Loc_iloc_ix

November 18, 2016

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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            Ti
        0               Ithaca             NaN       TRIANGLE    NY   6/1/1930 22:
        1          Willingboro             NaN          OTHER    NJ  6/30/1930 20:
        2              Holyoke             NaN           OVAL    CO  2/15/1931 14:
        3              Abilene             NaN           DISK    KS   6/1/1931 13:
        4  New York Worlds Fair             NaN          LIGHT    NY  4/18/1933 19:

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
        Time              6/1/1930 22:00
        Name: 0, dtype: object

In [7]: ufo.loc[0:2, :]

Out[7]:          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    CO  2/15/1931 14:00

In [8]: ufo.loc[0:2]

Out[8]:          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    CO  2/15/1931 14:00

In [11]: ufo.loc[:, ['City', 'State']] # City, State
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Out[11]:                        City State
        0                     Ithaca    NY
        1                Willingboro    NJ
        2                    Holyoke    CO
        3                    Abilene    KS
        4        New York Worlds Fair    NY
        5                 Valley City    ND
        6                 Crater Lake    CA
        7                       Alma    MI
        8                    Eklutna    AK
        9                    Hubbard    OR
        10                   Fontana    CA
        11                  Waterloo    AL
        12                    Belton    SC
        13                    Keokuk    IA
        14                 Ludington    MI
        15               Forest Home    CA
        16               Los Angeles    CA
        17                 Hapeville    GA
        18                    Oneida    TN
        19                Bering Sea    AK
        20                  Nebraska    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
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      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]
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In [12]: ufo.loc[:, 'City':'State'] # city through State

Out[12]:   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
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         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
      18229               Chicago          NaN        DISK    IL
      18230           Pismo Beach          NaN        OVAL    CA
      18231           Pismo Beach          NaN        OVAL    CA
      18232                  Lodi          NaN         NaN    WI
      18233             Anchorage          RED     VARIOUS    AK
      18234              Capitola          NaN    TRIANGLE    CA
      18235        Fountain Hills          NaN         NaN    AZ
      18236            Grant Park          NaN    TRIANGLE    IL
      18237           Spirit Lake          NaN        DISK    IA
      18238            Eagle River          NaN        NaN    WI
      18239            Eagle River          RED       LIGHT    WI
      18240                  Ybor          NaN        OVAL    FL

      [18241 rows x 4 columns]

In [13]: ufo.loc[0:2, 'City': 'State']  # rows 0 through 2 and City through State

Out[13]:          City Colors Reported Shape Reported State
         0       Ithaca              NaN     TRIANGLE      NY
         1  Willingboro              NaN        OTHER      NJ
         2      Holyoke              NaN         OVAL      CO

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       Ithaca              NaN     TRIANGLE      NY
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         1  Willingboro            NaN         OTHER    NJ
         2    Holyoke              NaN          OVAL    CO
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In [15]: ufo[ufo.City == 'Oakland']
         # where City is Oakland

Out[15]:   City Colors Reported Shape Reported State   Time
         1694   Oakland   NaN   CIGAR   CA   7/21/1968 14:00
         2144   Oakland   NaN   DISK   CA   8/19/1971 0:00
         4686   Oakland   NaN   LIGHT   MD   6/1/1982 0:00
         7293   Oakland   NaN   LIGHT   CA   3/28/1994 17:00
         8488   Oakland   NaN   NaN   CA   8/10/1995 21:45
         8768   Oakland   NaN   NaN   CA   10/10/1995 22:40
         10816 Oakland   NaN   LIGHT   OR   10/1/1997 21:30
         10948 Oakland   NaN   DISK   CA   11/14/1997 19:55
         11045 Oakland   NaN   TRIANGLE   CA   12/10/1997 1:30
         12322 Oakland   NaN   FIREBALL   CA   10/9/1998 19:40
         12941 Oakland   NaN   CYLINDER   CA   1/23/1999 21:30
         16803 Oakland   NaN   TRIANGLE   MD   7/4/2000 23:00
         17322 Oakland   NaN   CYLINDER   CA   9/1/2000 21:35

In [16]: ufo.loc[ufo.City == 'Oakland', :]
         # , : means -> columns all

Out[16]:   City Colors Reported Shape Reported State   Time
         1694   Oakland   NaN   CIGAR   CA   7/21/1968 14:00
         2144   Oakland   NaN   DISK   CA   8/19/1971 0:00
         4686   Oakland   NaN   LIGHT   MD   6/1/1982 0:00
         7293   Oakland   NaN   LIGHT   CA   3/28/1994 17:00
         8488   Oakland   NaN   NaN   CA   8/10/1995 21:45
         8768   Oakland   NaN   NaN   CA   10/10/1995 22:40
         10816 Oakland   NaN   LIGHT   OR   10/1/1997 21:30
         10948 Oakland   NaN   DISK   CA   11/14/1997 19:55
         11045 Oakland   NaN   TRIANGLE   CA   12/10/1997 1:30
         12322 Oakland   NaN   FIREBALL   CA   10/9/1998 19:40
         12941 Oakland   NaN   CYLINDER   CA   1/23/1999 21:30
         16803 Oakland   NaN   TRIANGLE   MD   7/4/2000 23:00
         17322 Oakland   NaN   CYLINDER   CA   9/1/2000 21:35

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
         6            Crater Lake    CA
         7                   Alma    MI
         8                Eklutna    AK
         9                Hubbard    OR
         10               Fontana    CA
         11              Waterloo    AL
         12                Belton    SC
         13                Keokuk    IA
         14             Ludington    MI
         15           Forest Home    CA
         16           Los Angeles    CA
         17             Hapeville    GA
         18                Oneida    TN
         19            Bering Sea    AK
         20              Nebraska    NE
```

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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  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]
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In [20]: ufo.iloc[:, 0:4] *# range iloc is exclusive of second number, inclusive of*
        # so shows rows 0 through 3 (excludes four)

Out[20]:   City Colors Reported Shape Reported State
        0   Ithaca   NaN   TRIANGLE   NY

                              7

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

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

[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    CO  2/15/1931 14:00
```

In [ ]: