On TAP:

Module 2: Data Frames

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- See which frames are available to us (get_frame_names)
- Load a frame into current namespace
- Examine frame methods
- Frame debugging
- add_columns


Data

TAP Data Frames

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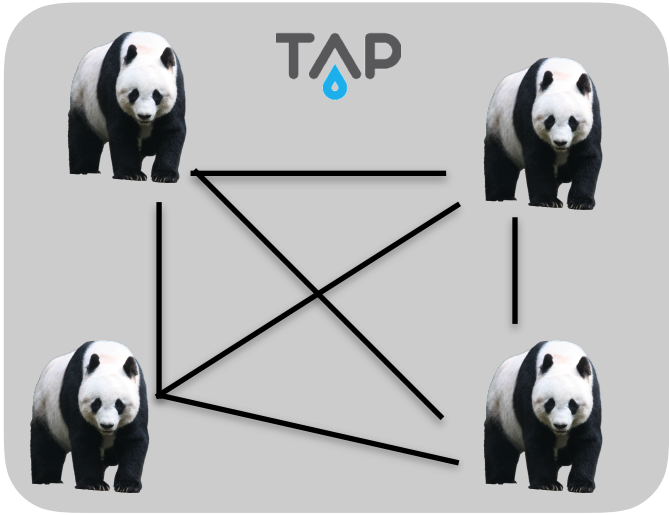
- Analogous to Pandas Frames
    - only distributed!
- Columns are strongly-typed
- Within a row, elements can be accessed like python attributes, or like entries in a dictionary



Data Types

All data manipulated and stored using frames and graphs must fit into one of the supported Python data types.

```
>>> ta.valid_data_types

float32, float64, ignore, int32, int64, unicode, vector(n), datetime
(and aliases: float->float64, int->int32, list->vector, long->int64, str->unicode)
```

datetime	[ALPHA] object for date and time; equivalent to python's datetime.datetime class. Converts to and from strings using the ISO 8601 format. Inside the server, the object is represented by the nscala/joda DateTime object. When interfacing with various data sources and sinks that use different data types for datetime, the datetime value will be converted to a string by default.
float32	32-bit floating point number; equivalent to numpy.float32
float64	64-bit floating point number; equivalent to numpy.float64
ignore	type available to describe a field in a data source that the parser should ignore
int32	32-bit integer; equivalent to numpy.int32
int64	32-bit integer; equivalent to numpy.int64
unicode	Python's unicode representation for strings.
vector(n)	[ALPHA] Ordered list of n float64 numbers (array of fixed-length n); uses numpy.ndarray

Note: Numpy values of positive infinity (np.inf), negative infinity (-np.inf) or nan (np.nan) are treated as Python's None when sent to the server. Results of any user-defined functions which deal with such values are automatically converted to None. Any further usage of those data points should treat the values as None.

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Additional data types are in development!


Data


Data

!

— add_columns!

- Arguably, the main workhorse function of data wrangling
- We'll explore this extensively in coding sessions


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Frame.add_columns(self, func, schema, columns_accessed=None)
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Frame.add_columns(self, func, schema, columns_accessed=None)

>>> frame.inspect()
        [#]  name      age  tenure  phone
        ===================================
        [0]  Fred       39      16  555-1234
        [1]  Susan      33       3  555-0202
        [2]  Thurston   65      26  555-4510
        [3]  Judy       44      14  555-2183

>>> frame.add_columns(lambda row: row.age - 18,
('adult_years', ta.int32))
>>> frame.inspect()
        [#]  name      age  tenure  phone     adult_years
        ============================================================
        [0]  Fred       39      16  555-1234            21
        [1]  Susan      33       3  555-0202            15
        [2]  Thurston   65      26  555-4510            47
        [3]  Judy       44      14  555-2183            26
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```

You can use add_columns to generate multiple columns simultaneously!

Data

¡Pro Tip!

add_columns can be used intuitively when wrapped as a function!

```
def add_offset_age(row):
    my_json = json.loads(row[0])
    AGE = my_json['AGE'] if 'AGE' in my_json else 0.0
    rn = random.randint(a=0, b=1000)
    return AGE + rn

tutorial_inpat.add_columns(add_offset_age, ("OFFSET_AGE", ia.float64))
```

add_columns

- Arguably
function

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```
Frame.add_columns(self, func, schema, columns_accessed=None)
```

```
 age  tenure  phone
=======================
  39      16  555-1234
  33       3  555-0202
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```

You can use add_columns to generate multiple columns simultaneously!

Inspect

Inspect

```
inspect(self, n=10,
         offset=0,
         columns=None,
         wrap='inspect_settings',
         truncate='inspect_settings',
         round='inspect_settings',
         width='inspect_settings',
         margin='inspect_settings',
         with_types='inspect_settings'
        )
```

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inspect(self, n=10,
        offset=0,
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        round='inspect_settings',
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        margin='inspect_settings',
        with_types='inspect_settings'
       )
```

```
>>> frame.inspect(4)
      [#]  animal    name    age  weight
      ================================
      [0]  human     George    8   542.5
      [1]  human     Ursula    6   495.0
      [2]  ape       Ape      41   400.0
      [3]  elephant  Shep      5  8630.0
```

Inspect

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inspect(self, n=10,
        offset=0,
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```

Inspect prints to std.out!

Inspect

row_count, column_names

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row_count → returns an integer

column_names → returns a list

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row_count, column_names

row_count → returns an integer

column_names → returns a list

row_count and column_names are attributes of a Frame object!

Inspect

row_count, column_names

sort


```
Frame.sort(self, columns, ascending=True)
```

Inspect

row_count, column_names

sort

Inspect

row_count, column_names

sort

```
Frame.sort(self, columns, ascending=True)
```

```
>>> frame.inspect()
        [#]  col1  col2
        ==================
        [0]     3  foxtrot
        [1]     1  charlie
        [2]     3  bravo
        [3]     2  echo
        [4]     4  delta
        [5]     3  alpha

>>> frame.sort('col1')
>>> frame.inspect()
        [#]  col1  col2
        ==================
        [0]     1  charlie
        [1]     2  echo
        [2]     3  foxtrot
        [3]     3  bravo
        [4]     3  alpha
        [5]     4  delta
```

Inspect

row_count, column_names

sort

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Frame.sort(self, columns, ascending=True)
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```

Sort modifies a frame in place!

Inspect
row_count, column_names
sort
filter


```
Frame.filter(self, predicate)
```

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>> frame.inspect()
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>>> frame.filter(lambda row: row.tenure >= 15)
>>> frame.inspect()
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        [0]  Fred       39      16  555-1234
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```

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Frame.filter(self, predicate)

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        [3]  Judy       44      14  555-2183
>>> frame.filter(lambda row: row.tenure >= 15)
>>> frame.inspect()
        [#]  name      age  tenure  phone
        ===================================
        [0]  Fred       39      16  555-1234
        [1]  Thurston   65      26  555-4510
```

`predicate` evaluates rows to boolean; '`False`' rows are dropped from the frame
`filter` modifies the frame in place!

Inspect
row_count, column_names
sort
filter
group_by

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Additional data types are in development!

Inspect
row_count, column_names
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filter
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```
>>> frame.inspect()
        [#]  a  b        c     d       e  f    g
        ======================================
        [0]  1  alpha     3.0  small   1  3.0  9
        [1]  1  bravo     5.0  medium  1  4.0  9
        [2]  1  alpha     5.0  large   1  8.0  8
        [3]  2  bravo     8.0  large   1  5.0  7
        [4]  2  charlie  12.0  medium  1  6.0  6
        [5]  2  bravo     7.0  small   1  8.0  5
        [6]  2  bravo    12.0  large   1  6.0  4

>>> b_count = frame.group_by('b', ta.agg.count)
>>> b_count.inspect()
        [#]  b        count
        ==================
        [0]  alpha        2
        [1]  bravo        4
        [2]  charlie      1
```

Additional data types are in development!

Inspect
row_count, column_names
sort
filter
group_by

```
Frame.group_by(self, group_by_columns, *aggregation_arguments)
>>> frame.inspect()
        [#]  a  b        c     d       e  f    g
        ======================================
        [0]  1  alpha     3.0  small   1  3.0  9
        [1]  1  bravo     5.0  medium  1  4.0  9
        [2]  1  alpha     5.0  large   1  8.0  8
        [3]  2  bravo     8.0  large   1  5.0  7
        [4]  2  charlie  12.0  medium  1  6.0  6
        [5]  2  bravo     7.0  small   1  8.0  5
        [6]  2  bravo    12.0  large   1  6.0  4

>>> b_count = frame.group_by('b', ta.agg.count)
>>> b_count.inspect()
        [#]  b        count
        ==================
        [0]  alpha        2
        [1]  bravo        4
        [2]  charlie      1
```

Additional data types are in development!

code!

Problems:

[**1**] Using a copy of the `inpat` data set, identify the first five data fields in the *json* of the first row in the frame.

[**2**] What is the data type of the Using a copy of the `inpat` data set, identify the first five data fields in the *json* of the first row in the frame.

[**3**] What is the maximum value of the field '`DRG_WEIGHT`' in the data set?

[**4**] In the same data set, how many '`DRG_WEIGHT`' values are between 0 and 5? Between 5 and 10? Between 10 and 15?