
PyFunctional Documentation

Release 1.3.0

Pedro Rodriguez

Sep 17, 2020

Contents

1	Table of Contents	3
1.1	API Documentation	3
1.2	Developer Documentation	26
	Python Module Index	59
	Index	61

Welcome to the *PyFunctional* documentation. For a tutorial of how to use this package you should visit pyfunctional.org.

The documentation on this site should primarily be used as an API reference. The Streams documentation covers ways to read data into *PyFunctional* while the Transformations and Actions documentations covers the available operators.

1.1 API Documentation

1.1.1 Streams API

The streams API enables you to read data into *PyFunctional*. The *seq* function imported with *from functional import seq* is actually an instance of *functional.streams.Stream*. Therefore, all the methods available on *seq* such as *seq.csv* are documented in the *Streams* class.

```
class functional.streams.ParallelStream(processes=None, partition_size=None, disable_compression=False)
```

Bases: *functional.streams.Stream*

Parallelized version of *functional.streams.Stream* normally accessible as *pseq*

```
class functional.streams.Stream(disable_compression=False, max_repr_items=100)
```

Bases: object

Represents and implements a stream which separates the responsibilities of Sequence and ExecutionEngine.

An instance of Stream is normally accessed as *seq*

```
csv(csv_file, dialect='excel', **fmt_params)
```

Reads and parses the input of a csv stream or file.

csv_file can be a filepath or an object that implements the iterator interface (defines *next()* or *__next__()* depending on python version).

```
>>> seq.csv('examples/camping_purchases.csv').take(2)
[['1', 'tent', '300'], ['2', 'food', '100']]
```

Parameters

- **csv_file** – path to file or iterator object
- **dialect** – dialect of csv, passed to *csv.reader*

- **fmt_params** – options passed to csv.reader

Returns Sequence wrapping csv file

csv_dict_reader (*csv_file*, *fieldnames=None*, *restkey=None*, *restval=None*, *dialect='excel'*, ***kwds*)

json (*json_file*)

Reads and parses the input of a json file handler or file.

Json files are parsed differently depending on if the root is a dictionary or an array.

- 1) If the json's root is a dictionary, these are parsed into a sequence of (Key, Value) pairs
- 2) If the json's root is an array, these are parsed into a sequence of entries

```
>>> seq.json('examples/users.json').first()
[u'sarah', {'date_created': u'08/08', 'news_email': True, 'email': u
↪ 'sarah@gmail.com'}]
```

Parameters json_file – path or file containing json content

Returns Sequence wrapping jsonl file

jsonl (*jsonl_file*)

Reads and parses the input of a jsonl file stream or file.

Jsonl formatted files must have a single valid json value on each line which is parsed by the python json module.

```
>>> seq.jsonl('examples/chat_logs.jsonl').first()
{'date': u'10/09', 'message': u'hello anyone there?', 'user': u'bob'}
```

Parameters jsonl_file – path or file containing jsonl content

Returns Sequence wrapping jsonl file

open (*path*, *delimiter=None*, *mode='r'*, *buffering=-1*, *encoding=None*, *errors=None*, *newline=None*)

Reads and parses input files as defined.

If delimiter is not None, then the file is read in bulk then split on it. If it is None (the default), then the file is parsed as sequence of lines. The rest of the options are passed directly to builtins.open with the exception that write/append file modes is not allowed.

```
>>> seq.open('examples/gear_list.txt').take(1)
[u'tent\n']
```

Parameters

- **path** – path to file
- **delimiter** – delimiter to split joined text on. if None, defaults to per line split
- **mode** – file open mode
- **buffering** – passed to builtins.open
- **encoding** – passed to builtins.open
- **errors** – passed to builtins.open
- **newline** – passed to builtins.open

Returns output of file depending on options wrapped in a Sequence via seq

range (*args)

Alias to range function where seq.range(args) is equivalent to seq(range(args)).

```
>>> seq.range(1, 8, 2)
[1, 3, 5, 7]
```

Parameters **args** – args to range function

Returns range(args) wrapped by a sequence

sqlite3 (conn, sql, parameters=None, *args, **kwargs)

Reads input by querying from a sqlite database.

```
>>> seq.sqlite3('examples/users.db', 'select id, name from users where id = 1;
↳').first()
[(1, 'Tom')]
```

Parameters

- **conn** – path or sqlite connection, cursor
- **sql** – SQL query string
- **parameters** – Parameters for sql query

Returns Sequence wrapping SQL cursor

1.1.2 Transformations and Actions API

The pipeline module contains the transformations and actions API of PyFunctional

class functional.pipeline.**Sequence** (sequence, transform=None, engine=None, max_repr_items=None)

Bases: object

Sequence is a wrapper around any type of sequence which provides access to common functional transformations and reductions in a data pipeline style

accumulate (func=<built-in function add>)

Accumulate sequence of elements using func. API mirrors itertools.accumulate

```
>>> seq([1, 2, 3]).accumulate(lambda x, y: x + y)
[1, 3, 6]
```

```
>>> seq(['a', 'b', 'c']).accumulate()
['a', 'ab', 'abc']
```

Parameters **func** – two parameter, associative accumulate function

Returns accumulated values using func in sequence

aggregate (*args)

Aggregates the sequence by specified arguments. Its behavior varies depending on if one, two, or three arguments are passed. Assuming the type of the sequence is A:

One Argument: argument specifies a function of the type `f(current: B, next: A => result: B)`. `current` represents results computed so far, and `next` is the next element to aggregate into `current` in order to return result.

Two Argument: the first argument is the seed value for the aggregation. The second argument is the same as for the one argument case.

Three Argument: the first two arguments are the same as for one and two argument calls. The additional third parameter is a function applied to the result of the aggregation before returning the value.

Parameters `args` – options for how to execute the aggregation

Returns aggregated value

all()

Returns True if the truth value of all items in the sequence true.

```
>>> seq([True, True]).all()
True
```

```
>>> seq([True, False]).all()
False
```

Returns True if all items truth value evaluates to True

any()

Returns True if any element in the sequence has truth value True

```
>>> seq([True, False]).any()
True
```

```
>>> seq([False, False]).any()
False
```

Returns True if any element is True

average (*projection=None*)

Takes the average of elements in the sequence

```
>>> seq([1, 2]).average()
1.5
```

```
>>> seq([('a', 1), ('b', 2)]).average(lambda x: x[1])
```

Parameters `projection` – function to project on the sequence before taking the average

Returns average of elements in the sequence

cache (*delete_lineage=False*)

Caches the result of the Sequence so far. This means that any functions applied on the pipeline before `cache()` are evaluated, and the result is stored in the Sequence. This is primarily used internally and is no more helpful than `to_list()` externally. `delete_lineage` allows for `cache()` to be used in internal initialization calls without the caller having knowledge of the internals via the lineage

Parameters `delete_lineage` – If set to True, it will cache then erase the lineage

cartesian (*iterables, **kwargs)

Returns the cartesian product of the passed iterables with the specified number of repetitions.

The keyword argument *repeat* is read from kwargs to pass to `itertools.cartesian`.

```
>>> seq.range(2).cartesian(range(2))
[(0, 0), (0, 1), (1, 0), (1, 1)]
```

Parameters

- **iterables** – elements for cartesian product
- **kwargs** – the variable *repeat* is read from kwargs

Returns cartesian product

count (func)

Counts the number of elements in the sequence which satisfy the predicate func.

```
>>> seq([-1, -2, 1, 2]).count(lambda x: x > 0)
2
```

Parameters **func** – predicate to count elements on

Returns count of elements that satisfy predicate

count_by_key ()

Reduces a sequence of (Key, Value) by counting each key

```
>>> seq([('a', 1), ('b', 2), ('b', 3), ('b', 4), ('c', 3), ('c', 0)]).count_
↳by_key()
[('a', 1), ('b', 3), ('c', 2)]
:return: Sequence of tuples where value is the count of each key
```

count_by_value ()

Reduces a sequence of items by counting each unique item

```
>>> seq(['a', 'a', 'a', 'b', 'b', 'c', 'd']).count_by_value()
[('a', 3), ('b', 2), ('c', 1), ('d', 1)]
:return: Sequence of tuples where value is the count of each key
```

dict (default=None)

Converts sequence of (Key, Value) pairs to a dictionary.

```
>>> type(seq([('a', 1)]).dict())
dict
```

```
>>> seq([('a', 1), ('b', 2)]).dict()
{'a': 1, 'b': 2}
```

Parameters **default** – Can be a callable zero argument function. When not None, the returned dictionary is a `collections.defaultdict` with default as value for missing keys. If the value is not callable, then a zero argument lambda function is created returning the value and used for `collections.defaultdict`

Returns dictionary from sequence of (Key, Value) elements

difference (*other*)

New sequence with unique elements present in sequence but not in other.

```
>>> seq([1, 2, 3]).difference([2, 3, 4])
[1]
```

Parameters *other* – sequence to perform difference with

Returns difference of sequence and other

distinct ()

Returns sequence of distinct elements. Elements must be hashable.

```
>>> seq([1, 1, 2, 3, 3, 3, 4]).distinct()
[1, 2, 3, 4]
```

Returns sequence of distinct elements

distinct_by (*func*)

Returns sequence of elements who are distinct by the passed function. The return value of *func* must be hashable. When two elements are distinct by *func*, the first is taken.

Parameters *func* – function to use for determining distinctness

Returns elements distinct by *func*

drop (*n*)

Drop the first *n* elements of the sequence.

```
>>> seq([1, 2, 3, 4, 5]).drop(2)
[3, 4, 5]
```

Parameters *n* – number of elements to drop

Returns sequence without first *n* elements

drop_right (*n*)

Drops the last *n* elements of the sequence.

```
>>> seq([1, 2, 3, 4, 5]).drop_right(2)
[1, 2, 3]
```

Parameters *n* – number of elements to drop

Returns sequence with last *n* elements dropped

drop_while (*func*)

Drops elements in the sequence while *func* evaluates to True, then returns the rest.

```
>>> seq([1, 2, 3, 4, 5, 1, 2]).drop_while(lambda x: x < 3)
[3, 4, 5, 1, 2]
```

Parameters *func* – truth returning function

Returns elements including and after *func* evaluates to False

empty()

Returns True if the sequence has length zero.

```
>>> seq([]).empty()
True
```

```
>>> seq([1]).empty()
False
```

Returns True if sequence length is zero

enumerate (*start=0*)

Uses python enumerate to to zip the sequence with indexes starting at start.

```
>>> seq(['a', 'b', 'c']).enumerate(start=1)
[(1, 'a'), (2, 'b'), (3, 'c')]
```

Parameters **start** – Beginning of zip

Returns enumerated sequence starting at start

exists (*func*)

Returns True if an element in the sequence makes func evaluate to True.

```
>>> seq([1, 2, 3, 4]).exists(lambda x: x == 2)
True
```

```
>>> seq([1, 2, 3, 4]).exists(lambda x: x < 0)
False
```

Parameters **func** – existence check function

Returns True if any element satisfies func

filter (*func*)

Filters sequence to include only elements where func is True.

```
>>> seq([-1, 1, -2, 2]).filter(lambda x: x > 0)
[1, 2]
```

Parameters **func** – function to filter on

Returns filtered sequence

filter_not (*func*)

Filters sequence to include only elements where func is False.

```
>>> seq([-1, 1, -2, 2]).filter_not(lambda x: x > 0)
[-1, -2]
```

Parameters **func** – function to filter_not on

Returns filtered sequence

find (*func*)

Finds the first element of the sequence that satisfies *func*. If no such element exists, then return `None`.

```
>>> seq(["abc", "ab", "bc"]).find(lambda x: len(x) == 2)
'ab'
```

Parameters *func* – function to find with

Returns first element to satisfy *func* or `None`

first ()

Returns the first element of the sequence.

```
>>> seq([1, 2, 3]).first()
1
```

Raises `IndexError` when the sequence is empty.

```
>>> seq([]).first()
Traceback (most recent call last):
...
IndexError: list index out of range
```

Returns first element of sequence

flat_map (*func*)

Applies *func* to each element of the sequence, which themselves should be sequences. Then appends each element of each sequence to a final result

```
>>> seq([[1, 2], [3, 4], [5, 6]]).flat_map(lambda x: x)
[1, 2, 3, 4, 5, 6]
```

```
>>> seq(["a", "bc", "def"]).flat_map(list)
['a', 'b', 'c', 'd', 'e', 'f']
```

```
>>> seq([[1], [2], [3]]).flat_map(lambda x: x * 2)
[1, 1, 2, 2, 3, 3]
```

Parameters *func* – function to apply to each sequence in the sequence

Returns application of *func* to elements followed by flattening

flatten ()

Flattens a sequence of sequences to a single sequence of elements.

```
>>> seq([[1, 2], [3, 4], [5, 6]])
[1, 2, 3, 4, 5, 6]
```

Returns flattened sequence

fold_left (*zero_value*, *func*)

Assuming that the sequence elements are of type *A*, folds from left to right starting with the seed value given by *zero_value* (of type *A*) using a function of type *func*(*current*: *B*, *next*: *A*) => *B*. *current* represents the folded value so far and *next* is the next element from the sequence to fold into *current*.

```
>>> seq('a', 'b', 'c').fold_left(['start'], lambda current, next: current +
↳ [next])
['start', 'a', 'b', 'c']
```

Parameters

- **zero_value** – zero value to reduce into
- **func** – Two parameter function as described by function docs

Returns value from folding values with func into zero_value from left to right.

fold_right (*zero_value, func*)

Assuming that the sequence elements are of type A, folds from right to left starting with the seed value given by zero_value (of type A) using a function of type func(next: A, current: B) => B. current represents the folded value so far and next is the next element from the sequence to fold into current.

```
>>> seq('a', 'b', 'c').fold_right(['start'], lambda next, current: current +
↳ [next])
['start', 'c', 'b', 'a']
```

Parameters

- **zero_value** – zero value to reduce into
- **func** – Two parameter function as described by function docs

Returns value from folding values with func into zero_value from right to left

for_all (*func*)

Returns True if all elements in sequence make func evaluate to True.

```
>>> seq([1, 2, 3]).for_all(lambda x: x > 0)
True
```

```
>>> seq([1, 2, -1]).for_all(lambda x: x > 0)
False
```

Parameters **func** – function to check truth value of all elements with

Returns True if all elements make func evaluate to True

for_each (*func*)

Executes func on each element of the sequence.

```
>>> l = []
>>> seq([1, 2, 3, 4]).for_each(l.append)
>>> l
[1, 2, 3, 4]
```

Parameters **func** – function to execute

group_by (*func*)

Group elements into a list of (Key, Value) tuples where func creates the key and maps to values matching that key.

```
>>> seq(["abc", "ab", "z", "f", "qw"]).group_by(len)
[(1, ['z', 'f']), (2, ['ab', 'qw']), (3, ['abc'])]
```

Parameters **func** – group by result of this function

Returns grouped sequence

group_by_key()

Group sequence of (Key, Value) elements by Key.

```
>>> seq([('a', 1), ('b', 2), ('b', 3), ('b', 4), ('c', 3), ('c', 0)]).group_
↳by_key()
[('a', [1]), ('c', [3, 0]), ('b', [2, 3, 4])]
```

Returns sequence grouped by key

grouped(size)

Partitions the elements into groups of length size.

```
>>> seq([1, 2, 3, 4, 5, 6, 7, 8]).grouped(2)
[[1, 2], [3, 4], [5, 6], [7, 8]]
```

```
>>> seq([1, 2, 3, 4, 5, 6, 7, 8]).grouped(3)
[[1, 2, 3], [4, 5, 6], [7, 8]]
```

The last partition has at least one element but may have less than size elements.

Parameters **size** – size of the partitions

Returns sequence partitioned into groups of length size

head()

Returns the first element of the sequence.

```
>>> seq([1, 2, 3]).head()
1
```

Raises `IndexError` when the sequence is empty.

```
>>> seq([]).head()
Traceback (most recent call last):
...
IndexError: list index out of range
```

Returns first element of sequence

head_option()

Returns the first element of the sequence or `None`, if the sequence is empty.

```
>>> seq([1, 2, 3]).head_option()
1
```

```
>>> seq([]).head_option()
None
```


Returns first element of sequence or None if sequence is empty

init()

Returns the sequence, without its last element.

```
>>> seq([1, 2, 3]).init()
[1, 2]
```

Returns sequence without last element

inits()

Returns consecutive inits of the sequence.

```
>>> seq([1, 2, 3]).inits()
[[1, 2, 3], [1, 2], [1], []]
```

Returns consecutive init(s) on sequence

inner_join(other)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. Will return only elements where the key exists in both sequences.

```
>>> seq([('a', 1), ('b', 2), ('c', 3)]).inner_join([('a', 2), ('c', 5)])
[('a', (1, 2)), ('c', (3, 5))]
```

Parameters other – sequence to join with

Returns joined sequence of (K, (V, W)) pairs

intersection(other)

New sequence with unique elements present in sequence and other.

```
>>> seq([1, 1, 2, 3]).intersection([2, 3, 4])
[2, 3]
```

Parameters other – sequence to perform intersection with

Returns intersection of sequence and other

join(other, join_type='inner')

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. If join_type is “left”, V values will always be present, W values may be present or None. If join_type is “right”, W values will always be present, V values may be present or None. If join_type is “outer”, V or W may be present or None, but never at the same time.

```
>>> seq([('a', 1), ('b', 2), ('c', 3)]).join([('a', 2), ('c', 5)], "inner")
[('a', (1, 2)), ('c', (3, 5))]
```

```
>>> seq([('a', 1), ('b', 2), ('c', 3)]).join([('a', 2), ('c', 5)])
[('a', (1, 2)), ('c', (3, 5))]
```

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)], "left")
[('a', (1, 3)), ('b', (2, None))]
```

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)], "right")
[('a', (1, 3)), ('c', (None, 4))]
```

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)], "outer")
[('a', (1, 3)), ('b', (2, None)), ('c', (None, 4))]
```

Parameters

- **other** – sequence to join with
- **join_type** – specifies join_type, may be “left”, “right”, or “outer”

Returns side joined sequence of (K, (V, W)) pairs

last()

Returns the last element of the sequence.

```
>>> seq([1, 2, 3]).last()
3
```

Raises `IndexError` when the sequence is empty.

```
>>> seq([]).last()
Traceback (most recent call last):
...
IndexError: list index out of range
```

Returns last element of sequence

last_option()

Returns the last element of the sequence or `None`, if the sequence is empty.

```
>>> seq([1, 2, 3]).last_option()
3
```

```
>>> seq([]).last_option()
None
```

Returns last element of sequence or `None` if sequence is empty

left_join(other)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. V values will always be present, W values may be present or `None`.

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)])
[('a', (1, 3)), ('b', (2, None))]
```

Parameters **other** – sequence to join with

Returns left joined sequence of (K, (V, W)) pairs

len()

Return length of sequence using its length function.

```
>>> seq([1, 2, 3]).len()
3
```

Returns length of sequence

list (*n=None*)

Converts sequence to list of elements.

```
>>> type(seq([]).list())
list
```

```
>>> type(seq([]))
functional.pipeline.Sequence
```

```
>>> seq([1, 2, 3]).list()
[1, 2, 3]
```

Parameters *n* – Take *n* elements of sequence if not None

Returns list of elements in sequence

make_string (*separator*)

Concatenate the elements of the sequence into a string separated by separator.

```
>>> seq([1, 2, 3]).make_string("@")
'1@2@3'
```

Parameters *separator* – string separating elements in string

Returns concatenated string separated by separator

map (*func*)

Maps *f* onto the elements of the sequence.

```
>>> seq([1, 2, 3, 4]).map(lambda x: x * -1)
[-1, -2, -3, -4]
```

Parameters *func* – function to map with

Returns sequence with *func* mapped onto it

max ()

Returns the largest element in the sequence. If the sequence has multiple maximal elements, only the first one is returned.

The compared objects must have defined comparison methods. Raises `TypeError` when the objects are not comparable.

The sequence can not be empty. Raises `ValueError` when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).max()
5
```

```
>>> seq('aa', 'xyz', 'abcd', 'xyy').max()
'xyz'
```

```
>>> seq([1, "a"]).max()
Traceback (most recent call last):
...
TypeError: unorderable types: int() < str()
```

```
>>> seq([]).max()
Traceback (most recent call last):
...
ValueError: max() arg is an empty sequence
```

Returns Maximal value of sequence

max_by (*func*)

Returns the largest element in the sequence. Provided function is used to generate key used to compare the elements. If the sequence has multiple maximal elements, only the first one is returned.

The sequence can not be empty. Raises ValueError when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).max_by(lambda num: num % 4)
3
```

```
>>> seq('aa', 'xyz', 'abcd', 'xyy').max_by(len)
'abcd'
```

```
>>> seq([]).max_by(lambda x: x)
Traceback (most recent call last):
...
ValueError: max() arg is an empty sequence
```

Parameters **func** – function to compute max by

Returns Maximal element by func(element)

min ()

Returns the smallest element in the sequence. If the sequence has multiple minimal elements, only the first one is returned.

The compared objects must have defined comparison methods. Raises TypeError when the objects are not comparable.

The sequence can not be empty. Raises ValueError when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).min()
1
```

```
>>> seq('aa', 'xyz', 'abcd', 'xyy').min()
'aa'
```

```
>>> seq([1, "a"]).min()
Traceback (most recent call last):
...
TypeError: unorderable types: int() < str()
```

```
>>> seq([]).min()
Traceback (most recent call last):
...
ValueError: min() arg is an empty sequence
```

Returns Minimal value of sequence

min_by (*func*)

Returns the smallest element in the sequence. Provided function is used to generate key used to compare the elements. If the sequence has multiple minimal elements, only the first one is returned.

The sequence can not be empty. Raises ValueError when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).min_by(lambda num: num % 6)
5
```

```
>>> seq('aa', 'xyz', 'abcd', 'xyy').min_by(len)
'aa'
```

```
>>> seq([]).min_by(lambda x: x)
Traceback (most recent call last):
...
ValueError: min() arg is an empty sequence
```

Parameters **func** – function to compute min by

Returns Maximal element by func(element)

non_empty ()

Returns True if the sequence does not have length zero.

```
>>> seq([]).non_empty()
False
```

```
>>> seq([1]).non_empty()
True
```

Returns True if sequence length is not zero

order_by (*func*)

Orders the input according to func

```
>>> seq([(2, 'a'), (1, 'b'), (4, 'c'), (3, 'd')]).order_by(lambda x: x[0])
[1, 2, 3, 4]
```

Parameters **func** – order by function

Returns ordered sequence

outer_join (*other*)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. One of V or W will always be not None, but the other may be None

```
>>> seq([('a', 1), ('b', 2)]).outer_join([('a', 3), ('c', 4)], "outer")
[('a', (1, 3)), ('b', (2, None)), ('c', (None, 4))]
```

Parameters **other** – sequence to join with

Returns outer joined sequence of (K, (V, W)) pairs

partition (*func*)

Partition the sequence based on satisfying the predicate func.

```
>>> seq([-1, 1, -2, 2]).partition(lambda x: x < 0)
[[-1, -2], [1, 2]]
```

Parameters **func** – predicate to partition on

Returns tuple of partitioned sequences

product (*projection=None*)

Takes product of elements in sequence.

```
>>> seq([1, 2, 3, 4]).product()
24
```

```
>>> seq([]).product()
1
```

```
>>> seq([(1, 2), (1, 3), (1, 4)]).product(lambda x: x[0])
1
```

Parameters **projection** – function to project on the sequence before taking the product

Returns product of elements in sequence

reduce (*func, *initial*)

Reduce sequence of elements using func. API mirrors functools.reduce

```
>>> seq([1, 2, 3]).reduce(lambda x, y: x + y)
6
```

Parameters

- **func** – two parameter, associative reduce function
- **initial** – single optional argument acting as initial value

Returns reduced value using func

reduce_by_key (*func*)

Reduces a sequence of (Key, Value) using func on each sequence of values.

```
>>> seq([('a', 1), ('b', 2), ('b', 3), ('b', 4), ('c', 3), ('c', 0)])
↳ .reduce_by_key(lambda x, y: x + y)
[('a', 1), ('c', 3), ('b', 9)]
```

Parameters **func** – reduce each list of values using two parameter, associative func

Returns Sequence of tuples where the value is reduced with func

reverse ()

Returns the reversed sequence.

```
>>> seq([1, 2, 3]).reverse()
[3, 2, 1]
```

Returns reversed sequence

right_join (other)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. W values will always be present, V values may be present or None.

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)])
[('a', (1, 3)), ('b', (2, None))]
```

Parameters other – sequence to join with

Returns right joined sequence of (K, (V, W)) pairs

select (func)

Selects f from the elements of the sequence.

```
>>> seq([1, 2, 3, 4]).select(lambda x: x * -1)
[-1, -2, -3, -4]
```

Parameters func – function to select with

Returns sequence with func mapped onto it

sequence

Alias for to_list used internally for brevity

Returns result of to_list() on sequence

set ()

Converts sequence to a set of elements.

```
>>> type(seq([])).to_set()
set
```

```
>>> type(seq([]))
functional.pipeline.Sequence
```

```
>>> seq([1, 1, 2, 2]).set()
{1, 2}
```

:return:set of elements in sequence

show (n=10, headers=(), tablefmt='simple', floatfmt='g', numalign='decimal', stralign='left', missing-val='')

Pretty print first n rows of sequence as a table. See <https://bitbucket.org/astanin/python-tabulate> for details on tabulate parameters

Parameters

- **n** – Number of rows to show
- **headers** – Passed to tabulate
- **tablefmt** – Passed to tabulate
- **floatfmt** – Passed to tabulate
- **numalign** – Passed to tabulate
- **stralign** – Passed to tabulate
- **missingval** – Passed to tabulate

size()

Return size of sequence using its length function.

Returns size of sequence

slice (*start, until*)

Takes a slice of the sequence starting at start and until but not including until.

```
>>> seq([1, 2, 3, 4]).slice(1, 2)
[2]
>>> seq([1, 2, 3, 4]).slice(1, 3)
[2, 3]
```

Parameters

- **start** – starting index
- **until** – ending index

Returns slice including start until but not including until

sliding (*size, step=1*)

Groups elements in fixed size blocks by passing a sliding window over them.

The last window has at least one element but may have less than size elements

Parameters

- **size** – size of sliding window
- **step** – step size between windows

Returns sequence of sliding windows

smap (*func*)

Alias to Sequence.starmap

starmaps f onto the sequence as itertools.starmap does.

```
>>> seq([(2, 3), (-2, 1), (0, 10)]).smap(lambda x, y: x + y)
[5, -1, 10]
```

Parameters **func** – function to starmap with

Returns sequence with func starmapped onto it

sorted (*key=None, reverse=False*)

Uses python sort and its passed arguments to sort the input.


```
>>> seq([2, 1, 4, 3]).sorted()
[1, 2, 3, 4]
```

Parameters

- **key** – sort using key function
- **reverse** – return list reversed or not

Returns sorted sequence**starmap** (*func*)starmaps *f* onto the sequence as `itertools.starmap` does.

```
>>> seq([(2, 3), (-2, 1), (0, 10)]).starmap(lambda x, y: x + y)
[5, -1, 10]
```

Parameters **func** – function to starmap with**Returns** sequence with *func* starmapped onto it**sum** (*projection=None*)

Takes sum of elements in sequence.

```
>>> seq([1, 2, 3, 4]).sum()
10
```

```
>>> seq([(1, 2), (1, 3), (1, 4)]).sum(lambda x: x[0])
3
```

Parameters **projection** – function to project on the sequence before taking the sum**Returns** sum of elements in sequence**symmetric_difference** (*other*)New sequence with elements in either sequence or *other*, but not both.

```
>>> seq([1, 2, 3, 3]).symmetric_difference([2, 4, 5])
[1, 3, 4, 5]
```

Parameters **other** – sequence to perform symmetric difference with**Returns** symmetric difference of sequence and *other***tabulate** (*n=None, headers=(), tablefmt='simple', floatfmt='g', numalign='decimal', stralign='left', missingval=""*)Return pretty string table of first *n* rows of sequence or everything if *n* is `None`. See <https://bitbucket.org/astanin/python-tabulate> for details on `tabulate` parameters**Parameters**

- **n** – Number of rows to show, if set to `None` return all rows
- **headers** – Passed to `tabulate`
- **tablefmt** – Passed to `tabulate`
- **floatfmt** – Passed to `tabulate`

- **numalign** – Passed to tabulate
- **stralign** – Passed to tabulate
- **missingval** – Passed to tabulate

tail()

Returns the sequence, without its first element.

```
>>> seq([1, 2, 3]).tail()
[2, 3]
```

Returns sequence without first element

tails()

Returns consecutive tails of the sequence.

```
>>> seq([1, 2, 3]).tails()
[[1, 2, 3], [2, 3], [3], []]
```

Returns consecutive tail(s) of the sequence

take(n)

Take the first n elements of the sequence.

```
>>> seq([1, 2, 3, 4]).take(2)
[1, 2]
```

Parameters n – number of elements to take

Returns first n elements of sequence

take_while(func)

Take elements in the sequence until func evaluates to False, then return them.

```
>>> seq([1, 2, 3, 4, 5, 1, 2]).take_while(lambda x: x < 3)
[1, 2]
```

Parameters func – truth returning function

Returns elements taken until func evaluates to False

to_csv(path, mode='wt', dialect='excel', compression=None, newline="", **fmtparams)

Saves the sequence to a csv file. Each element should be an iterable which will be expanded to the elements of each row.

Parameters

- **path** – path to write file
- **mode** – file open mode
- **dialect** – passed to csv.writer
- **fmtparams** – passed to csv.writer

to_dict(default=None)

Converts sequence of (Key, Value) pairs to a dictionary.

```
>>> type(seq([('a', 1)].to_dict())
dict
```

```
>>> seq([('a', 1), ('b', 2)].to_dict())
{'a': 1, 'b': 2}
```

Parameters default – Can be a callable zero argument function. When not None, the returned dictionary is a `collections.defaultdict` with default as value for missing keys. If the value is not callable, then a zero argument lambda function is created returning the value and used for `collections.defaultdict`

Returns dictionary from sequence of (Key, Value) elements

to_file (*path*, *delimiter=None*, *mode='wt'*, *buffering=-1*, *encoding=None*, *errors=None*, *newline=None*, *compresslevel=9*, *format=None*, *check=-1*, *preset=None*, *filters=None*, *compression=None*)

Saves the sequence to a file by executing `str(self)` which becomes `str(self.to_list())`. If `delimiter` is defined will instead execute `self.make_string(delimiter)`

Parameters

- **path** – path to write file
- **delimiter** – if defined, will call `make_string(delimiter)` and save that to file.
- **mode** – file open mode
- **buffering** – passed to `builtins.open`
- **encoding** – passed to `builtins.open`
- **errors** – passed to `builtins.open`
- **newline** – passed to `builtins.open`
- **compression** – compression format
- **compresslevel** – passed to `gzip.open`
- **format** – passed to `lzma.open`
- **check** – passed to `lzma.open`
- **preset** – passed to `lzma.open`
- **filters** – passed to `lzma.open`

to_json (*path*, *root_array=True*, *mode='wt'*, *compression=None*)

Saves the sequence to a json file. If `root_array` is True, then the sequence will be written to json with an array at the root. If it is False, then the sequence will be converted from a sequence of (Key, Value) pairs to a dictionary so that the json root is a dictionary.

Parameters

- **path** – path to write file
- **root_array** – write json root as an array or dictionary
- **mode** – file open mode

to_jsonl (*path*, *mode='wb'*, *compression=None*)

Saves the sequence to a jsonl file. Each element is mapped using `json.dumps` then written with a newline separating each element.

Parameters

- **path** – path to write file
- **mode** – mode to write in, defaults to 'w' to overwrite contents
- **compression** – compression format

to_list (*n=None*)

Converts sequence to list of elements.

```
>>> type(seq([]).to_list())  
list
```

```
>>> type(seq([]))  
functional.pipeline.Sequence
```

```
>>> seq([1, 2, 3]).to_list()  
[1, 2, 3]
```

Parameters **n** – Take n elements of sequence if not None

Returns list of elements in sequence

to_pandas (*columns=None*)

Converts sequence to a pandas DataFrame using pandas.DataFrame.from_records

Parameters **columns** – columns for pandas to use

Returns DataFrame of sequence

to_set ()

Converts sequence to a set of elements.

```
>>> type(seq([]).to_set())  
set
```

```
>>> type(seq([]))  
functional.pipeline.Sequence
```

```
>>> seq([1, 1, 2, 2]).to_set()  
{1, 2}
```

:return:set of elements in sequence

to_sqlite3 (*conn, target, *args, **kwargs*)

Saves the sequence to sqlite3 database. Target table must be created in advance. The table schema is inferred from the elements in the sequence if only target table name is supplied.

```
>>> seq([(1, 'Tom'), (2, 'Jack')]).to_sqlite3('users.db',  
↳ 'INSERT INTO user (id, name) VALUES (?, ?)')
```

```
>>> seq([{'id': 1, 'name': 'Tom'}, {'id': 2, 'name': 'Jack'}]).to_  
↳ sqlite3(conn, 'user')
```

Parameters

- **conn** – path or sqlite connection, cursor

- **target** – SQL query string or table name
- **args** – passed to `sqlite3.connect`
- **kwargs** – passed to `sqlite3.connect`

union (*other*)

New sequence with unique elements from self and other.

```
>>> seq([1, 1, 2, 3, 3]).union([1, 4, 5])
[1, 2, 3, 4, 5]
```

Parameters **other** – sequence to union with

Returns union of sequence and other

where (*func*)

Selects elements where `func` evaluates to `True`.

```
>>> seq([-1, 1, -2, 2]).where(lambda x: x > 0)
[1, 2]
```

Parameters **func** – function to filter on

Returns filtered sequence

zip (*sequence*)

Zips the stored sequence with the given sequence.

```
>>> seq([1, 2, 3]).zip([4, 5, 6])
[(1, 4), (2, 5), (3, 6)]
```

Parameters **sequence** – second sequence to zip

Returns stored sequence zipped with given sequence

zip_with_index (*start=0*)

Zips the sequence to its index, with the index being the second element of each tuple.

```
>>> seq(['a', 'b', 'c']).zip_with_index()
[('a', 0), ('b', 1), ('c', 2)]
```

Returns sequence zipped to its index

`functional.pipeline.extend` (*func=None, aslist=False, final=False, name=None, parallel=False*)

Function decorator for adding new methods to the Sequence class.

```
>>> @extend()
def zip2(it):
    return [(i,i) for i in it]
```

```
>>> seq.range(3).zip2()
[(0, 0), (1, 1), (2, 2)]
```

```
>>> @extend(aslist=True)
def zip2(it):
    return zip(it,it)
```

```
>>> seq.range(3).zip2()
[(0, 0), (1, 1), (2, 2)]
```

```
>>> @extend(final=True)
def make_set(it):
    return set(it)
```

```
>>> r = seq([0,1,1]).make_set()
>>> r
{0, 1}
```

```
>>> type(r)
<class 'set'>
```

Parameters

- **func** – function to decorate
- **aslist** – if True convert input sequence to list (default False)
- **final** – If True decorated function does not return a sequence. Useful for creating functions such as `to_list`.
- **name** – name of the function (default function definition name)
- **parallel** – if true the function is executed in parallel execution strategy (default False)

1.2 Developer Documentation

1.2.1 functional.streams

class `functional.streams.ParallelStream` (*processes=None, partition_size=None, disable_compression=False*)

Bases: `functional.streams.Stream`

Parallelized version of `functional.streams.Stream` normally accessible as `pseq`

__call__ (**args, **kwargs*)

Create a Sequence using a parallel ExecutionEngine.

If `args` has more than one argument then the argument list becomes the sequence.

If `args[0]` is primitive, a sequence wrapping it is created.

If `args[0]` is a list, tuple, iterable, or Sequence it is wrapped as a Sequence.

Parameters `args` – Sequence to wrap

Returns Wrapped sequence

__init__ (*processes=None, partition_size=None, disable_compression=False*)

Configure Stream for parallel processing and file compression detection :param `processes`: Number of parallel processes :param `disable_compression`: Disable file compression detection

```
__module__ = 'functional.streams'
```

```
class functional.streams.Stream(disable_compression=False, max_repr_items=100)
```

Bases: object

Represents and implements a stream which separates the responsibilities of Sequence and ExecutionEngine.

An instance of Stream is normally accessed as *seq*

```
__call__ (*args, **kwargs)
```

Create a Sequence using a sequential ExecutionEngine.

If args has more than one argument then the argument list becomes the sequence.

If args[0] is primitive, a sequence wrapping it is created.

If args[0] is a list, tuple, iterable, or Sequence it is wrapped as a Sequence.

Parameters *args* – Sequence to wrap

Returns Wrapped sequence

```
__dict__ = mappingproxy({'__module__': 'functional.streams', '__doc__': '\n Represent
```

```
__init__ (disable_compression=False, max_repr_items=100)
```

Default stream constructor. :param *disable_compression*: Disable file compression detection

```
__module__ = 'functional.streams'
```

```
__weakref__
```

list of weak references to the object (if defined)

```
_parse_args (args, engine, error_message)
```

```
csv (csv_file, dialect='excel', **fmt_params)
```

Reads and parses the input of a csv stream or file.

csv_file can be a filepath or an object that implements the iterator interface (defines `next()` or `__next__()` depending on python version).

```
>>> seq.csv('examples/camping_purchases.csv').take(2)
[['1', 'tent', '300'], ['2', 'food', '100']]
```

Parameters

- **csv_file** – path to file or iterator object
- **dialect** – dialect of csv, passed to `csv.reader`
- **fmt_params** – options passed to `csv.reader`

Returns Sequence wrapping csv file

```
csv_dict_reader (csv_file, fieldnames=None, restkey=None, restval=None, dialect='excel',
                 **kwds)
```

```
json (json_file)
```

Reads and parses the input of a json file handler or file.

Json files are parsed differently depending on if the root is a dictionary or an array.

- 1) If the json's root is a dictionary, these are parsed into a sequence of (Key, Value) pairs
- 2) If the json's root is an array, these are parsed into a sequence of entries

```
>>> seq.json('examples/users.json').first()
[u'sarah', {'date_created': u'08/08', 'news_email': True, 'email': u
↳ 'sarah@gmail.com'}]
```

Parameters `json_file` – path or file containing json content

Returns Sequence wrapping jsonl file

jsonl (*jsonl_file*)

Reads and parses the input of a jsonl file stream or file.

Jsonl formatted files must have a single valid json value on each line which is parsed by the python json module.

```
>>> seq.jsonl('examples/chat_logs.jsonl').first()
{'date': u'10/09', 'message': u'hello anyone there?', 'user': u'bob'}
```

Parameters `jsonl_file` – path or file containing jsonl content

Returns Sequence wrapping jsonl file

open (*path, delimiter=None, mode='r', buffering=-1, encoding=None, errors=None, newline=None*)

Reads and parses input files as defined.

If `delimiter` is not `None`, then the file is read in bulk then split on it. If it is `None` (the default), then the file is parsed as sequence of lines. The rest of the options are passed directly to `builtins.open` with the exception that write/append file modes is not allowed.

```
>>> seq.open('examples/gear_list.txt').take(1)
[u'tent\n']
```

Parameters

- **path** – path to file
- **delimiter** – delimiter to split joined text on. if `None`, defaults to per line split
- **mode** – file open mode
- **buffering** – passed to `builtins.open`
- **encoding** – passed to `builtins.open`
- **errors** – passed to `builtins.open`
- **newline** – passed to `builtins.open`

Returns output of file depending on options wrapped in a Sequence via `seq`

range (**args*)

Alias to range function where `seq.range(args)` is equivalent to `seq(range(args))`.

```
>>> seq.range(1, 8, 2)
[1, 3, 5, 7]
```

Parameters `args` – args to range function

Returns `range(args)` wrapped by a sequence

sqlite3 (*conn, sql, parameters=None, *args, **kwargs*)
 Reads input by querying from a sqlite database.

```
>>> seq.sqlite3('examples/users.db', 'select id, name from users where id = 1;
↳').first()
[(1, 'Tom')]
```

Parameters

- **conn** – path or sqlite connection, cursor
- **sql** – SQL query string
- **parameters** – Parameters for sql query

Returns Sequence wrapping SQL cursor

1.2.2 functional.pipeline

The pipeline module contains the transformations and actions API of PyFunctional

class functional.pipeline.**Sequence** (*sequence, transform=None, engine=None, max_repr_items=None*)

Bases: object

Sequence is a wrapper around any type of sequence which provides access to common functional transformations and reductions in a data pipeline style

__add__ (*other*)

Concatenates sequence with other.

Parameters **other** – sequence to concatenate

Returns concatenated sequence with other

__bool__ ()

Returns True if size is not zero.

Returns True if size is not zero

__contains__ (*item*)

Checks if item is in sequence.

Parameters **item** – item to check

Returns True if item is in sequence

__dict__ = mappingproxy({'__module__': 'functional.pipeline', '__doc__': '\n Sequence

__eq__ (*other*)

Checks for equality with the sequence's equality operator.

Parameters **other** – object to compare to

Returns true if the underlying sequence is equal to other

__getitem__ (*item*)

Gets item at given index.

Parameters **item** – key to use for getitem

Returns item at index key

`__hash__()`

Return the hash of the sequence.

Returns hash of sequence

`__init__(sequence, transform=None, engine=None, max_repr_items=None)`

Takes a Sequence, list, tuple. or iterable sequence and wraps it around a Sequence object. If the sequence is already an instance of Sequence, it will in total be wrapped exactly once. A TypeError is raised if sequence is none of these.

Parameters

- **sequence** – sequence of items to wrap in a Sequence
- **transform** – transformation to apply
- **engine** – execution engine
- **max_repr_items** – maximum number of items to print with repr

Returns sequence wrapped in a Sequence

`__iter__()`

Return iterator of sequence.

Returns iterator of sequence

`__module__ = 'functional.pipeline'`

`__ne__(other)`

Checks for inequality with the sequence's inequality operator.

Parameters **other** – object to compare to

Returns true if the underlying sequence is not equal to other

`__nonzero__()`

Returns True if size is not zero.

Returns True if size is not zero

`__repr__()`

Return repr using sequence's repr function.

Returns sequence's repr

`__reversed__()`

Return reversed sequence using sequence's reverse function

Returns reversed sequence

`__str__()`

Return string using sequence's string function.

Returns sequence's string

`__weakref__`

list of weak references to the object (if defined)

`__evaluate__()`

Creates and returns an iterator which applies all the transformations in the lineage

Returns iterator over the transformed sequence

`__repr_html__()`

Allows IPython render HTML tables :return: First 10 rows of data as an HTML table

`_to_sqlite3_by_query` (*conn, sql*)

Saves the sequence to sqlite3 database by supplied query. Each element should be an iterable which will be expanded to the elements of each row. Target table must be created in advance.

Parameters

- **conn** – path or sqlite connection, cursor
- **sql** – SQL query string

`_to_sqlite3_by_table` (*conn, table_name*)

Saves the sequence to the specified table of sqlite3 database. Each element can be a dictionary, namedtuple, tuple or list. Target table must be created in advance.

Parameters

- **conn** – path or sqlite connection, cursor
- **table_name** – table name string

`_transform` (**transforms*)

Copies the given Sequence and appends new transformation :param transform: transform to apply or list of transforms to apply :return: transformed sequence

`accumulate` (*func=<built-in function add>*)

Accumulate sequence of elements using func. API mirrors itertools.accumulate

```
>>> seq([1, 2, 3]).accumulate(lambda x, y: x + y)
[1, 3, 6]
```

```
>>> seq(['a', 'b', 'c']).accumulate()
['a', 'ab', 'abc']
```

Parameters **func** – two parameter, associative accumulate function

Returns accumulated values using func in sequence

`aggregate` (**args*)

Aggregates the sequence by specified arguments. Its behavior varies depending on if one, two, or three arguments are passed. Assuming the type of the sequence is A:

One Argument: argument specifies a function of the type $f(\text{current: B, next: A} \Rightarrow \text{result: B})$. current represents results computed so far, and next is the next element to aggregate into current in order to return result.

Two Argument: the first argument is the seed value for the aggregation. The second argument is the same as for the one argument case.

Three Argument: the first two arguments are the same as for one and two argument calls. The additional third parameter is a function applied to the result of the aggregation before returning the value.

Parameters **args** – options for how to execute the aggregation

Returns aggregated value

`all` ()

Returns True if the truth value of all items in the sequence true.

```
>>> seq([True, True]).all()
True
```

```
>>> seq([True, False]).all()
False
```

Returns True if all items truth value evaluates to True

any()

Returns True if any element in the sequence has truth value True

```
>>> seq([True, False]).any()
True
```

```
>>> seq([False, False]).any()
False
```

Returns True if any element is True

average (*projection=None*)

Takes the average of elements in the sequence

```
>>> seq([1, 2]).average()
1.5
```

```
>>> seq([('a', 1), ('b', 2)]).average(lambda x: x[1])
```

Parameters **projection** – function to project on the sequence before taking the average

Returns average of elements in the sequence

cache (*delete_lineage=False*)

Caches the result of the Sequence so far. This means that any functions applied on the pipeline before `cache()` are evaluated, and the result is stored in the Sequence. This is primarily used internally and is no more helpful than `to_list()` externally. `delete_lineage` allows for `cache()` to be used in internal initialization calls without the caller having knowledge of the internals via the lineage

Parameters **delete_lineage** – If set to True, it will cache then erase the lineage

cartesian (**iterables, **kwargs*)

Returns the cartesian product of the passed iterables with the specified number of repetitions.

The keyword argument *repeat* is read from *kwargs* to pass to `itertools.cartesian`.

```
>>> seq.range(2).cartesian(range(2))
[(0, 0), (0, 1), (1, 0), (1, 1)]
```

Parameters

- **iterables** – elements for cartesian product
- **kwargs** – the variable *repeat* is read from *kwargs*

Returns cartesian product

count (*func*)

Counts the number of elements in the sequence which satisfy the predicate *func*.

```
>>> seq([-1, -2, 1, 2]).count(lambda x: x > 0)
2
```

Parameters **func** – predicate to count elements on

Returns count of elements that satisfy predicate

count_by_key()

Reduces a sequence of (Key, Value) by counting each key

```
>>> seq([('a', 1), ('b', 2), ('b', 3), ('b', 4), ('c', 3), ('c', 0)]).count_
↳by_key()
[('a', 1), ('b', 3), ('c', 2)]
:return: Sequence of tuples where value is the count of each key
```

count_by_value()

Reduces a sequence of items by counting each unique item

```
>>> seq(['a', 'a', 'a', 'b', 'b', 'c', 'd']).count_by_value()
[('a', 3), ('b', 2), ('c', 1), ('d', 1)]
:return: Sequence of tuples where value is the count of each key
```

dict (*default=None*)

Converts sequence of (Key, Value) pairs to a dictionary.

```
>>> type(seq([('a', 1)]).dict())
dict
```

```
>>> seq([('a', 1), ('b', 2)]).dict()
{'a': 1, 'b': 2}
```

Parameters **default** – Can be a callable zero argument function. When not None, the returned dictionary is a `collections.defaultdict` with `default` as value for missing keys. If the value is not callable, then a zero argument lambda function is created returning the value and used for `collections.defaultdict`

Returns dictionary from sequence of (Key, Value) elements

difference (*other*)

New sequence with unique elements present in sequence but not in other.

```
>>> seq([1, 2, 3]).difference([2, 3, 4])
[1]
```

Parameters **other** – sequence to perform difference with

Returns difference of sequence and other

distinct()

Returns sequence of distinct elements. Elements must be hashable.

```
>>> seq([1, 1, 2, 3, 3, 3, 4]).distinct()
[1, 2, 3, 4]
```

Returns sequence of distinct elements

distinct_by (*func*)

Returns sequence of elements who are distinct by the passed function. The return value of func must be hashable. When two elements are distinct by func, the first is taken.

Parameters **func** – function to use for determining distinctness

Returns elements distinct by func

drop (*n*)

Drop the first n elements of the sequence.

```
>>> seq([1, 2, 3, 4, 5]).drop(2)
[3, 4, 5]
```

Parameters **n** – number of elements to drop

Returns sequence without first n elements

drop_right (*n*)

Drops the last n elements of the sequence.

```
>>> seq([1, 2, 3, 4, 5]).drop_right(2)
[1, 2, 3]
```

Parameters **n** – number of elements to drop

Returns sequence with last n elements dropped

drop_while (*func*)

Drops elements in the sequence while func evaluates to True, then returns the rest.

```
>>> seq([1, 2, 3, 4, 5, 1, 2]).drop_while(lambda x: x < 3)
[3, 4, 5, 1, 2]
```

Parameters **func** – truth returning function

Returns elements including and after func evaluates to False

empty ()

Returns True if the sequence has length zero.

```
>>> seq([]).empty()
True
```

```
>>> seq([1]).empty()
False
```

Returns True if sequence length is zero

enumerate (*start=0*)

Uses python enumerate to to zip the sequence with indexes starting at start.

```
>>> seq(['a', 'b', 'c']).enumerate(start=1)
[(1, 'a'), (2, 'b'), (3, 'c')]
```

Parameters **start** – Beginning of zip

Returns enumerated sequence starting at start

exists (*func*)

Returns True if an element in the sequence makes *func* evaluate to True.

```
>>> seq([1, 2, 3, 4]).exists(lambda x: x == 2)
True
```

```
>>> seq([1, 2, 3, 4]).exists(lambda x: x < 0)
False
```

Parameters *func* – existence check function

Returns True if any element satisfies *func*

filter (*func*)

Filters sequence to include only elements where *func* is True.

```
>>> seq([-1, 1, -2, 2]).filter(lambda x: x > 0)
[1, 2]
```

Parameters *func* – function to filter on

Returns filtered sequence

filter_not (*func*)

Filters sequence to include only elements where *func* is False.

```
>>> seq([-1, 1, -2, 2]).filter_not(lambda x: x > 0)
[-1, -2]
```

Parameters *func* – function to filter_not on

Returns filtered sequence

find (*func*)

Finds the first element of the sequence that satisfies *func*. If no such element exists, then return None.

```
>>> seq(["abc", "ab", "bc"]).find(lambda x: len(x) == 2)
'ab'
```

Parameters *func* – function to find with

Returns first element to satisfy *func* or None

first ()

Returns the first element of the sequence.

```
>>> seq([1, 2, 3]).first()
1
```

Raises `IndexError` when the sequence is empty.

```
>>> seq([]).first()
Traceback (most recent call last):
...
IndexError: list index out of range
```

Returns first element of sequence

flat_map (*func*)

Applies *func* to each element of the sequence, which themselves should be sequences. Then appends each element of each sequence to a final result

```
>>> seq([[1, 2], [3, 4], [5, 6]]).flat_map(lambda x: x)
[1, 2, 3, 4, 5, 6]
```

```
>>> seq(["a", "bc", "def"]).flat_map(list)
['a', 'b', 'c', 'd', 'e', 'f']
```

```
>>> seq([[1], [2], [3]]).flat_map(lambda x: x * 2)
[1, 1, 2, 2, 3, 3]
```

Parameters **func** – function to apply to each sequence in the sequence

Returns application of *func* to elements followed by flattening

flatten ()

Flattens a sequence of sequences to a single sequence of elements.

```
>>> seq([[1, 2], [3, 4], [5, 6]])
[1, 2, 3, 4, 5, 6]
```

Returns flattened sequence

fold_left (*zero_value, func*)

Assuming that the sequence elements are of type A, folds from left to right starting with the seed value given by *zero_value* (of type A) using a function of type *func*(*current*: B, *next*: A) => B. *current* represents the folded value so far and *next* is the next element from the sequence to fold into *current*.

```
>>> seq('a', 'b', 'c').fold_left(['start'], lambda current, next: current +
↳ [next])
['start', 'a', 'b', 'c']
```

Parameters

- **zero_value** – zero value to reduce into
- **func** – Two parameter function as described by function docs

Returns value from folding values with *func* into *zero_value* from left to right.

fold_right (*zero_value, func*)

Assuming that the sequence elements are of type A, folds from right to left starting with the seed value given by *zero_value* (of type A) using a function of type *func*(*next*: A, *current*: B) => B. *current* represents the folded value so far and *next* is the next element from the sequence to fold into *current*.


```
>>> seq('a', 'b', 'c').fold_left(['start'], lambda next, current: current +
↳ [next])
['start', 'c', 'b', 'a']
```

Parameters

- **zero_value** – zero value to reduce into
- **func** – Two parameter function as described by function docs

Returns value from folding values with func into zero_value from right to left

for_all (*func*)

Returns True if all elements in sequence make func evaluate to True.

```
>>> seq([1, 2, 3]).for_all(lambda x: x > 0)
True
```

```
>>> seq([1, 2, -1]).for_all(lambda x: x > 0)
False
```

Parameters **func** – function to check truth value of all elements with

Returns True if all elements make func evaluate to True

for_each (*func*)

Executes func on each element of the sequence.

```
>>> l = []
>>> seq([1, 2, 3, 4]).for_each(l.append)
>>> l
[1, 2, 3, 4]
```

Parameters **func** – function to execute

group_by (*func*)

Group elements into a list of (Key, Value) tuples where func creates the key and maps to values matching that key.

```
>>> seq(["abc", "ab", "z", "f", "qw"]).group_by(len)
[(1, ['z', 'f']), (2, ['ab', 'qw']), (3, ['abc'])]
```

Parameters **func** – group by result of this function

Returns grouped sequence

group_by_key ()

Group sequence of (Key, Value) elements by Key.

```
>>> seq([('a', 1), ('b', 2), ('b', 3), ('b', 4), ('c', 3), ('c', 0)]).group_
↳ by_key()
[('a', [1]), ('c', [3, 0]), ('b', [2, 3, 4])]
```

Returns sequence grouped by key

grouped (*size*)

Partitions the elements into groups of length *size*.

```
>>> seq([1, 2, 3, 4, 5, 6, 7, 8]).grouped(2)
[[1, 2], [3, 4], [5, 6], [7, 8]]
```

```
>>> seq([1, 2, 3, 4, 5, 6, 7, 8]).grouped(3)
[[1, 2, 3], [4, 5, 6], [7, 8]]
```

The last partition has at least one element but may have less than *size* elements.

Parameters *size* – size of the partitions

Returns sequence partitioned into groups of length *size*

head ()

Returns the first element of the sequence.

```
>>> seq([1, 2, 3]).head()
1
```

Raises `IndexError` when the sequence is empty.

```
>>> seq([]).head()
Traceback (most recent call last):
...
IndexError: list index out of range
```

Returns first element of sequence

head_option ()

Returns the first element of the sequence or `None`, if the sequence is empty.

```
>>> seq([1, 2, 3]).head_option()
1
```

```
>>> seq([]).head_option()
None
```

Returns first element of sequence or `None` if sequence is empty

init ()

Returns the sequence, without its last element.

```
>>> seq([1, 2, 3]).init()
[1, 2]
```

Returns sequence without last element

inits ()

Returns consecutive inits of the sequence.

```
>>> seq([1, 2, 3]).inits()
[[1, 2, 3], [1, 2], [1], []]
```

Returns consecutive `init`(s) on sequence

inner_join (*other*)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. Will return only elements where the key exists in both sequences.

```
>>> seq([('a', 1), ('b', 2), ('c', 3)]).inner_join([('a', 2), ('c', 5)])
[('a', (1, 2)), ('c', (3, 5))]
```

Parameters *other* – sequence to join with

Returns joined sequence of (K, (V, W)) pairs

intersection (*other*)

New sequence with unique elements present in sequence and other.

```
>>> seq([1, 1, 2, 3]).intersection([2, 3, 4])
[2, 3]
```

Parameters *other* – sequence to perform intersection with

Returns intersection of sequence and other

join (*other*, *join_type='inner'*)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. If *join_type* is “left”, V values will always be present, W values may be present or None. If *join_type* is “right”, W values will always be present, V values may be present or None. If *join_type* is “outer”, V or W may be present or None, but never at the same time.

```
>>> seq([('a', 1), ('b', 2), ('c', 3)]).join([('a', 2), ('c', 5)], "inner")
[('a', (1, 2)), ('c', (3, 5))]
```

```
>>> seq([('a', 1), ('b', 2), ('c', 3)]).join([('a', 2), ('c', 5)])
[('a', (1, 2)), ('c', (3, 5))]
```

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)], "left")
[('a', (1, 3)), ('b', (2, None))]
```

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)], "right")
[('a', (1, 3)), ('c', (None, 4))]
```

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)], "outer")
[('a', (1, 3)), ('b', (2, None)), ('c', (None, 4))]
```

Parameters

- **other** – sequence to join with
- **join_type** – specifies *join_type*, may be “left”, “right”, or “outer”

Returns side joined sequence of (K, (V, W)) pairs

last ()

Returns the last element of the sequence.

```
>>> seq([1, 2, 3]).last()
3
```

Raises `IndexError` when the sequence is empty.

```
>>> seq([]).last()
Traceback (most recent call last):
...
IndexError: list index out of range
```

Returns last element of sequence

`last_option()`

Returns the last element of the sequence or `None`, if the sequence is empty.

```
>>> seq([1, 2, 3]).last_option()
3
```

```
>>> seq([]).last_option()
None
```

Returns last element of sequence or `None` if sequence is empty

`left_join(other)`

Sequence and other must be composed of (Key, Value) pairs. If `self.sequence` contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. V values will always be present, W values may be present or `None`.

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)])
[('a', (1, 3)), ('b', (2, None))]
```

Parameters `other` – sequence to join with

Returns left joined sequence of (K, (V, W)) pairs

`len()`

Return length of sequence using its length function.

```
>>> seq([1, 2, 3]).len()
3
```

Returns length of sequence

`list (n=None)`

Converts sequence to list of elements.

```
>>> type(seq([]).list())
list
```

```
>>> type(seq([]))
functional.pipeline.Sequence
```

```
>>> seq([1, 2, 3]).list()
[1, 2, 3]
```

Parameters *n* – Take *n* elements of sequence if not None

Returns list of elements in sequence

make_string (*separator*)

Concatenate the elements of the sequence into a string separated by separator.

```
>>> seq([1, 2, 3]).make_string("@")
'1@2@3'
```

Parameters *separator* – string separating elements in string

Returns concatenated string separated by separator

map (*func*)

Maps *f* onto the elements of the sequence.

```
>>> seq([1, 2, 3, 4]).map(lambda x: x * -1)
[-1, -2, -3, -4]
```

Parameters *func* – function to map with

Returns sequence with *func* mapped onto it

max ()

Returns the largest element in the sequence. If the sequence has multiple maximal elements, only the first one is returned.

The compared objects must have defined comparison methods. Raises `TypeError` when the objects are not comparable.

The sequence can not be empty. Raises `ValueError` when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).max()
5
```

```
>>> seq('aa', 'xyz', 'abcd', 'xy').max()
'xyz'
```

```
>>> seq([1, "a"]).max()
Traceback (most recent call last):
...
TypeError: unorderable types: int() < str()
```

```
>>> seq([]).max()
Traceback (most recent call last):
...
ValueError: max() arg is an empty sequence
```

Returns Maximal value of sequence

max_by (*func*)

Returns the largest element in the sequence. Provided function is used to generate key used to compare the elements. If the sequence has multiple maximal elements, only the first one is returned.

The sequence can not be empty. Raises ValueError when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).max_by(lambda num: num % 4)
3
```

```
>>> seq('aa', 'xyz', 'abcd', 'xyy').max_by(len)
'abcd'
```

```
>>> seq([]).max_by(lambda x: x)
Traceback (most recent call last):
...
ValueError: max() arg is an empty sequence
```

Parameters *func* – function to compute max by

Returns Maximal element by func(element)

min ()

Returns the smallest element in the sequence. If the sequence has multiple minimal elements, only the first one is returned.

The compared objects must have defined comparison methods. Raises TypeError when the objects are not comparable.

The sequence can not be empty. Raises ValueError when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).min()
1
```

```
>>> seq('aa', 'xyz', 'abcd', 'xyy').min()
'aa'
```

```
>>> seq([1, "a"]).min()
Traceback (most recent call last):
...
TypeError: unorderable types: int() < str()
```

```
>>> seq([]).min()
Traceback (most recent call last):
...
ValueError: min() arg is an empty sequence
```

Returns Minimal value of sequence

min_by (*func*)

Returns the smallest element in the sequence. Provided function is used to generate key used to compare the elements. If the sequence has multiple minimal elements, only the first one is returned.

The sequence can not be empty. Raises ValueError when the sequence is empty.

```
>>> seq([2, 4, 5, 1, 3]).min_by(lambda num: num % 6)
5
```

```
>>> seq('aa', 'xyz', 'abcd', 'xyy').min_by(len)
'aa'
```

```
>>> seq([]).min_by(lambda x: x)
Traceback (most recent call last):
...
ValueError: min() arg is an empty sequence
```

Parameters **func** – function to compute min by

Returns Maximal element by func(element)

non_empty()

Returns True if the sequence does not have length zero.

```
>>> seq([]).non_empty()
False
```

```
>>> seq([1]).non_empty()
True
```

Returns True if sequence length is not zero

order_by(func)

Orders the input according to func

```
>>> seq([(2, 'a'), (1, 'b'), (4, 'c'), (3, 'd')]).order_by(lambda x: x[0])
[1, 2, 3, 4]
```

Parameters **func** – order by function

Returns ordered sequence

outer_join(other)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. One of V or W will always be not None, but the other may be None

```
>>> seq([('a', 1), ('b', 2)]).outer_join([('a', 3), ('c', 4)], "outer")
[('a', (1, 3)), ('b', (2, None)), ('c', (None, 4))]
```

Parameters **other** – sequence to join with

Returns outer joined sequence of (K, (V, W)) pairs

partition(func)

Partition the sequence based on satisfying the predicate func.

```
>>> seq([-1, 1, -2, 2]).partition(lambda x: x < 0)
([-1, -2], [1, 2])
```

Parameters **func** – predicate to partition on

Returns tuple of partitioned sequences

product (*projection=None*)

Takes product of elements in sequence.

```
>>> seq([1, 2, 3, 4]).product()
24
```

```
>>> seq([]).product()
1
```

```
>>> seq([(1, 2), (1, 3), (1, 4)]).product(lambda x: x[0])
1
```

Parameters **projection** – function to project on the sequence before taking the product

Returns product of elements in sequence

reduce (*func, *initial*)

Reduce sequence of elements using func. API mirrors functools.reduce

```
>>> seq([1, 2, 3]).reduce(lambda x, y: x + y)
6
```

Parameters

- **func** – two parameter, associative reduce function
- **initial** – single optional argument acting as initial value

Returns reduced value using func

reduce_by_key (*func*)

Reduces a sequence of (Key, Value) using func on each sequence of values.

```
>>> seq([('a', 1), ('b', 2), ('b', 3), ('b', 4), ('c', 3), ('c', 0)])
↳ .reduce_by_key(lambda x, y: x + y)
[('a', 1), ('c', 3), ('b', 9)]
```

Parameters **func** – reduce each list of values using two parameter, associative func

Returns Sequence of tuples where the value is reduced with func

reverse ()

Returns the reversed sequence.

```
>>> seq([1, 2, 3]).reverse()
[3, 2, 1]
```

Returns reversed sequence

right_join (*other*)

Sequence and other must be composed of (Key, Value) pairs. If self.sequence contains (K, V) pairs and other contains (K, W) pairs, the return result is a sequence of (K, (V, W)) pairs. W values will always be present, V values may be present or None.

```
>>> seq([('a', 1), ('b', 2)]).join([('a', 3), ('c', 4)])
[('a', (1, 3)), ('b', (2, None))]
```


Parameters **other** – sequence to join with

Returns right joined sequence of (K, (V, W)) pairs

select (*func*)

Selects *f* from the elements of the sequence.

```
>>> seq([1, 2, 3, 4]).select(lambda x: x * -1)
[-1, -2, -3, -4]
```

Parameters **func** – function to select with

Returns sequence with *func* mapped onto it

sequence

Alias for `to_list` used internally for brevity

Returns result of `to_list()` on sequence

set ()

Converts sequence to a set of elements.

```
>>> type(seq([])).to_set()
set
```

```
>>> type(seq([]))
functional.pipeline.Sequence
```

```
>>> seq([1, 1, 2, 2]).set()
{1, 2}
```

:return:set of elements in sequence

show (*n=10, headers=(), tablefmt='simple', floatfmt='g', numalign='decimal', stralign='left', missingval=""*)

Pretty print first *n* rows of sequence as a table. See <https://bitbucket.org/astanin/python-tabulate> for details on tabulate parameters

Parameters

- **n** – Number of rows to show
- **headers** – Passed to tabulate
- **tablefmt** – Passed to tabulate
- **floatfmt** – Passed to tabulate
- **numalign** – Passed to tabulate
- **stralign** – Passed to tabulate
- **missingval** – Passed to tabulate

size ()

Return size of sequence using its length function.

Returns size of sequence

slice (*start, until*)

Takes a slice of the sequence starting at *start* and *until* but not including *until*.

```
>>> seq([1, 2, 3, 4]).slice(1, 2)
[2]
>>> seq([1, 2, 3, 4]).slice(1, 3)
[2, 3]
```

Parameters

- **start** – starting index
- **until** – ending index

Returns slice including start until but not including until

sliding (*size, step=1*)

Groups elements in fixed size blocks by passing a sliding window over them.

The last window has at least one element but may have less than size elements

Parameters

- **size** – size of sliding window
- **step** – step size between windows

Returns sequence of sliding windows

smap (*func*)

Alias to Sequence.starmap

starmaps f onto the sequence as itertools.starmap does.

```
>>> seq([(2, 3), (-2, 1), (0, 10)]).smap(lambda x, y: x + y)
[5, -1, 10]
```

Parameters **func** – function to starmap with

Returns sequence with func starmapped onto it

sorted (*key=None, reverse=False*)

Uses python sort and its passed arguments to sort the input.

```
>>> seq([2, 1, 4, 3]).sorted()
[1, 2, 3, 4]
```

Parameters

- **key** – sort using key function
- **reverse** – return list reversed or not

Returns sorted sequence

starmap (*func*)

starmaps f onto the sequence as itertools.starmap does.

```
>>> seq([(2, 3), (-2, 1), (0, 10)]).starmap(lambda x, y: x + y)
[5, -1, 10]
```

Parameters **func** – function to starmap with

Returns sequence with func starmapped onto it

sum (*projection=None*)

Takes sum of elements in sequence.

```
>>> seq([1, 2, 3, 4]).sum()
10
```

```
>>> seq([(1, 2), (1, 3), (1, 4)]).sum(lambda x: x[0])
3
```

Parameters **projection** – function to project on the sequence before taking the sum

Returns sum of elements in sequence

symmetric_difference (*other*)

New sequence with elements in either sequence or other, but not both.

```
>>> seq([1, 2, 3, 3]).symmetric_difference([2, 4, 5])
[1, 3, 4, 5]
```

Parameters **other** – sequence to perform symmetric difference with

Returns symmetric difference of sequence and other

tabulate (*n=None, headers=(), tablefmt='simple', floatfmt='g', numalign='decimal', stralign='left', missingval=""*)

Return pretty string table of first n rows of sequence or everything if n is None. See <https://bitbucket.org/astanin/python-tabulate> for details on tabulate parameters

Parameters

- **n** – Number of rows to show, if set to None return all rows
- **headers** – Passed to tabulate
- **tablefmt** – Passed to tabulate
- **floatfmt** – Passed to tabulate
- **numalign** – Passed to tabulate
- **stralign** – Passed to tabulate
- **missingval** – Passed to tabulate

tail ()

Returns the sequence, without its first element.

```
>>> seq([1, 2, 3]).tail()
[2, 3]
```

Returns sequence without first element

tails ()

Returns consecutive tails of the sequence.

```
>>> seq([1, 2, 3]).tails()
[[1, 2, 3], [2, 3], [3], []]
```

Returns consecutive tail()s of the sequence

take (*n*)

Take the first *n* elements of the sequence.

```
>>> seq([1, 2, 3, 4]).take(2)
[1, 2]
```

Parameters *n* – number of elements to take

Returns first *n* elements of sequence

take_while (*func*)

Take elements in the sequence until *func* evaluates to False, then return them.

```
>>> seq([1, 2, 3, 4, 5, 1, 2]).take_while(lambda x: x < 3)
[1, 2]
```

Parameters *func* – truth returning function

Returns elements taken until *func* evaluates to False

to_csv (*path*, *mode*='wt', *dialect*='excel', *compression*=None, *newline*=", ***fmtparams*)

Saves the sequence to a csv file. Each element should be an iterable which will be expanded to the elements of each row.

Parameters

- **path** – path to write file
- **mode** – file open mode
- **dialect** – passed to csv.writer
- **fmtparams** – passed to csv.writer

to_dict (*default*=None)

Converts sequence of (Key, Value) pairs to a dictionary.

```
>>> type(seq([('a', 1)].to_dict())
dict
```

```
>>> seq([('a', 1), ('b', 2)].to_dict())
{'a': 1, 'b': 2}
```

Parameters **default** – Can be a callable zero argument function. When not None, the returned dictionary is a collections.defaultdict with default as value for missing keys. If the value is not callable, then a zero argument lambda function is created returning the value and used for collections.defaultdict

Returns dictionary from sequence of (Key, Value) elements

to_file (*path*, *delimiter*=None, *mode*='wt', *buffering*=-1, *encoding*=None, *errors*=None, *newline*=None, *compresslevel*=9, *format*=None, *check*=-1, *preset*=None, *filters*=None, *compression*=None)

Saves the sequence to a file by executing str(self) which becomes str(self.to_list()). If delimiter is defined will instead execute self.make_string(delimiter)

Parameters

- **path** – path to write file
- **delimiter** – if defined, will call `make_string(delimiter)` and save that to file.
- **mode** – file open mode
- **buffering** – passed to `builtins.open`
- **encoding** – passed to `builtins.open`
- **errors** – passed to `builtins.open`
- **newline** – passed to `builtins.open`
- **compression** – compression format
- **compresslevel** – passed to `gzip.open`
- **format** – passed to `lzma.open`
- **check** – passed to `lzma.open`
- **preset** – passed to `lzma.open`
- **filters** – passed to `lzma.open`

to_json (*path*, *root_array=True*, *mode='wt'*, *compression=None*)

Saves the sequence to a json file. If `root_array` is `True`, then the sequence will be written to json with an array at the root. If it is `False`, then the sequence will be converted from a sequence of (Key, Value) pairs to a dictionary so that the json root is a dictionary.

Parameters

- **path** – path to write file
- **root_array** – write json root as an array or dictionary
- **mode** – file open mode

to_jsonl (*path*, *mode='wb'*, *compression=None*)

Saves the sequence to a jsonl file. Each element is mapped using `json.dumps` then written with a newline separating each element.

Parameters

- **path** – path to write file
- **mode** – mode to write in, defaults to 'w' to overwrite contents
- **compression** – compression format

to_list (*n=None*)

Converts sequence to list of elements.

```
>>> type(seq([]).to_list())
list
```

```
>>> type(seq([]))
functional.pipeline.Sequence
```

```
>>> seq([1, 2, 3]).to_list()
[1, 2, 3]
```

Parameters *n* – Take *n* elements of sequence if not `None`

Returns list of elements in sequence

to_pandas (*columns=None*)

Converts sequence to a pandas DataFrame using pandas.DataFrame.from_records

Parameters **columns** – columns for pandas to use

Returns DataFrame of sequence

to_set ()

Converts sequence to a set of elements.

```
>>> type(seq([])).to_set()
set
```

```
>>> type(seq([]))
functional.pipeline.Sequence
```

```
>>> seq([1, 1, 2, 2]).to_set()
{1, 2}
```

:return:set of elements in sequence

to_sqlite3 (*conn, target, *args, **kwargs*)

Saves the sequence to sqlite3 database. Target table must be created in advance. The table schema is inferred from the elements in the sequence if only target table name is supplied.

```
>>> seq([(1, 'Tom'), (2, 'Jack')]).to_sqlite3('users.db',
↳ 'INSERT INTO user (id, name) VALUES (?, ?)')
```

```
>>> seq([{'id': 1, 'name': 'Tom'}, {'id': 2, 'name': 'Jack'}]).to_
↳ sqlite3(conn, 'user')
```

Parameters

- **conn** – path or sqlite connection, cursor
- **target** – SQL query string or table name
- **args** – passed to sqlite3.connect
- **kwargs** – passed to sqlite3.connect

union (*other*)

New sequence with unique elements from self and other.

```
>>> seq([1, 1, 2, 3, 3]).union([1, 4, 5])
[1, 2, 3, 4, 5]
```

Parameters **other** – sequence to union with

Returns union of sequence and other

where (*func*)

Selects elements where func evaluates to True.

```
>>> seq([-1, 1, -2, 2]).where(lambda x: x > 0)
[1, 2]
```

Parameters **func** – function to filter on

Returns filtered sequence

zip (*sequence*)

Zips the stored sequence with the given sequence.

```
>>> seq([1, 2, 3]).zip([4, 5, 6])
[(1, 4), (2, 5), (3, 6)]
```

Parameters **sequence** – second sequence to zip

Returns stored sequence zipped with given sequence

zip_with_index (*start=0*)

Zips the sequence to its index, with the index being the second element of each tuple.

```
>>> seq(['a', 'b', 'c']).zip_with_index()
[('a', 0), ('b', 1), ('c', 2)]
```

Returns sequence zipped to its index

`functional.pipeline._wrap` (*value*)

Wraps the passed value in a Sequence if it is not a primitive. If it is a string argument it is expanded to a list of characters.

```
>>> _wrap(1)
1
```

```
>>> _wrap("abc")
['a', 'b', 'c']
```

```
>>> type(_wrap([1, 2]))
functional.pipeline.Sequence
```

Parameters **value** – value to wrap

Returns wrapped or not wrapped value

`functional.pipeline.extend` (*func=None, aslist=False, final=False, name=None, parallel=False*)

Function decorator for adding new methods to the Sequence class.

```
>>> @extend()
def zip2(it):
    return [(i,i) for i in it]
```

```
>>> seq.range(3).zip2()
[(0, 0), (1, 1), (2, 2)]
```

```
>>> @extend(aslist=True)
def zip2(it):
    return zip(it,it)
```

```
>>> seq.range(3).zip2()
[(0, 0), (1, 1), (2, 2)]
```

```
>>> @extend(final=True)
def make_set(it):
    return set(it)
```

```
>>> r = seq([0,1,1]).make_set()
>>> r
{0, 1}
```

```
>>> type(r)
<class 'set'>
```

Parameters

- **func** – function to decorate
- **aslist** – if True convert input sequence to list (default False)
- **final** – If True decorated function does not return a sequence. Useful for creating functions such as `to_list`.
- **name** – name of the function (default function definition name)
- **parallel** – if true the function is executed in parallel execution strategy (default False)

1.2.3 functional.lineage

class `functional.lineage.Lineage` (*prior_lineage=None, engine=None*)

Bases: `object`

Class for tracking the lineage of transformations, and applying them to a given sequence.

__dict__ = `mappingproxy({'__module__': 'functional.lineage', '__doc__': '\n Class fo`

__getitem__ (*item*)

Return specific transformation in lineage. :param item: Transformation to retrieve :return: Requested transformation

__init__ (*prior_lineage=None, engine=None*)

Construct an empty lineage if *prior_lineage* is None or if its not use it as the list of current transformations

Parameters *prior_lineage* – Lineage object to inherit

Returns new Lineage object

__len__ ()

Number of transformations in lineage

Returns number of transformations

__module__ = 'functional.lineage'

__repr__ ()

Returns readable representation of Lineage

Returns readable Lineage

__weakref__

list of weak references to the object (if defined)

apply (*transform*)

Add the transformation to the lineage :param transform: Transformation to apply

cache_scan ()

Scan the lineage for the index of the most recent cache. :return: Index of most recent cache

evaluate (*sequence*)

Compute the lineage on the sequence.

Parameters **sequence** – Sequence to compute

Returns Evaluated sequence

1.2.4 functional.transformations

`functional.transformations.CACHE_T = Transformation(name='cache', function=None, execution_strategies=)`
Cache transformation

class `functional.transformations.Transformation` (*name, function, execution_strategies*)
Bases: tuple

Defines a Transformation from a name, function, and execution_strategies

`__getnewargs__` ()

Return self as a plain tuple. Used by copy and pickle.

`__module__` = `'functional.transformations'`

static `__new__` (*_cls, name, function, execution_strategies*)

Create new instance of Transformation(name, function, execution_strategies)

`__repr__` ()

Return a nicely formatted representation string

`__slots__` = ()

`__asdict` ()

Return a new OrderedDict which maps field names to their values.

`_fields` = (`'name'`, `'function'`, `'execution_strategies'`)

`_fields_defaults` = {}

classmethod `_make` (*iterable*)

Make a new Transformation object from a sequence or iterable

`_replace` (***kws*)

Return a new Transformation object replacing specified fields with new values

execution_strategies

Alias for field number 2

function

Alias for field number 1

name

Alias for field number 0

`functional.transformations.accumulate_impl` (*func, sequence*)

Implementation for accumulate :param sequence: sequence to accumulate :param func: accumulate function

`functional.transformations.accumulate_t` (*func*)

Transformation for Sequence.accumulate

`functional.transformations.cartesian_t` (*iterables, repeat*)

Transformation for Sequence.cartesian :param iterables: elements for cartesian product :param repeat: how many times to repeat iterables :return: transformation

`functional.transformations.count_by_key_impl` (*sequence*)
Implementation for `count_by_key_t` :param sequence: sequence of (key, value) pairs :return: counts by key

`functional.transformations.count_by_key_t` ()
Transformation for `Sequence.count_by_key` :return: transformation

`functional.transformations.count_by_value_impl` (*sequence*)
Implementation for `count_by_value_t` :param sequence: sequence of values :return: counts by value

`functional.transformations.count_by_value_t` ()
Transformation for `Sequence.count_by_value` :return: transformation

`functional.transformations.difference_t` (*other*)
Transformation for `Sequence.difference` :param other: sequence to different with :return: transformation

`functional.transformations.distinct_by_t` (*func*)
Transformation for `Sequence.distinct_by` :param func: distinct_by function :return: transformation

`functional.transformations.distinct_t` ()
Transformation for `Sequence.distinct` :return: transformation

`functional.transformations.drop_right_t` (*n*)
Transformation for `Sequence.drop_right` :param n: number to drop from right :return: transformation

`functional.transformations.drop_t` (*n*)
Transformation for `Sequence.drop` :param n: number to drop from left :return: transformation

`functional.transformations.drop_while_t` (*func*)
Transformation for `Sequence.drop_while` :param func: drops while func is true :return: transformation

`functional.transformations.enumerate_t` (*start*)
Transformation for `Sequence.enumerate` :param start: start index for enumerate :return: transformation

`functional.transformations.filter_not_t` (*func*)
Transformation for `Sequence.filter_not` :param func: filter_not function :return: transformation

`functional.transformations.filter_t` (*func*)
Transformation for `Sequence.filter` :param func: filter function :return: transformation

`functional.transformations.flat_map_impl` (*func, sequence*)
Implementation for `flat_map_t` :param func: function to map :param sequence: sequence to flat_map over :return: flat_map generator

`functional.transformations.flat_map_t` (*func*)
Transformation for `Sequence.flat_map` :param func: function to flat_map :return: transformation

`functional.transformations.flatten_t` ()
Transformation for `Sequence.flatten` :return: transformation

`functional.transformations.group_by_impl` (*func, sequence*)
Implementation for `group_by_t` :param func: grouping function :param sequence: sequence to group :return: grouped sequence

`functional.transformations.group_by_key_impl` (*sequence*)
Implementation for `group_by_key_t` :param sequence: sequence to group :return: grouped sequence

`functional.transformations.group_by_key_t` ()
Transformation for `Sequence.group_by_key` :return: transformation

`functional.transformations.group_by_t` (*func*)
Transformation for `Sequence.group_by` :param func: grouping function :return: transformation

`functional.transformations.grouped_impl` (*wrap, size, sequence*)
 Implementation for `grouped_t` :param wrap: wrap children values with this :param size: size of groups :param sequence: sequence to group :return: grouped sequence

`functional.transformations.grouped_t` (*wrap, size*)
 Transformation for `Sequence.grouped` :param wrap: wrap children values with this :param size: size of groups :return: transformation

`functional.transformations.init_t` ()
 Transformation for `Sequence.init` :return: transformation

`functional.transformations.inits_t` (*wrap*)
 Transformation for `Sequence.inits` :param wrap: wrap children values with this :return: transformation

`functional.transformations.inner_join_impl` (*other, sequence*)
 Implementation for part of `join_impl` :param other: other sequence to join with :param sequence: first sequence to join with :return: joined sequence

`functional.transformations.intersection_t` (*other*)
 Transformation for `Sequence.intersection` :param other: sequence to intersect with :return: transformation

`functional.transformations.join_impl` (*other, join_type, sequence*)
 Implementation for `join_t` :param other: other sequence to join with :param join_type: join type (inner, outer, left, right) :param sequence: first sequence to join with :return: joined sequence

`functional.transformations.join_t` (*other, join_type*)
 Transformation for `Sequence.join`, `Sequence.inner_join`, `Sequence.outer_join`, `Sequence.right_join`, and `Sequence.left_join` :param other: other sequence to join with :param join_type: join type from left, right, inner, and outer :return: transformation

`functional.transformations.map_t` (*func*)
 Transformation for `Sequence.map` :param func: map function :return: transformation

`functional.transformations.name` (*function*)
 Retrieve a pretty name for the function :param function: function to get name from :return: pretty name

`functional.transformations.order_by_t` (*func*)
 Transformation for `Sequence.order_by` :param func: order_by function :return: transformation

`functional.transformations.partition_impl` (*wrap, predicate, sequence*)

`functional.transformations.partition_t` (*wrap, func*)
 Transformation for `Sequence.partition` :param wrap: wrap children values with this :param func: partition function :return: transformation

`functional.transformations.reduce_by_key_impl` (*func, sequence*)
 Implementation for `reduce_by_key_t` :param func: reduce function :param sequence: sequence to reduce :return: reduced sequence

`functional.transformations.reduce_by_key_t` (*func*)
 Transformation for `Sequence.reduce_by_key` :param func: reduce function :return: transformation

`functional.transformations.reversed_t` ()
 Transformation for `Sequence.reverse` :return: transformation

`functional.transformations.select_t` (*func*)
 Transformation for `Sequence.select` :param func: select function :return: transformation

`functional.transformations.slice_t` (*start, until*)
 Transformation for `Sequence.slice` :param start: start index :param until: until index (does not include element at until) :return: transformation

`functional.transformations.sliding_impl` (*wrap, size, step, sequence*)
Implementation for `sliding_t` :param wrap: wrap children values with this :param size: size of window :param step: step size :param sequence: sequence to create sliding windows from :return: sequence of sliding windows

`functional.transformations.sliding_t` (*wrap, size, step*)
Transformation for `Sequence.sliding` :param wrap: wrap children values with this :param size: size of window :param step: step size :return: transformation

`functional.transformations.sorted_t` (*key=None, reverse=False*)
Transformation for `Sequence.sorted` :param key: key to sort by :param reverse: reverse or not :return: transformation

`functional.transformations.starmap_t` (*func*)
Transformation for `Sequence.starmap` and `Sequence.smap` :param func: starmap function :return: transformation

`functional.transformations.symmetric_difference_t` (*other*)
Transformation for `Sequence.symmetric_difference` :param other: sequence to `symmetric_difference` with :return: transformation

`functional.transformations.tail_t` ()
Transformation for `Sequence.tail` :return: transformation

`functional.transformations.tails_t` (*wrap*)
Transformation for `Sequence.tails` :param wrap: wrap children values with this :return: transformation

`functional.transformations.take_t` (*n*)
Transformation for `Sequence.take` :param n: number to take :return: transformation

`functional.transformations.take_while_t` (*func*)
Transformation for `Sequence.take_while` :param func: takes while func is True :return: transformation

`functional.transformations.union_t` (*other*)
Transformation for `Sequence.union` :param other: sequence to union with :return: transformation

`functional.transformations.where_t` (*func*)
Transformation for `Sequence.where` :param func: where function :return: transformation

`functional.transformations.zip_t` (*zip_sequence*)
Transformation for `Sequence.zip` :param zip_sequence: sequence to zip with :return: transformation

`functional.transformations.zip_with_index_t` (*start*)
Transformation for `Sequence.zip_with_index` :return: transformation

1.2.5 functional.util

`functional.util.compose` (**functions*)
Compose all the function arguments together :param functions: Functions to compose :return: Single composed function

`functional.util.compute_partition_size` (*result, processes*)
Attempts to compute the partition size to evenly distribute work across processes. Defaults to 1 if the length of result cannot be determined.

Parameters

- **result** – Result to compute on
- **processes** – Number of processes to use

Returns Best partition size

`functional.util.identity` (*arg*)

Function which returns the argument. Used as a default lambda function.

```
>>> obj = object()
>>> obj is identity(obj)
True
```

Parameters *arg* – object to take identity of

Returns return *arg*

`functional.util.is_iterable` (*val*)

Check if *val* is not a list, but is a `collections.Iterable` type. This is used to determine when `list()` should be called on *val*

```
>>> l = [1, 2]
>>> is_iterable(l)
False
>>> is_iterable(iter(l))
True
```

Parameters *val* – value to check

Returns True if it is not a list, but is a `collections.Iterable`

`functional.util.is_namedtuple` (*val*)

Use Duck Typing to check if *val* is a named tuple. Checks that *val* is of type `tuple` and contains the attribute `_fields` which is defined for named tuples.
:param *val*: value to check type of
:return: True if *val* is a `namedtuple`

`functional.util.is_primitive` (*val*)

Checks if the passed value is a primitive type.

```
>>> is_primitive(1)
True
```

```
>>> is_primitive("abc")
True
```

```
>>> is_primitive(True)
True
```

```
>>> is_primitive({})
False
```

```
>>> is_primitive([])
False
```

```
>>> is_primitive(set([]))
```

Parameters *val* – value to check

Returns True if value is a primitive, else False

`functional.util.is_tabulatable` (*val*)

`functional.util.lazy_parallelize` (*func, result, processes=None, partition_size=None*)

Lazily computes an iterable in parallel, and returns them in pool chunks :param func: Function to apply :param result: Data to apply to :param processes: Number of processes to use in parallel :param partition_size: Size of partitions for each parallel process :return: Iterable of chunks where each chunk as func applied to it

`functional.util.pack` (*func, args*)

Pack a function and the args it should be applied to :param func: Function to apply :param args: Args to evaluate with :return: Packed (func, args) tuple

`functional.util.parallelize` (*func, result, processes=None, partition_size=None*)

Creates an iterable which is lazily computed in parallel from applying func on result :param func: Function to apply :param result: Data to apply to :param processes: Number of processes to use in parallel :param partition_size: Size of partitions for each parallel process :return: Iterable of applying func on result

`functional.util.split_every` (*parts, iterable*)

Split an iterable into parts of length parts

```
>>> l = iter([1, 2, 3, 4])
>>> split_every(2, l)
[[1, 2], [3, 4]]
```

Parameters

- **iterable** – iterable to split
- **parts** – number of chunks

Returns return the iterable split in parts

`functional.util.unpack` (*packed*)

Unpack the function and args then apply the function to the arguments and return result :param packed: input packed tuple of (func, args) :return: result of applying packed function on packed args

f

`functional.lineage`, 52

`functional.pipeline`, 5

`functional.streams`, 3

`functional.transformations`, 53

`functional.util`, 56

Symbols

- `__add__()` (*functional.pipeline.Sequence* method), 29
- `__bool__()` (*functional.pipeline.Sequence* method), 29
- `__call__()` (*functional.streams.ParallelStream* method), 26
- `__call__()` (*functional.streams.Stream* method), 27
- `__contains__()` (*functional.pipeline.Sequence* method), 29
- `__dict__` (*functional.lineage.Lineage* attribute), 52
- `__dict__` (*functional.pipeline.Sequence* attribute), 29
- `__dict__` (*functional.streams.Stream* attribute), 27
- `__eq__()` (*functional.pipeline.Sequence* method), 29
- `__getitem__()` (*functional.lineage.Lineage* method), 52
- `__getitem__()` (*functional.pipeline.Sequence* method), 29
- `__getnewargs__()` (*functional.transformations.Transformation* method), 53
- `__hash__()` (*functional.pipeline.Sequence* method), 29
- `__init__()` (*functional.lineage.Lineage* method), 52
- `__init__()` (*functional.pipeline.Sequence* method), 30
- `__init__()` (*functional.streams.ParallelStream* method), 26
- `__init__()` (*functional.streams.Stream* method), 27
- `__iter__()` (*functional.pipeline.Sequence* method), 30
- `__len__()` (*functional.lineage.Lineage* method), 52
- `__module__` (*functional.lineage.Lineage* attribute), 52
- `__module__` (*functional.pipeline.Sequence* attribute), 30
- `__module__` (*functional.streams.ParallelStream* attribute), 26
- `__module__` (*functional.streams.Stream* attribute), 27
- `__module__` (*functional.transformations.Transformation* attribute), 53
- `__ne__()` (*functional.pipeline.Sequence* method), 30
- `__new__()` (*functional.transformations.Transformation* static method), 53
- `__nonzero__()` (*functional.pipeline.Sequence* method), 30
- `__repr__()` (*functional.lineage.Lineage* method), 52
- `__repr__()` (*functional.pipeline.Sequence* method), 30
- `__repr__()` (*functional.transformations.Transformation* method), 53
- `__reversed__()` (*functional.pipeline.Sequence* method), 30
- `__slots__` (*functional.transformations.Transformation* attribute), 53
- `__str__()` (*functional.pipeline.Sequence* method), 30
- `__weakref__` (*functional.lineage.Lineage* attribute), 52
- `__weakref__` (*functional.pipeline.Sequence* attribute), 30
- `__weakref__` (*functional.streams.Stream* attribute), 27
- `_asdict()` (*functional.transformations.Transformation* method), 53
- `_evaluate()` (*functional.pipeline.Sequence* method), 30
- `_fields` (*functional.transformations.Transformation* attribute), 53
- `_fields_defaults` (*functional.transformations.Transformation* attribute), 53
- `_make()` (*functional.transformations.Transformation* class method), 53
- `_parse_args()` (*functional.streams.Stream* method), 27
- `_replace()` (*functional.transformations.Transformation* method), 53
- `_repr_html__()` (*functional.pipeline.Sequence* method), 30
- `_to_sqlite3_by_query()` (*functional.pipeline.Sequence* method), 30
- `_to_sqlite3_by_table()` (*func-*

tional.pipeline.Sequence method), 31
 _transform() (*functional.pipeline.Sequence method*), 31
 _wrap() (*in module functional.pipeline*), 51

A

accumulate() (*functional.pipeline.Sequence method*), 5, 31
 accumulate_impl() (*in module functional.transformations*), 53
 accumulate_t() (*in module functional.transformations*), 53
 aggregate() (*functional.pipeline.Sequence method*), 5, 31
 all() (*functional.pipeline.Sequence method*), 6, 31
 any() (*functional.pipeline.Sequence method*), 6, 32
 apply() (*functional.lineage.Lineage method*), 52
 average() (*functional.pipeline.Sequence method*), 6, 32

C

cache() (*functional.pipeline.Sequence method*), 6, 32
 cache_scan() (*functional.lineage.Lineage method*), 52
 CACHE_T (*in module functional.transformations*), 53
 cartesian() (*functional.pipeline.Sequence method*), 6, 32
 cartesian_t() (*in module functional.transformations*), 53
 compose() (*in module functional.util*), 56
 compute_partition_size() (*in module functional.util*), 56
 count() (*functional.pipeline.Sequence method*), 7, 32
 count_by_key() (*functional.pipeline.Sequence method*), 7, 33
 count_by_key_impl() (*in module functional.transformations*), 54
 count_by_key_t() (*in module functional.transformations*), 54
 count_by_value() (*functional.pipeline.Sequence method*), 7, 33
 count_by_value_impl() (*in module functional.transformations*), 54
 count_by_value_t() (*in module functional.transformations*), 54
 csv() (*functional.streams.Stream method*), 3, 27
 csv_dict_reader() (*functional.streams.Stream method*), 4, 27

D

dict() (*functional.pipeline.Sequence method*), 7, 33
 difference() (*functional.pipeline.Sequence method*), 7, 33

difference_t() (*in module functional.transformations*), 54
 distinct() (*functional.pipeline.Sequence method*), 8, 33
 distinct_by() (*functional.pipeline.Sequence method*), 8, 34
 distinct_by_t() (*in module functional.transformations*), 54
 distinct_t() (*in module functional.transformations*), 54
 drop() (*functional.pipeline.Sequence method*), 8, 34
 drop_right() (*functional.pipeline.Sequence method*), 8, 34
 drop_right_t() (*in module functional.transformations*), 54
 drop_t() (*in module functional.transformations*), 54
 drop_while() (*functional.pipeline.Sequence method*), 8, 34
 drop_while_t() (*in module functional.transformations*), 54

E

empty() (*functional.pipeline.Sequence method*), 8, 34
 enumerate() (*functional.pipeline.Sequence method*), 9, 34
 enumerate_t() (*in module functional.transformations*), 54
 evaluate() (*functional.lineage.Lineage method*), 53
 execution_strategies (*functional.transformations.Transformation attribute*), 53
 exists() (*functional.pipeline.Sequence method*), 9, 35
 extend() (*in module functional.pipeline*), 25, 51

F

filter() (*functional.pipeline.Sequence method*), 9, 35
 filter_not() (*functional.pipeline.Sequence method*), 9, 35
 filter_not_t() (*in module functional.transformations*), 54
 filter_t() (*in module functional.transformations*), 54
 find() (*functional.pipeline.Sequence method*), 9, 35
 first() (*functional.pipeline.Sequence method*), 10, 35
 flat_map() (*functional.pipeline.Sequence method*), 10, 36
 flat_map_impl() (*in module functional.transformations*), 54
 flat_map_t() (*in module functional.transformations*), 54
 flatten() (*functional.pipeline.Sequence method*), 10, 36
 flatten_t() (*in module functional.transformations*), 54

- fold_left() (*functional.pipeline.Sequence method*), 10, 36
 fold_right() (*functional.pipeline.Sequence method*), 11, 36
 for_all() (*functional.pipeline.Sequence method*), 11, 37
 for_each() (*functional.pipeline.Sequence method*), 11, 37
 function (*functional.transformations.Transformation attribute*), 53
 functional.lineage (*module*), 52
 functional.pipeline (*module*), 5, 29
 functional.streams (*module*), 3, 26
 functional.transformations (*module*), 53
 functional.util (*module*), 56
- ## G
- group_by() (*functional.pipeline.Sequence method*), 11, 37
 group_by_impl() (*in module functional.transformations*), 54
 group_by_key() (*functional.pipeline.Sequence method*), 12, 37
 group_by_key_impl() (*in module functional.transformations*), 54
 group_by_key_t() (*in module functional.transformations*), 54
 group_by_t() (*in module functional.transformations*), 54
 grouped() (*functional.pipeline.Sequence method*), 12, 37
 grouped_impl() (*in module functional.transformations*), 54
 grouped_t() (*in module functional.transformations*), 55
- ## H
- head() (*functional.pipeline.Sequence method*), 12, 38
 head_option() (*functional.pipeline.Sequence method*), 12, 38
- ## I
- identity() (*in module functional.util*), 56
 init() (*functional.pipeline.Sequence method*), 13, 38
 init_t() (*in module functional.transformations*), 55
 inits() (*functional.pipeline.Sequence method*), 13, 38
 inits_t() (*in module functional.transformations*), 55
 inner_join() (*functional.pipeline.Sequence method*), 13, 39
 inner_join_impl() (*in module functional.transformations*), 55
 intersection() (*functional.pipeline.Sequence method*), 13, 39
- intersection_t() (*in module functional.transformations*), 55
 is_iterable() (*in module functional.util*), 57
 is_namedtuple() (*in module functional.util*), 57
 is_primitive() (*in module functional.util*), 57
 is_tabulatable() (*in module functional.util*), 57
- ## J
- join() (*functional.pipeline.Sequence method*), 13, 39
 join_impl() (*in module functional.transformations*), 55
 join_t() (*in module functional.transformations*), 55
 json() (*functional.streams.Stream method*), 4, 27
 jsonl() (*functional.streams.Stream method*), 4, 28
- ## L
- last() (*functional.pipeline.Sequence method*), 14, 39
 last_option() (*functional.pipeline.Sequence method*), 14, 40
 lazy_parallelize() (*in module functional.util*), 57
 left_join() (*functional.pipeline.Sequence method*), 14, 40
 len() (*functional.pipeline.Sequence method*), 14, 40
 Lineage (*class in functional.lineage*), 52
 list() (*functional.pipeline.Sequence method*), 15, 40
- ## M
- make_string() (*functional.pipeline.Sequence method*), 15, 41
 map() (*functional.pipeline.Sequence method*), 15, 41
 map_t() (*in module functional.transformations*), 55
 max() (*functional.pipeline.Sequence method*), 15, 41
 max_by() (*functional.pipeline.Sequence method*), 16, 41
 min() (*functional.pipeline.Sequence method*), 16, 42
 min_by() (*functional.pipeline.Sequence method*), 17, 42
- ## N
- name (*functional.transformations.Transformation attribute*), 53
 name() (*in module functional.transformations*), 55
 non_empty() (*functional.pipeline.Sequence method*), 17, 43
- ## O
- open() (*functional.streams.Stream method*), 4, 28
 order_by() (*functional.pipeline.Sequence method*), 17, 43
 order_by_t() (*in module functional.transformations*), 55
 outer_join() (*functional.pipeline.Sequence method*), 17, 43

P

pack() (in module *functional.util*), 58
 parallelize() (in module *functional.util*), 58
 ParallelStream (class in *functional.streams*), 3, 26
 partition() (*functional.pipeline.Sequence* method), 18, 43
 partition_impl() (in module *functional.transformations*), 55
 partition_t() (in module *functional.transformations*), 55
 product() (*functional.pipeline.Sequence* method), 18, 43

R

range() (*functional.streams.Stream* method), 5, 28
 reduce() (*functional.pipeline.Sequence* method), 18, 44
 reduce_by_key() (*functional.pipeline.Sequence* method), 18, 44
 reduce_by_key_impl() (in module *functional.transformations*), 55
 reduce_by_key_t() (in module *functional.transformations*), 55
 reverse() (*functional.pipeline.Sequence* method), 19, 44
 reversed_t() (in module *functional.transformations*), 55
 right_join() (*functional.pipeline.Sequence* method), 19, 44

S

select() (*functional.pipeline.Sequence* method), 19, 45
 select_t() (in module *functional.transformations*), 55
 Sequence (class in *functional.pipeline*), 5, 29
 sequence (*functional.pipeline.Sequence* attribute), 19, 45
 set() (*functional.pipeline.Sequence* method), 19, 45
 show() (*functional.pipeline.Sequence* method), 19, 45
 size() (*functional.pipeline.Sequence* method), 20, 45
 slice() (*functional.pipeline.Sequence* method), 20, 45
 slice_t() (in module *functional.transformations*), 55
 sliding() (*functional.pipeline.Sequence* method), 20, 46
 sliding_impl() (in module *functional.transformations*), 55
 sliding_t() (in module *functional.transformations*), 56
 smap() (*functional.pipeline.Sequence* method), 20, 46
 sorted() (*functional.pipeline.Sequence* method), 20, 46
 sorted_t() (in module *functional.transformations*), 56

split_every() (in module *functional.util*), 58
 sqlite3() (*functional.streams.Stream* method), 5, 28
 starmap() (*functional.pipeline.Sequence* method), 21, 46
 starmap_t() (in module *functional.transformations*), 56
 Stream (class in *functional.streams*), 3, 27
 sum() (*functional.pipeline.Sequence* method), 21, 47
 symmetric_difference() (*functional.pipeline.Sequence* method), 21, 47
 symmetric_difference_t() (in module *functional.transformations*), 56

T

tabulate() (*functional.pipeline.Sequence* method), 21, 47
 tail() (*functional.pipeline.Sequence* method), 22, 47
 tail_t() (in module *functional.transformations*), 56
 tails() (*functional.pipeline.Sequence* method), 22, 47
 tails_t() (in module *functional.transformations*), 56
 take() (*functional.pipeline.Sequence* method), 22, 48
 take_t() (in module *functional.transformations*), 56
 take_while() (*functional.pipeline.Sequence* method), 22, 48
 take_while_t() (in module *functional.transformations*), 56
 to_csv() (*functional.pipeline.Sequence* method), 22, 48
 to_dict() (*functional.pipeline.Sequence* method), 22, 48
 to_file() (*functional.pipeline.Sequence* method), 23, 48
 to_json() (*functional.pipeline.Sequence* method), 23, 49
 to_jsonl() (*functional.pipeline.Sequence* method), 23, 49
 to_list() (*functional.pipeline.Sequence* method), 24, 49
 to_pandas() (*functional.pipeline.Sequence* method), 24, 50
 to_set() (*functional.pipeline.Sequence* method), 24, 50
 to_sqlite3() (*functional.pipeline.Sequence* method), 24, 50
 Transformation (class in *functional.transformations*), 53

U

union() (*functional.pipeline.Sequence* method), 25, 50
 union_t() (in module *functional.transformations*), 56
 unpack() (in module *functional.util*), 58

W

where() (*functional.pipeline.Sequence* method), 25, 50

`where_t()` (in module `functional.transformations`), 56

Z

`zip()` (`functional.pipeline.Sequence` method), 25, 51

`zip_t()` (in module `functional.transformations`), 56

`zip_with_index()` (`functional.pipeline.Sequence`
method), 25, 51

`zip_with_index_t()` (in module `func-`
`tional.transformations`), 56