
petlx Documentation

Release 0.9

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CONTENTS

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

- Documentation: <http://petlx.readthedocs.org/>
- 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`.

Note that each submodule within the `petlx` package has dependencies on one or more third party modules which will need to be installed separately.

MODULES

2.1 Excel files (openpyxl)

`petlx.xlsx.fromxlsx` (*filename, sheetname*)

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 petlx 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]
0.100000000000000001
```

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, 4.400000095367432),
      ( 'pear', 7, 0.10000000149011612)],
      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')])
```

`petlx.array.torecarray(*args, **kwargs)`

Convenient shorthand for `toarray(...).view(np.recarray)`. New in version 0.5.1.

`petlx.array.fromarray(a)`

Extract rows from a numpy structured array. New in version 0.4.

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 petlx 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'*, *valuespec=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
petlx.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
petlx.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]
>>> 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 petlx 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 petlx 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 petlx 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='s

```

```

>>> 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.

`petlx.interval.intervaljoinvalues` (*left*, *right*, *lstart='start'*, *lstop='stop'*, *rstart='start'*, *rstop='stop'*, *lfacet=None*, *rfacet=None*, *proximity=0*, *valuespec=None*, *valuesfield='values'*)

Convenience function to join the left table with values from a specific field in the right hand table. New in version 0.5.3.

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

Subtract intervals in the right hand table from intervals in the left hand table. New in version 0.5.4.

`petlx.interval.collapsedintervals` (*tbl*, *start='start'*, *stop='stop'*, *facet=None*)

Utility function to collapse intervals in a table.

If no facet key is given, returns an iterator over (*start*, *stop*) tuples.

If facet key is given, returns an iterator over (*key*, *start*, *stop*) tuples. New in version 0.5.5.

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 petlx 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.

2.6 Tabix (pysam)

`petlx.tabix.fromtabix(filename, reference=None, start=None, end=None, region=None, header=None)`

Extract rows from a tabix indexed file. E.g.:

```
>>> from petlx.tabix import fromtabix
>>> from petl import look
>>> t = fromtabix('test.bed.gz', region='Pf3D7_02_v3:100000-200000')
>>> look(t)
+-----+-----+-----+-----+
| '#chrom' | 'start' | 'end' | 'region' |
+-----+-----+-----+-----+
| 'Pf3D7_02_v3' | '23100' | '105800' | 'SubtelomericHypervariable' |
+-----+-----+-----+-----+
| 'Pf3D7_02_v3' | '105800' | '447300' | 'Core' |
+-----+-----+-----+-----+
```

New in version 0.4.

2.7 iPython Utilities

`petlx.ipython.display(tbl, *sliceargs)`

Display a table inline within an iPython notebook. E.g.:

```
In [0]: from petlx.ipython import display
        tbl = [['foo', 'bar'], ['a', 1], ['b', 2]]
        display(tbl)
```

Alternatively, using the fluent style:

```
In [0]: from petl.interactive import etl
        import petlx.ipython
        tbl = [['foo', 'bar'], ['a', 1], ['b', 2]]
        etl(tbl).display()
```

New in version 0.5. Deprecated since version 0.6. The `petlx.interactive` module supports `_repr_html_` as of 0.13.1 so this function is not necessary. E.g., the following should give an HTML rendering of the table inline within an iPython notebook:

```
In [0]: from petlx.interactive import etl
        tbl = [['foo', 'bar'], ['a', 1], ['b', 2]]
        etl(tbl)
```

`petlx.ipython.displayall(tbl)`

Display *all rows* from a table inline within an iPython notebook. E.g.:

```
In [0]: from petlx.ipython import displayall
        tbl = [['foo', 'bar'], ['a', 1], ['b', 2]]
        displayall(tbl)
```

Alternatively, using the fluent style:

```
In [0]: from petlx.interactive import etl
        import petlx.ipython
        tbl = [['foo', 'bar'], ['a', 1], ['b', 2]]
        etl(tbl).displayall()
```

New in version 0.5. Deprecated since version 0.6. The `petlx.interactive` module supports `_repr_html_` as of 0.13.1 so this function is not necessary. E.g., the following should give an HTML rendering of the table inline within an iPython notebook:

```
In [0]: from petlx.interactive import etl
        tbl = [['foo', 'bar'], ['a', 1], ['b', 2]]
        etl(tbl)
```

2.8 Variant Call Format Utilities (PyVCF)

`petlx.vcf.fromvcf(filename, chrom=None, start=None, end=None, samples=True)`

Returns a table providing access to data from a variant call file (VCF). E.g.:

```
>>> from petlx import look
>>> from petlx.vcf import fromvcf
>>> t = fromvcf('example.vcf')
>>> look(t)
```

'CHROM'	'POS'	'ID'	'REF'	'ALT'	'QUAL'	'FILTER'	'INFO'
'19'	111	None	'A'	[C]	9.6	[]	{}
'19'	112	None	'A'	[G]	10	[]	{}
'20'	14370	'rs6054257'	'G'	[A]	29	[]	OrderedDict([('NS',
'20'	17330	None	'T'	[A]	3	['q10']	OrderedDict([('NS',
'20'	1110696	'rs6040355'	'A'	[G, T]	67	[]	OrderedDict([('NS',
'20'	1230237	None	'T'	[None]	47	[]	OrderedDict([('NS',
'20'	1234567	'microsat1'	'G'	[GA, GAC]	50	[]	OrderedDict([('NS',
'20'	1235237	None	'T'	[None]	None	[]	{}

```
+-----+-----+-----+-----+-----+-----+-----+-----+
| 'X'      |      10 | 'rsTest'  | 'AC'  | [A, ATG] |      10 | []      | {}
+-----+-----+-----+-----+-----+-----+-----+-----+
```

New in version 0.5.

`petlx.vcf.unpackinfo(tbl, *keys, **kwargs)`
 Unpack the INFO field into separate fields. E.g.:

```
>>> from petlx.vcf import fromvcf, unpackinfo
>>> from petl import look
>>> t1 = fromvcf('../fixture/sample.vcf', samples=False)
>>> look(t1)
```

```
+-----+-----+-----+-----+-----+-----+-----+-----+
| 'CHROM' | 'POS'  | 'ID'      | 'REF' | 'ALT'     | 'QUAL' | 'FILTER' | 'INFO'
+-----+-----+-----+-----+-----+-----+-----+-----+
| '19'    |      111 | None     | 'A'   | [C]       |    9.6 | []       | {}
+-----+-----+-----+-----+-----+-----+-----+-----+
| '19'    |      112 | None     | 'A'   | [G]       |    10  | []       | {}
+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |     14370 | 'rs6054257' | 'G'   | [A]       |    29  | []       | OrderedDict([('NS',
+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |     17330 | None     | 'T'   | [A]       |     3  | ['q10'] | OrderedDict([('NS',
+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1110696 | 'rs6040355' | 'A'   | [G, T]    |    67  | []       | OrderedDict([('NS',
+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1230237 | None     | 'T'   | [None]    |    47  | []       | OrderedDict([('NS',
+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1234567 | 'microsat1' | 'G'   | [GA, GAC] |    50  | []       | OrderedDict([('NS',
+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1235237 | None     | 'T'   | [None]    | None   | []       | {}
+-----+-----+-----+-----+-----+-----+-----+-----+
| 'X'      |      10 | 'rsTest'  | 'AC'  | [A, ATG] |      10 | []      | {}
+-----+-----+-----+-----+-----+-----+-----+-----+
```

```
>>> t2 = unpackinfo(t1)
>>> look(t2)
```

```
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 'CHROM' | 'POS'  | 'ID'      | 'REF' | 'ALT'     | 'QUAL' | 'FILTER' | 'NS' | 'AN' | 'AC'
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '19'    |      111 | None     | 'A'   | [C]       |    9.6 | []       | None | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '19'    |      112 | None     | 'A'   | [G]       |    10  | []       | None | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |     14370 | 'rs6054257' | 'G'   | [A]       |    29  | []       | 3    | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |     17330 | None     | 'T'   | [A]       |     3  | ['q10'] | 3    | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1110696 | 'rs6040355' | 'A'   | [G, T]    |    67  | []       | 2    | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1230237 | None     | 'T'   | [None]    |    47  | []       | 3    | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1234567 | 'microsat1' | 'G'   | [GA, GAC] |    50  | []       | 3    | 6    | [3, 1]
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| '20'    |    1235237 | None     | 'T'   | [None]    | None   | []       | None | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 'X'      |      10 | 'rsTest'  | 'AC'  | [A, ATG] |      10 | []       | None | None | None
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
```

New in version 0.5.

`petlx.vcf.meltsamples` (*tbl*, **samples*)

Melt the samples columns. E.g.:

```
>>> from petlx.vcf import fromvcf, unpackinfo, meltsamples
>>> from petl import look, cutout
>>> t1 = fromvcf('../fixture/sample.vcf')
>>> t2 = meltsamples(t1)
>>> t3 = cutout(t2, 'INFO')
>>> look(t3)
```

'CHROM'	'POS'	'ID'	'REF'	'ALT'	'QUAL'	'FILTER'	'SAMPLE'	'CALL'
'19'	111	None	'A'	[C]	9.6	[]	'NA00001'	Call(sample=NA
'19'	111	None	'A'	[C]	9.6	[]	'NA00002'	Call(sample=NA
'19'	111	None	'A'	[C]	9.6	[]	'NA00003'	Call(sample=NA
'19'	112	None	'A'	[G]	10	[]	'NA00001'	Call(sample=NA
'19'	112	None	'A'	[G]	10	[]	'NA00002'	Call(sample=NA
'19'	112	None	'A'	[G]	10	[]	'NA00003'	Call(sample=NA
'20'	14370	'rs6054257'	'G'	[A]	29	[]	'NA00001'	Call(sample=NA
'20'	14370	'rs6054257'	'G'	[A]	29	[]	'NA00002'	Call(sample=NA
'20'	14370	'rs6054257'	'G'	[A]	29	[]	'NA00003'	Call(sample=NA
'20'	17330	None	'T'	[A]	3	['q10']	'NA00001'	Call(sample=NA

New in version 0.5.

`petlx.vcf.unpackcall` (*tbl*, **keys*, ***kwargs*)

Unpack the call column. E.g.:

```
>>> from petlx.vcf import fromvcf, unpackinfo, meltsamples, unpackcall
>>> from petl import look, cutout
>>> t1 = fromvcf('../fixture/sample.vcf')
>>> t2 = meltsamples(t1)
>>> t3 = unpackcall(t2)
>>> t4 = cutout(t3, 'INFO')
>>> look(t4)
```

'CHROM'	'POS'	'ID'	'REF'	'ALT'	'QUAL'	'FILTER'	'SAMPLE'	'GT'	'GQ'
'19'	111	None	'A'	[C]	9.6	[]	'NA00001'	'0 0'	None
'19'	111	None	'A'	[C]	9.6	[]	'NA00002'	'0 0'	None
'19'	111	None	'A'	[C]	9.6	[]	'NA00003'	'0 1'	None
'19'	112	None	'A'	[G]	10	[]	'NA00001'	'0 0'	None
'19'	112	None	'A'	[G]	10	[]	'NA00002'	'0 0'	None

'19'	112	None	'A'	[G]	10	[]	'NA00003'	'0/1'	None
'20'	14370	'rs6054257'	'G'	[A]	29	[]	'NA00001'	'0 0'	48
'20'	14370	'rs6054257'	'G'	[A]	29	[]	'NA00002'	'1 0'	48
'20'	14370	'rs6054257'	'G'	[A]	29	[]	'NA00003'	'1/1'	43
'20'	17330	None	'T'	[A]	3	['q10']	'NA00001'	'0 0'	49

New in version 0.5.

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