup`(*table*, *key*, *start*=*'start'*, *stop*=*'stop'*, *valuespec*=*None*, *proximity*=0)

Construct a faceted interval lookup for the given table. E.g.:

```
>>> from petl import look
>>> from petlx.interval import facetintervallookup
>>> look(table)
+-----+-----+-----+
| 'type' | 'start' | 'stop' | 'value' |
+=====+=====+=====+
| 'apple' | 1       | 4       | 'foo'    |
+-----+-----+-----+
```

```
| 'apple' | 3      | 7      | 'bar'   |
+-----+-----+-----+-----+
| 'orange' | 4      | 9      | 'baz'   |
+-----+-----+-----+
>>> lkp = facetintervallookup(table, key='type', start='start', stop='stop')
>>> lkp['apple'][1:2]
[('apple', 1, 4, 'foo')]
>>> lkp['apple'][2:4]
[('apple', 1, 4, 'foo'), ('apple', 3, 7, 'bar')]
>>> lkp['apple'][2:5]
[('apple', 1, 4, 'foo'), ('apple', 3, 7, 'bar')]
>>> lkp['orange'][2:5]
[('orange', 4, 9, 'baz')]
>>> lkp['orange'][9:14]
[]
>>> lkp['orange'][19:140]
[]
>>> lkp['apple'][1]
[]
>>> lkp['apple'][2]
[('apple', 1, 4, 'foo')]
>>> lkp['apple'][4]
[('apple', 3, 7, 'bar')]
>>> lkp['apple'][5]
[('apple', 3, 7, 'bar')]
>>> lkp['orange'][5]
[('orange', 4, 9, 'baz')]
```

New in version 0.2.

```
petlx.interval.facetintervallookupone(table, key, start='start', stop='stop', value-
                                         spec=None, proximity=0, strict=True)
```

Construct a faceted interval lookup for the given table, returning at most one result for each query, e.g.:

```
>>> from petl import look
>>> from petlx.interval import facetintervallookupone
>>> look(table)
+-----+-----+-----+-----+
| 'type' | 'start' | 'stop' | 'value' |
+=====+=====+=====+=====
| 'apple' | 1      | 4      | 'foo'   |
+-----+-----+-----+-----+
| 'apple' | 3      | 7      | 'bar'   |
+-----+-----+-----+-----+
| 'orange' | 4      | 9      | 'baz'   |
+-----+-----+-----+
>>> lkp = facetintervallookupone(table, key='type', start='start', stop='stop', valuespec='value'
>>> lkp['apple'][1:2]
'foo'
>>> lkp['apple'][2:4]
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
    File "petlx/interval.py", line 191, in __getitem__
      raise DuplicateKeyError
petl.util.DuplicateKeyError
>>> lkp['apple'][2:5]
Traceback (most recent call last):
```

```

File "<stdin>", line 1, in <module>
  File "petlx/interval.py", line 191, in __getitem__
    raise DuplicateKeyError
petl.util.DuplicateKeyError
>>> lkp['apple'][4:5]
'bar'
>>> lkp['orange'][4:5]
'baz'
>>> lkp['apple'][5:7]
'bar'
>>> lkp['orange'][5:7]
'baz'
>>> lkp['apple'][8:9]
'baz'
>>> lkp['orange'][8:9]
'baz'
>>> lkp['orange'][9:14]
>>> lkp['orange'][19:140]
>>> lkp['apple'][1]
>>> lkp['apple'][2]
'foo'
>>> lkp['apple'][4]
'bar'
>>> lkp['apple'][5]
'bar'
>>> lkp['orange'][5]
'baz'
>>> lkp['apple'][8]
>>> lkp['orange'][8]
'baz'

```

If `strict=True` is given, queries returning more than one result will raise a `DuplicateKeyError`. If `strict=False` is given, and there is more than one result, the first result is returned.

See also [facetintervallookup\(\)](#). New in version 0.2.

`petlx.interval.facetintervalrecordlookup(table, key, start='start', stop='stop', proximity=0)`

As [facetintervallookup\(\)](#) but return records (dictionaries of values indexed by field name). New in version 0.2.

`petlx.interval.facetintervalrecordlookupone(table, key, start, stop, proximity=0, strict=True)`

As [facetintervallookupone\(\)](#) but return records (dictionaries of values indexed by field name). New in version 0.2.

`petlx.interval.intervaljoin(left, right, lstart='start', lstop='stop', rstart='start', rstop='stop', lfacet=None, rfacet=None, proximity=0)`

Join two tables by overlapping intervals. E.g.:

```

>>> from petl import look
>>> from petlx.interval import intervaljoin
>>> look(left)
+-----+-----+-----+
| 'begin' | 'end' | 'quux' |
+=====+=====+=====+
| 1       | 2      | 'a'     |
+-----+-----+-----+
| 2       | 4      | 'b'     |
+-----+-----+-----+
| 2       | 5      | 'c'     |

```

```
+-----+-----+-----+
| 9     | 14     | 'd'    |
+-----+-----+-----+
| 9     | 140    | 'e'    |
+-----+-----+-----+
| 1     | 1      | 'f'    |
+-----+-----+-----+
| 2     | 2      | 'g'    |
+-----+-----+-----+
| 4     | 4      | 'h'    |
+-----+-----+-----+
| 5     | 5      | 'i'    |
+-----+-----+-----+
| 1     | 8      | 'j'    |
+-----+-----+-----+
>>> look(right)
+-----+-----+-----+
| 'start' | 'stop' | 'value' |
+=====+=====+=====+
| 1     | 4      | 'foo'   |
+-----+-----+-----+
| 3     | 7      | 'bar'   |
+-----+-----+-----+
| 4     | 9      | 'baz'   |
+-----+-----+-----+
>>> result = intervaljoin(left, right, lstart='begin', lstop='end', rstart='start', rstop='stop')
>>> look(result)
+-----+-----+-----+-----+-----+-----+
| 'begin' | 'end' | 'quux' | 'start' | 'stop' | 'value' |
+=====+=====+=====+=====+=====+=====+
| 1     | 2     | 'a'    | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+
| 2     | 4     | 'b'    | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+
| 2     | 4     | 'b'    | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+
| 2     | 5     | 'c'    | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+
| 2     | 5     | 'c'    | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+
| 2     | 5     | 'c'    | 4       | 9       | 'baz'   |
+-----+-----+-----+-----+-----+-----+
| 2     | 2     | 'g'    | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+
| 4     | 4     | 'h'    | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+
| 5     | 5     | 'i'    | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+
| 5     | 5     | 'i'    | 4       | 9       | 'baz'   |
+-----+-----+-----+-----+-----+-----+
```

An additional key comparison can be added, e.g.:

```
>>> from petl import look
>>> from petlx.interval import intervaljoin
>>> look(left)
+-----+-----+-----+
```

```

| 'fruit' | 'begin' | 'end' |
+=====+=====+=====
| 'apple' | 1       | 2       |
+-----+-----+-----+
| 'apple' | 2       | 4       |
+-----+-----+-----+
| 'apple' | 2       | 5       |
+-----+-----+-----+
| 'orange' | 2       | 5       |
+-----+-----+-----+
| 'orange' | 9       | 14      |
+-----+-----+-----+
| 'orange' | 19      | 140     |
+-----+-----+-----+
| 'apple' | 1       | 1       |
+-----+-----+-----+
| 'apple' | 2       | 2       |
+-----+-----+-----+
| 'apple' | 4       | 4       |
+-----+-----+-----+
| 'apple' | 5       | 5       |
+-----+-----+-----+
>>> look(right)
+-----+-----+-----+-----+
| 'type' | 'start' | 'stop' | 'value' |
+=====+=====+=====+=====
| 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+
| 'apple' | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+
| 'orange' | 4       | 9       | 'baz'   |
+-----+-----+-----+
>>> result = intervaljoin(left, right, lstart='begin', lstop='end', rstart='start', rstop='stop')
>>> look(result)
+-----+-----+-----+-----+-----+-----+-----+-----+
| 'fruit' | 'begin' | 'end' | 'type' | 'start' | 'stop' | 'value' |
+=====+=====+=====+=====+=====+=====+=====+=====
| 'apple' | 1       | 2       | 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 4       | 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 4       | 'apple' | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 5       | 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 5       | 'apple' | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'orange' | 2       | 5       | 'orange' | 4       | 9       | 'baz'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 2       | 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'apple' | 4       | 4       | 'apple' | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'apple' | 5       | 5       | 'apple' | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+-----+
| 'orange' | 5       | 5       | 'orange' | 4       | 9       | 'baz'   |
+-----+-----+-----+-----+-----+-----+

```

```
+-----+-----+-----+-----+-----+-----+
```

New in version 0.2.

```
petlx.interval.intervalleftjoin(left, right, lstart='start', lstop='stop', rstart='start',
                                rstop='stop', lfacet=None, rfacet=None, proximity=0,
                                missing=None)
```

Like `intervaljoin()` but rows from the left table without a match in the right table are also included. E.g.:

```
>>> from petl import look
>>> from petlx.interval import intervalleftjoin
>>> look(left)
+-----+-----+-----+
| 'fruit' | 'begin' | 'end' |
+=====+=====+=====
| 'apple' | 1       | 2       |
+-----+-----+-----+
| 'apple' | 2       | 4       |
+-----+-----+-----+
| 'apple' | 2       | 5       |
+-----+-----+-----+
| 'orange' | 2       | 5       |
+-----+-----+-----+
| 'orange' | 9       | 14      |
+-----+-----+-----+
| 'orange' | 19      | 140     |
+-----+-----+-----+
| 'apple' | 1       | 1       |
+-----+-----+-----+
| 'apple' | 2       | 2       |
+-----+-----+-----+
| 'apple' | 4       | 4       |
+-----+-----+-----+
| 'apple' | 5       | 5       |
+-----+-----+-----+

>>> look(right)
+-----+-----+-----+-----+
| 'type' | 'start' | 'stop' | 'value' |
+=====+=====+=====+=====
| 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+
| 'apple' | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+
| 'orange' | 4       | 9       | 'baz'   |
+-----+-----+-----+-----+


>>> result = intervalleftjoin(left, right, lstart='begin', lstop='end', rstart='start', rstop='stop')
>>> look(result)
+-----+-----+-----+-----+-----+-----+
| 'fruit' | 'begin' | 'end' | 'type' | 'start' | 'stop' | 'value' |
+=====+=====+=====+=====+=====+=====+=====
| 'apple' | 1       | 2       | 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 4       | 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 4       | 'apple' | 3       | 7       | 'bar'   |
+-----+-----+-----+-----+-----+-----+
| 'apple' | 2       | 5       | 'apple' | 1       | 4       | 'foo'   |
+-----+-----+-----+-----+-----+-----+
```

'apple' 2	5	'apple'	3	7	'bar'
'apple' 2	5	'orange'	4	9	'baz'
'orange' 2	5	'apple'	1	4	'foo'
'orange' 2	5	'apple'	3	7	'bar'
'orange' 2	5	'orange'	4	9	'baz'
'orange' 9	14	None	None	None	None

New in version 0.2.

2.4 GFF3 Utilities

`petlx.gff3.fromgff3(filename)`

Extract feature rows from a GFF3 file. New in version 0.2.

`petlx.gff3.gff3lookup(features, facet='seqid')`

Build a GFF3 feature lookup based on interval trees. See also `petlx.interval.facetintervallookup()`. New in version 0.2.

`petlx.gff3.gff3join(table, features, seqid='seqid', start='start', end='end', proximity=1)`

Join with a table of GFF3 features. See also `petlx.interval.intervaljoin()`. New in version 0.2.

`petlx.gff3.gff3leftjoin(table, features, seqid='seqid', start='start', end='end', proximity=1)`

Left join with a table of GFF3 features. See also `petlx.interval.intervalleftjoin()`. New in version 0.2.

2.5 HDF5 Files (pytables)

The package pytables is required. Instructions for installation can be found at <http://pytables.github.com/usersguide/installation.html> or try apt-get install python-tables.

`petlx.hdf5.fromhdf5(source, where=None, name=None, condition=None, condvars=None, start=None, stop=None, step=None)`

Provides access to an HDF5 table. E.g.:

```
>>> from petl import look
>>> from petlx.hdf5 import fromhdf5
>>> table1 = fromhdf5('test1.h5', '/testgroup', 'testtable')
>>> look(table1)
+-----+
| 'foo' | 'bar'   |
+=====+=====
| 1     | 'asdfgh' |
+-----+
| 2     | 'qwerty'  |
+-----+
| 3     | 'zxcvbn' |
+-----+
```

Some alternative signatures:

```
>>> # just specify path to table node
... table1 = fromhdf5('test1.h5', '/testgroup/testtable')
>>>
>>> # use an existing tables.File object
... import tables
>>> h5file = tables.openFile('test1.h5')
>>> table1 = fromhdf5(h5file, '/testgroup/testtable')
>>>
>>> # use an existing tables.Table object
... h5tbl = h5file.getNode('/testgroup/testtable')
>>> table1 = fromhdf5(h5tbl)
>>>
>>> # use a condition to filter data
... table2 = fromhdf5(h5tbl, condition="(foo < 3)")
>>> look(table2)
+-----+-----+
| 'foo' | 'bar'   |
+=====+=====+
| 1     | 'asdfgh' |
+-----+-----+
| 2     | 'qwerty' |
+-----+-----+
```

New in version 0.3.

`petlx.hdf5.fromhdf5sorted`(*source*, *where=None*, *name=None*, *sortby=None*, *checkCSI=False*, *start=None*, *stop=None*, *step=None*)

Provides access to an HDF5 table, sorted by an indexed column, e.g.:

```
>>> # set up a new hdf5 table to demonstrate with
... import tables
>>> h5file = tables.openFile("test1.h5", mode="w", title="Test file")
>>> h5file.createGroup('/', 'testgroup', 'Test Group')
/testgroup (Group) 'Test Group'
    children := []
>>> class FooBar(tables.IsDescription):
...     foo = tables.Int32Col(pos=0)
...     bar = tables.StringCol(6, pos=2)
...
>>> h5table = h5file.createTable('/testgroup', 'testtable', FooBar, 'Test Table')
>>>
>>> # load some data into the table
... table1 = (('foo', 'bar'),
...            (3, 'asdfgh'),
...            (2, 'qwerty'),
...            (1, 'zxcvbn'))
>>>
>>> for row in table1[1:]:
...     for i, f in enumerate(table1[0]):
...         h5table.row[f] = row[i]
...     h5table.row.append()
...
>>> h5table.cols.foo.createCSIndex() # CS index is required
0
>>> h5file.flush()
>>> h5file.close()
>>>
>>> # access the data, sorted by the indexed column
```

```

... from petl import look
>>> from petlx.hdf5 import fromhdf5sorted
>>> table2 = fromhdf5sorted('test1.h5', '/testgroup', 'testtable', sortby='foo')
>>> look(table2)
+-----+-----+
| 'foo' | 'bar'   |
+=====+=====+
| 1     | 'zxcvbn' |
+-----+-----+
| 2     | 'qwerty'  |
+-----+-----+
| 3     | 'asdfgh'  |
+-----+-----+

```

New in version 0.3.

```
petlx.hdf5.tohdf5(table, source, where=None, name=None, create=False, description=None, title='', filters=None, expectedrows=10000, chunkshape=None, byteorder=None, createparents=False, sample=1000)
```

Write to an HDF5 table. If *create* is *False*, assumes the table already exists, and attempts to truncate it before loading. If *create* is *True*, any existing table is dropped, and a new table is created; if *description* is None, the datatype will be guessed. E.g.:

```

>>> from petl import look
>>> look(table1)
+-----+-----+
| 'foo' | 'bar'   |
+=====+=====+
| 1     | 'asdfgh' |
+-----+-----+
| 2     | 'qwerty'  |
+-----+-----+
| 3     | 'zxcvbn' |
+-----+-----+

>>> from petlx.hdf5 import tohdf5, fromhdf5
>>> tohdf5(table1, 'test1.h5', '/testgroup', 'testtable', create=True, createparents=True)
>>> look(fromhdf5('test1.h5', '/testgroup', 'testtable'))
+-----+-----+
| 'foo' | 'bar'   |
+=====+=====+
| 1     | 'asdfgh' |
+-----+-----+
| 2     | 'qwerty'  |
+-----+-----+
| 3     | 'zxcvbn' |
+-----+-----+

```

See also [appendhdf5\(\)](#). New in version 0.3.

```
petlx.hdf5.appendhdf5(table, source, where=None, name=None)
```

Like [tohdf5\(\)](#) but don't truncate the table before loading. New in version 0.3.

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