
Python Data Audit



Python Data Audit Library API

Release 1.00

Wenqiang Feng and Ming Chen

April 28, 2019

CONTENTS

1	Preface	3
1.1	About	3
1.1.1	About this API	3
1.1.2	About the author	3
1.2	Feedback and suggestions	4
2	How to Install	5
2.1	Clone the Repository	5
2.2	Install	5
2.3	Uninstall	5
2.4	Test	5
3	Python Data Audit Functions	7
3.1	dtypes_class	7
3.2	missing_rate	7
3.3	zero_rate	8
3.4	feature_variance	8
4	Demos	11
5	Main Reference	13
	Bibliography	15
	Python Module Index	17
	Index	19

Python Data Audit



Welcome to our **Python Data Audit Library API**! The PDF version can be downloaded from [HERE](#).

PREFACE

Chinese proverb

Good tools are prerequisite to the successful execution of a job. – old Chinese proverb

1.1 About

1.1.1 About this API

This document is the API book for our Python Data Audit Library [PyAudit] API. The PDF version can be downloaded from [HERE](#). **You may download and distribute it. Please be aware, however, that the note contains typos as well as inaccurate or incorrect description.**

The API assumes that the reader has a preliminary knowledge of python programing and Linux. And this document is generated automatically by using [sphinx](#).

1.1.2 About the author

- **Wenqiang Feng**
 - Sr. Data Scientist and PhD in Mathematics
 - University of Tennessee at Knoxville
 - Webpage: <http://web.utk.edu/~wfeng1/>
 - Email: von198@gmail.com
- **Ming Chen**
 - Data Scientist and PhD in Genome Science and Technology
 - University of Tennessee at Knoxville

– Email: ming.chen0919@gmail.com

- **Biography**

Wenqiang Feng is Data Scientist within DST’s Applied Analytics Group. Dr. Feng’s responsibilities include providing DST clients with access to cutting-edge skills and technologies, including Big Data analytic solutions, advanced analytic and data enhancement techniques and modeling.

Dr. Feng has deep analytic expertise in data mining, analytic systems, machine learning algorithms, business intelligence, and applying Big Data tools to strategically solve industry problems in a cross-functional business. Before joining DST, Dr. Feng was an IMA Data Science Fellow at The Institute for Mathematics and its Applications (IMA) at the University of Minnesota. While there, he helped startup companies make marketing decisions based on deep predictive analytics.

Dr. Feng graduated from University of Tennessee, Knoxville, with Ph.D. in Computational Mathematics and Master’s degree in Statistics. He also holds Master’s degree in Computational Mathematics from Missouri University of Science and Technology (MST) and Master’s degree in Applied Mathematics from the University of Science and Technology of China (USTC).

- **Declaration**

The work of Wenqiang Feng was supported by the IMA, while working at IMA. However, any opinion, finding, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the IMA, UTK and DST.

1.2 Feedback and suggestions

Your comments and suggestions are highly appreciated. I am more than happy to receive corrections, suggestions or feedbacks through email (Wenqiang Feng: von198@gmail.com and Ming Chen: ming.chen0919@gmail.com) for improvements.

HOW TO INSTALL

2.1 Clone the Repository

```
git clone https://github.com/runawayhorse001/PyAudit.git
```

2.2 Install

```
cd PyAudit
pip install -r requirements.txt
python setup.py install
```

2.3 Uninstall

```
pip uninstall statspy
```

2.4 Test

```
cd PyAudit/test
python test1.py
```

test1.py

```
from PyAudit.basics import missing_rate, zero_rate, dtypes_class
from PyAudit.basics import feature_variance
import pandas as pd
```

(continues on next page)

(continued from previous page)

```
d = {'A': [1, 0, None, 3],
      'B': [1, 0, 0, 0],
      'C': ['a', None, 'c', 'd']}

# create DataFrame
df = pd.DataFrame(d)
print(missing_rate(df))
print(zero_rate(df))
print(feature_variance(df))

# read df
df = pd.read_csv('Heart.csv', dtype={'Sex': bool})
print(df.head(5))
(num_fields, cat_fields, bool_fields, data_types, type_class) = dtypes_
    class(df)

print(num_fields)
print(cat_fields)
print(bool_fields)
print(data_types)
print(type_class)
print(missing_rate(df))
#print(zero_rate(df))
```

Results:

```
[-1.27920153  0.84000173  1.75114469 -0.02731652 -0.56417185 -0.
    61239996
 -1.47376967  1.39551562 -0.8559779   0.60139758]

-----
    One Sample t-test
# data:  ['y']
# t = 3.872983346207417, df = 3, p-value = 0.030466291662170977
# alternative hypothesis: true mean is not equal to 0.0
# 95.0 percent confidence interval:
# 0.4457397432391206, 4.554260256760879
# mean of x
#          2.5
-----
```

PYTHON DATA AUDIT FUNCTIONS

3.1 dtypes_class

`PyAudit.basics.dtypes_class(df_in)`
numerical, categorical and bool name list in the DataFrame

Parameters `df_in` – input pandas DataFrame

Returns numerical, categorical and bool name list

Author Wenqiang Feng and Ming Chen

Email von198@gmail.com

```
>>> from PyAudit.basics import dtypes_class
>>> df = pd.read_csv('Heart.csv', dtype={'Sex': bool})
>>> (num_fields, cat_fields, bool_fields, data_types, type_class),
↳ dtypes_class(df)
>>> num_fields
['Age', 'RestBP', 'Chol', 'Fbs', 'RestECG', 'MaxHR', 'ExAng',
↳ 'Oldpeak', 'Slope', 'Ca']
```

3.2 missing_rate

`PyAudit.basics.missing_rate(df_in)`
calculate missing rate for each feature in the DataFrame

Parameters `df_in` – input pandas DataFrame

Returns missing rate

Author Wenqiang Feng and Ming Chen

Email von198@gmail.com

```
>>> import pandas as pd
>>> d = {'A': [1, 0, None, 3],
        'B': [1, 0, 0, 0],
        'C': ['a', None, 'c', 'd']}
>>> # create DataFrame
>>> df = pd.DataFrame(d)
>>> from PyAudit.basics import missing_rate
>>> missing_rate(df)
      feature  missing_rate
0          A           0.25
1          B           0.00
2          C           0.25
```

3.3 zero_rate

`PyAudit.basics.zero_rate(df_in)`

calculate the percentage of 0 value for each feature in the DataFrame

Parameters `df_in` – input pandas DataFrame

Returns zero rate

Author Wenqiang Feng and Ming Chen

Email von198@gmail.com

```
>>> import pandas as pd
>>> d = {'A': [1, 0, None, 3],
        'B': [1, 0, 0, 0],
        'C': ['a', None, 'c', 'd']}
>>> # create DataFrame
>>> df = pd.DataFrame(d)
>>> from PyAudit.basics import zero_rate
>>> zero_rate(df)
      feature  zero_rate
0          A   0.333333
1          B   0.750000
2          C   0.000000
```

3.4 feature_variance

`PyAudit.basics.feature_variance(df_in)`

calculate the variance for each feature

Parameters `df_in` – input pandas DataFrame

Returns feature variance

Author Wenqiang Feng and Ming Chen

Email von198@gmail.com

```
>>> import pandas as pd
>>> d = {'A': [1, 0, None, 3],
        'B': [1, 0, 0, 0],
        'C': ['a', None, 'c', 'd']}
>>> # create DataFrame
>>> df = pd.DataFrame(d)
>>> from PyAudit.basics import zero_rate
>>> zero_rate(df)
      feature  feature_variance
0          A                1.0
1          B                0.5
2          C                1.0
```


DEMOS

This is a usage of `PyAudit.basics.dtypes_class()`:

For example:

```
>>> from PyAudit.basics import missing_rate, zero_rate, dtypes_class
>>> df = pd.read_csv('Heart.csv', dtype={'Sex': bool})
>>> (num_fields, cat_fields, bool_fields, data_types, type_class) = \
    → dtypes_class(df)
['Age', 'RestBP', 'Chol', 'Fbs', 'RestECG', 'MaxHR', 'ExAng', 'Oldpeak',
    → ', 'Slope', 'Ca']
['ChestPain', 'Thal', 'AHD']
['Sex']
```

	feature	dtypes
0	Age	int64
1	Sex	bool
2	ChestPain	object
3	RestBP	int64
4	Chol	int64
5	Fbs	int64
6	RestECG	int64
7	MaxHR	int64
8	ExAng	int64
9	Oldpeak	float64
10	Slope	int64
11	Ca	float64
12	Thal	object
13	AHD	object

	feature	dtypes	class
0	Age	int64	numeric
1	Sex	bool	bool
2	ChestPain	object	category
3	RestBP	int64	numeric
4	Chol	int64	numeric
5	Fbs	int64	numeric

(continues on next page)

(continued from previous page)

6	RestECG	int64	numeric
7	MaxHR	int64	numeric
8	ExAng	int64	numeric
9	Oldpeak	float64	numeric
10	Slope	int64	numeric
11	Ca	float64	numeric
12	Thal	object	category
13	AHD	object	category

This is a usage of `PyAudit.basics.feature_variance()`:

For example:

```

    . . . .
    . . . * . . . .
    . - ' ' ' ; - ' ) ; ; .
    / ' . - . / * ; ;
    . ' \d \; ;
/ o \ \; ; , _ . . . . .
\ _ , _ . _ , ' \ _ . - ' ) _ ) -- . . . . . * . . . . .
' " " ; ; ; \ / - ' ) _ ) \ ' ' ; ; ; ;
; * ; ; ; - ' ) ' ) _ ) | \ | ; ; ; * ;
; ; ; ; | \ _ _ _ _ \ o | | ; ; * ; ;
* ; * ; \ | o / ; ; ; ; *
; ; ; ; / | . - - - - - \ / ; ; ; ; ;
; ; ; * ; / \ | ' . ( ' . ; ; ; * ; ;
; ; ; ; ' . ; | ) \ | ; ; ; ;
, ; * ; ; ; \ / | . / / ^ | ' ; ; ; * ;
; ; ; ; ; / | / / _ / ' ; ; ;
' * w f * / | / _ _ | ; * ;
' " " " " \ ' " " " " ; '

```


MAIN REFERENCE

BIBLIOGRAPHY

[PyAudit] Wenqiang Feng and Ming Chen. [Python Data Audit Library API](#), 2019.

PYTHON MODULE INDEX

p

`PyAudit.basics`, 8

INDEX

D

`dtypes_class()` (*in module PyAudit.basics*), 7

F

`feature_variance()` (*in module PyAudit.basics*), 8

M

`missing_rate()` (*in module PyAudit.basics*), 7

P

`PyAudit.basics` (*module*), 7, 8

Z

`zero_rate()` (*in module PyAudit.basics*), 8