## Loc\_iloc\_ix

## November 18, 2016

```
In [1]: import pandas as pd
In [2]: ufo = pd.read_csv('http://bit.ly/uforeports')
In [3]: ufo.head()
Out[3]:
                           City Colors Reported Shape Reported State
                                                       TRIANGLE
        0
                                                                         6/1/1930 22:
                         Ithaca
                                             NaN
                                                                   NY
        1
                    Willingboro
                                                          OTHER
                                                                   NJ 6/30/1930 20:
                                             NaN
        2
                        Holyoke
                                             NaN
                                                           OVAL
                                                                    CO 2/15/1931 14:
        3
                        Abilene
                                             NaN
                                                           DISK
                                                                   KS
                                                                         6/1/1931 13:
        4 New York Worlds Fair
                                                                   NY 4/18/1933 19:
                                             NaN
                                                          LIGHT
In [4]: # loc is used for filtering rows and selecting columns by label
        ufo.loc[0, :] # row zero, all columns
Out[4]: City
                                    Ithaca
        Colors Reported
                                       NaN
        Shape Reported
                                  TRIANGLE
        State
                                        NY
                           6/1/1930 22:00
        Name: 0, dtype: object
In [7]: ufo.loc[0:2, :]
                  City Colors Reported Shape Reported State
Out [7]:
                                                                          Time
                                              TRIANGLE
                                                               6/1/1930 22:00
                Ithaca
                                   NaN
                                                          NY
                                                              6/30/1930 20:00
        1 Willingboro
                                                          NJ
                                    NaN
                                                 OTHER
                                                          CO 2/15/1931 14:00
        2
               Holyoke
                                   NaN
                                                  OVAL
In [8]: ufo.loc[0:2]
Out[8]:
                  City Colors Reported Shape Reported State
                                                                          Time
                                              TRIANGLE
        0
                Ithaca
                                   NaN
                                                          NY
                                                               6/1/1930 22:00
        1
          Willingboro
                                   NaN
                                                 OTHER
                                                          NJ
                                                              6/30/1930 20:00
        2
                                                              2/15/1931 14:00
               Holyoke
                                   NaN
                                                  OVAL
                                                          CO
In [11]: ufo.loc[:, ['City', 'State']] # City, State
```

0					Q : +	Q + - + -
Out[11]:	0			т.	city	State
	0			Willing		NY NJ
	2		lyoke	CO		
	3				ilene	KS
	4	Мом	Vork	Worlds		NY
	5	New	IOIK	Valley		ND
	6			Crater	_	CA
	7			Clatel	Alma	MI
	8			Ek'	lutna	AK
	9				bard	OR
	10				ntana	CA
	11				erloo	AL
	12				elton	SC
	13				eokuk	IA
	14				ngton	MI
	15			Forest		CA
	16			Los And		CA
	17				ville	GA
	18				neida	TN
	19			Bering		AK
	20				raska	NE
	21			1,00	NaN	LA
	22				NaN	LA
	23			Owens	sboro	KY
	24			Wilder		WV
	25				Diego	CA
	26			Wilde	_	WV
	27				lovis	NM
	28			Los Al		NM
	29		1	Et. Dusc		UT
	18211			Но	lyoke	MA
	18212				arson	CA
	18213				adena	CA
	18214				ustin	TX
	18215				Campo	TX
	18216		(	Garden (	_	CA
	18217		Ве	erthoud	Pass	СО
	18218			Siste	rdale	TX
	18219		(	Garden (	Grove	CA
	18220			Shasta	Lake	CA
	18221				nklin	NH
	18222		Al	orights	ville	PA
	18223			Green		SC
	18224				faula	OK
	18225			Simi Va	alley	CA
	18226		Sa	an Franc	_	CA

18227	San Francisco	CA
18228	Kingsville	TX
18229	Chicago	IL
18230	Pismo Beach	CA
18231	Pismo Beach	CA
18232	Lodi	WI
18233	Anchorage	AK
18234	Capitola	CA
18235	Fountain Hills	AZ
18236	Grant Park	IL
18237	Spirit Lake	IA
18238	Eagle River	WI
18239	Eagle River	WI
18240	Ybor	FL

[18241 rows x 2 columns]

In [12]: ufo.loc[:, 'City':'State'] # city through State

Out[12]:					City	Colors	Reported	Shape	Reported	State
	0			Ιt	thaca		NaN		TRIANGLE	NY
	1			Willing	gboro		NaN		OTHER	NJ
	2			Но	lyoke		NaN		OVAL	CO
	3			Ab	ilene		NaN		DISK	KS
	4	New	York	Worlds	Fair		NaN		LIGHT	NY
	5			Valley	City		NaN		DISK	ND
	6			Crater	Lake		NaN		CIRCLE	CA
	7				Alma		NaN		DISK	MI
	8			Ek	lutna		NaN		CIGAR	AK
	9			Hul	obard		NaN		CYLINDER	OR
	10			For	ntana		NaN		LIGHT	CA
	11			Wate	erloo		NaN		FIREBALL	AL
	12			Ве	elton		RED		SPHERE	SC
	13			Ke	eokuk		NaN		OVAL	IA
	14			Ludi	ngton		NaN		DISK	MI
	15			Forest	Home		NaN		CIRCLE	CA
	16			Los And	geles		NaN		NaN	CA
	17			Hape	ville		NaN		NaN	GA
	18			Oı	neida		NaN	]	RECTANGLE	TN
	19			Bering	g Sea		RED		OTHER	AK
	20			Neb	raska		NaN		DISK	NE
	21				NaN		NaN		NaN	LA
	22				NaN		NaN		LIGHT	LA
	23			Owens	sboro		NaN	]	RECTANGLE	KY
	24			Wilde	rness		NaN		DISK	WV
	25			San I	Diego		NaN		CIGAR	CA
	26			Wilde	rness		NaN		DISK	WV
	27			C	lovis		NaN		DISK	NM

```
18214
                                Austin
                                                     NaN
                                                               FORMATION
                                                                             TX
         18215
                              El Campo
                                                     NaN
                                                                    OTHER
                                                                              TX
         18216
                          Garden Grove
                                                  ORANGE
                                                                    LIGHT
                                                                             CA
                         Berthoud Pass
         18217
                                                     NaN
                                                                TRIANGLE
                                                                              CO
         18218
                            Sisterdale
                                                                              TX
                                                     NaN
                                                                 DIAMOND
         18219
                          Garden Grove
                                                     NaN
                                                                 CHEVRON
                                                                              CA
                           Shasta Lake
         18220
                                                                              CA
                                                    BLUE
                                                                     DISK
         18221
                              Franklin
                                                     NaN
                                                                     DISK
                                                                              NH
         18222
                        Albrightsville
                                                     NaN
                                                                    OTHER
                                                                             PΑ
         18223
                            Greenville
                                                     NaN
                                                                      NaN
                                                                              SC
         18224
                               Eufaula
                                                     NaN
                                                                     DISK
                                                                              OK
         18225
                           Simi Valley
                                                               FORMATION
                                                                              CA
                                                     NaN
         18226
                         San Francisco
                                                               FORMATION
                                                                              CA
                                                     NaN
         18227
                         San Francisco
                                                     NaN
                                                                TRIANGLE
                                                                              CA
                            Kingsville
         18228
                                                     NaN
                                                                   LIGHT
                                                                             TX
         18229
                               Chicago
                                                     NaN
                                                                     DISK
                                                                              IL
         18230
                           Pismo Beach
                                                     NaN
                                                                     OVAL
                                                                              CA
         18231
                           Pismo Beach
                                                     NaN
                                                                     OVAL
                                                                              CA
         18232
                                  Lodi
                                                                      NaN
                                                                             WΙ
                                                     NaN
         18233
                             Anchorage
                                                                 VARIOUS
                                                                             ΑK
                                                     RED
         18234
                              Capitola
                                                                TRIANGLE
                                                                              CA
                                                     NaN
         18235
                        Fountain Hills
                                                     NaN
                                                                      NaN
                                                                              AZ
         18236
                            Grant Park
                                                     NaN
                                                                TRIANGLE
                                                                              IL
         18237
                           Spirit Lake
                                                     NaN
                                                                     DISK
                                                                              ΙA
         18238
                           Eagle River
                                                                              WΙ
                                                     NaN
                                                                      NaN
         18239
                           Eagle River
                                                     RED
                                                                    LIGHT
                                                                             WΙ
         18240
                                   Ybor
                                                     NaN
                                                                     OVAL
                                                                             FL
          [18241 \text{ rows } x \text{ 4 columns}]
In [13]: ufo.loc[0:2, 'City': 'State'] # rows 0 through 2 and City through State
                    City Colors Reported Shape Reported State
Out [13]:
         0
                                                  TRIANGLE
                  Ithaca
                                       NaN
         1
             Willingboro
                                       NaN
                                                     OTHER
                                                               NJ
                 Holyoke
                                                      OVAL
                                                               CO
                                       NaN
In [14]: ufo.head(3).drop('Time', axis=1)
          # accomplishes same as
          # ufo.loc[0:2, 'City': 'State'] # rows 0 through 2 and City through State
Out[14]:
                    City Colors Reported Shape Reported State
         0
                                                  TRIANGLE
                  Ithaca
                                       NaN
                                      4
```

28

29

. . .

18211

18212

18213

Los Alamos

. . .

Holyoke

Pasadena

Carson

Ft. Duschene

NaN

NaN

. . .

NaN

NaN

GREEN

DISK

DISK

DISK

DIAMOND

FIREBALL

. . .

MM

UT

. . .

MA

CA

CA

```
Willingboro
         1
                                       NaN
                                                     OTHER
                                                               NJ
         2
                 Holyoke
                                       NaN
                                                      OVAL
                                                               CO
In [15]: ufo[ufo.City == 'Oakland']
          # where City is Oakland
                    City Colors Reported Shape Reported State
Out [15]:
                                                                                Time
         1694
                 Oakland
                                       NaN
                                                     CIGAR
                                                                    7/21/1968 14:00
                                                               CA
         2144
                 Oakland
                                       NaN
                                                      DISK
                                                               CA
                                                                     8/19/1971 0:00
                                                                      6/1/1982 0:00
         4686
                 Oakland
                                                     LIGHT
                                                               MD
                                       NaN
         7293
                 Oakland
                                                                    3/28/1994 17:00
                                       NaN
                                                     LIGHT
                                                               CA
         8488
                 Oakland
                                       NaN
                                                       NaN
                                                               CA
                                                                    8/10/1995 21:45
         8768
                 Oakland
                                                               CA
                                                                  10/10/1995 22:40
                                       NaN
                                                       NaN
         10816
                Oakland
                                                     LIGHT
                                                                    10/1/1997 21:30
                                       NaN
                                                               OR
         10948
                 Oakland
                                       NaN
                                                      DISK
                                                               CA
                                                                  11/14/1997 19:55
         11045
                 Oakland
                                                                    12/10/1997 1:30
                                       NaN
                                                  TRIANGLE
                                                               CA
         12322
                                                                    10/9/1998 19:40
                 Oakland
                                       NaN
                                                  FIREBALL
                                                               CA
         12941
                 Oakland
                                                  CYLINDER
                                                                    1/23/1999 21:30
                                       NaN
                                                               CA
         16803
                 Oakland
                                                  TRIANGLE
                                                                     7/4/2000 23:00
                                       NaN
                                                               MD
                 Oakland
                                                                     9/1/2000 21:35
         17322
                                       NaN
                                                  CYLINDER
                                                               CA
In [16]: ufo.loc[ufo.City == 'Oakland', :]
          # , : means -> columns all
Out [16]:
                    City Colors Reported Shape Reported State
                                                                                Time
         1694
                 Oakland
                                                                    7/21/1968 14:00
                                       NaN
                                                     CIGAR
                                                               CA
         2144
                                                                     8/19/1971 0:00
                 Oakland
                                       NaN
                                                      DISK
                                                               CA
         4686
                 Oakland
                                       NaN
                                                     LIGHT
                                                               MD
                                                                      6/1/1982 0:00
         7293
                 Oakland
                                                     LIGHT
                                                               CA
                                                                    3/28/1994 17:00
                                       NaN
         8488
                 Oakland
                                                                    8/10/1995 21:45
                                       NaN
                                                       NaN
                                                               CA
         8768
                 Oakland
                                                               CA
                                                                  10/10/1995 22:40
                                       NaN
                                                       NaN
         10816
                 Oakland
                                       NaN
                                                     LIGHT
                                                               OR
                                                                    10/1/1997 21:30
         10948
                 Oakland
                                       NaN
                                                      DISK
                                                               CA
                                                                  11/14/1997 19:55
         11045
                 Oakland
                                                  TRIANGLE
                                                                    12/10/1997 1:30
                                       NaN
                                                               CA
         12322
                 Oakland
                                                                    10/9/1998 19:40
                                       NaN
                                                  FIREBALL
                                                               CA
         12941
                 Oakland
                                                  CYLINDER
                                                                    1/23/1999 21:30
                                       NaN
                                                               CA
         16803
                 Oakland
                                                  TRIANGLE
                                                                     7/4/2000 23:00
                                       NaN
                                                              MD
         17322
                 Oakland
                                                  CYLINDER
                                                                     9/1/2000 21:35
                                       NaN
                                                               CA
In [17]: ufo[ufo.City == 'Oakland'].State # chained indexing = not good
Out [17]: 1694
                   CA
         2144
                   CA
         4686
                   MD
         7293
                   CA
         8488
                   CA
         8768
                   CA
         10816
                   OR
```

10948

CA

```
11045
                   CA
         12322
                   CA
         12941
                   CA
         16803
                   MD
         17322
                   CA
         Name: State, dtype: object
In [18]: ufo.loc[ufo.City == 'Oakland', 'State'] # this is better
Out[18]: 1694
                   CA
         2144
                   CA
         4686
                   MD
         7293
                   CA
         8488
                   CA
         8768
                   CA
         10816
                   OR
         10948
                   CA
         11045
                   CA
         12322
                   CA
         12941
                   CA
         16803
                   MD
         17322
                   CA
         Name: State, dtype: object
In [19]: # iloc -> filtering by rows and columns by integer position
         ufo.iloc[:, [0, 3]] # positions row and three in database
Out [19]:
                                  City State
         0
                                Ithaca
                                          NY
         1
                          Willingboro
                                          NJ
         2
                               Holyoke
                                          CO
         3
                               Abilene
                                          KS
         4
                New York Worlds Fair
                                          NY
         5
                          Valley City
                                          ND
                          Crater Lake
         6
                                          CA
         7
                                  Alma
                                          ΜI
         8
                               Eklutna
                                          ΑK
         9
                               Hubbard
                                          OR
         10
                               Fontana
                                          CA
                             Waterloo
         11
                                          AL
         12
                               Belton
                                          SC
         13
                               Keokuk
                                          ΙA
         14
                            Ludington
                                          ΜI
         15
                          Forest Home
                                          CA
                          Los Angeles
         16
                                          CA
                            Hapeville
         17
                                          GA
         18
                               Oneida
                                          TN
         19
                           Bering Sea
                                          ΑK
                             Nebraska
         20
                                          NE
```

21	NaN	LA
22	NaN	LA
23	Owensboro	KY
24	Wilderness	WV
25	San Diego	CA
26	Wilderness	WV
27	Clovis	NM
28	Los Alamos	NM
29	Ft. Duschene	UT
18211	Holyoke	MA
18212	Carson	CA
18213	Pasadena	CA
18214	Austin	TX
18215	El Campo	TX
18216	Garden Grove	CA
18217	Berthoud Pass	CO
18218	Sisterdale	TX
18219	Garden Grove	CA
18220	Shasta Lake	CA
18221	Franklin	NH
18222	Albrightsville	PA
18223	Greenville	SC
18224	Eufaula	OK
18225	Simi Valley	CA
18226	San Francisco	CA
18227	San Francisco	CA
18228	Kingsville	TX
18229	- Chicago	IL
18230	Pismo Beach	CA
18231	Pismo Beach	CA
18232	Lodi	WI
18233	Anchorage	AK
18234	Capitola	CA
18235	Fountain Hills	ΑZ
18236	Grant Park	IL
18237	Spirit Lake	IA
18238	Eagle River	WI
18239	Eagle River	WI
18240	Ybor	FL
=	· · ·	_

[18241 rows x 2 columns]

Out[20]: City Colors Reported Shape Reported State

0 Ithaca NaN TRIANGLE NY

1	Willingboro	NaN	OTHER	NJ
2	Holyoke	NaN	OVAL	CO
3	Abilene	NaN	DISK	KS
4	New York Worlds Fair	NaN	LIGHT	NY
5	Valley City	NaN	DISK	ND
6	Crater Lake	NaN	CIRCLE	CA
7	Alma	NaN	DISK	MI
8	Eklutna	NaN	CIGAR	AK
9	Hubbard	NaN	CYLINDER	OR
10	Fontana	NaN	LIGHT	CA
11	Waterloo	NaN	FIREBALL	AL
12	Belton	RED	SPHERE	SC
13	Keokuk	NaN	OVAL	IA
14	Ludington	NaN	DISK	MI
15	Forest Home	NaN	CIRCLE	CA
16	Los Angeles	NaN	NaN	CA
17	Hapeville	NaN	NaN	GA
18	Oneida	NaN	RECTANGLE	TN
19	Bering Sea	RED	OTHER	AK
20	Nebraska	NaN	DISK	NE
21	NaN	NaN	NaN	LA
22	NaN	NaN	LIGHT	LA
23	Owensboro	NaN	RECTANGLE	KY
24	Wilderness	NaN	DISK	WV
25	San Diego	NaN	CIGAR	CA
26	Wilderness	NaN	DISK	WV
27	Clovis	NaN	DISK	NM
28	Los Alamos	NaN	DISK	NM
29	Ft. Duschene	NaN	DISK	UT
18211	Holyoke	NaN	DIAMOND	MA
18212	Carson	NaN	DISK	CA
18213	Pasadena	GREEN	FIREBALL	CA
18214	Austin	NaN	FORMATION	TX
18215	El Campo	NaN	OTHER	TX
18216	Garden Grove	ORANGE	LIGHT	CA
18217	Berthoud Pass	NaN	TRIANGLE	CO
18218	Sisterdale	NaN	DIAMOND	TX
18219	Garden Grove	NaN	CHEVRON	CA
18220	Shasta Lake	BLUE	DISK	CA
18221	Franklin	NaN	DISK	NH
18222	Albrightsville	NaN	OTHER	PA
18223	Greenville	NaN	NaN	SC
18224	Eufaula	NaN	DISK	OK
18225	Simi Valley	NaN	FORMATION	CA
18226	San Francisco	NaN	FORMATION	CA
18227	San Francisco	NaN	TRIANGLE	CA
18228	Kingsville	NaN	LIGHT	TX

IL	DISK	NaN	Chicago	18229
CA	OVAL	NaN	Pismo Beach	18230
CA	OVAL	NaN	Pismo Beach	18231
WΙ	NaN	NaN	Lodi	18232
AK	VARIOUS	RED	Anchorage	18233
CA	TRIANGLE	NaN	Capitola	18234
ΑZ	NaN	NaN	Fountain Hills	18235
IL	TRIANGLE	NaN	Grant Park	18236
IA	DISK	NaN	Spirit Lake	18237
WI	NaN	NaN	Eagle River	18238
WI	LIGHT	RED	Eagle River	18239
FL	OVAL	NaN	Ybor	18240

[18241 rows x 4 columns]

In [21]: ufo.iloc[0:3, :] # rows 0, 1, 2 and all columns

Out[21]:	City	Colors	Reported	Shape	Reported	State		Time
0	Ithaca		NaN		TRIANGLE	NY	6/1/1930	22:00
1	Willingboro		NaN		OTHER	NJ	6/30/1930	20:00
2	Holyoke		NaN		OVAL	СО	2/15/1931	14:00

In [ ]: