Python Cheatsheet

Contents

[Python Cheatsheet 1](#_Toc460399565)

[Arrays (numpy) 9](#_Toc460399566)

[Add a column to an array 9](#_Toc460399567)

[Add a dimension to an array 9](#_Toc460399568)

[Apply a function to every element of an array 9](#_Toc460399569)

[Change the Data Type of an Array 9](#_Toc460399570)

[Concatenate Arrays 10](#_Toc460399571)

[Convert a DataFrame to an Array 11](#_Toc460399572)

[Convert a list to an array 11](#_Toc460399573)

[Count the number of equal items in two arrays 11](#_Toc460399574)

[Create an array of constants 11](#_Toc460399575)

[Create an array of zeros 11](#_Toc460399576)

[2D 11](#_Toc460399577)

[Create and add rows to an array 12](#_Toc460399578)

[Dimensions of an array 12](#_Toc460399579)

[Dot Product of 2 arrays 13](#_Toc460399580)

[Element-wise Multiplication 13](#_Toc460399581)

[Expand the Rank (number of dimensions) of an array 13](#_Toc460399582)

[Flatten a numpy Array 13](#_Toc460399583)

[Load a CSV file into a numpy array 14](#_Toc460399584)

[print() options 14](#_Toc460399585)

[print entire array 14](#_Toc460399586)

[Select a Subset of Columns 14](#_Toc460399587)

[Select a Subset of Rows 14](#_Toc460399588)

[Select Rows from an Array which Match a List of Values for some Column 14](#_Toc460399589)

[Shuffle an Array 16](#_Toc460399590)

[Slicing an Array 16](#_Toc460399591)

[Return the last 3 elements 16](#_Toc460399592)

[Standardize an Array 16](#_Toc460399593)

[Sort a numpy.ndarray 17](#_Toc460399594)

[Split an Array into 2 parts 17](#_Toc460399595)

[Transpose a numpy.ndarray 17](#_Toc460399596)

[Classes 18](#_Toc460399597)

[Class static methods 18](#_Toc460399598)

[Control Statements 19](#_Toc460399599)

[for-next loops 19](#_Toc460399600)

[for-next over multiple variables 19](#_Toc460399601)

[while loops 19](#_Toc460399602)

[CSV Files 20](#_Toc460399603)

[Read from a CSV file 20](#_Toc460399604)

[Write to a CSV file 20](#_Toc460399605)

[Database Functions 20](#_Toc460399606)

[Postgres 20](#_Toc460399607)

[Connect to a Postgres database 20](#_Toc460399608)

[Execute SQL query on Postgres 21](#_Toc460399609)

[SQLite3 21](#_Toc460399610)

[Create a SQLite3 Database 21](#_Toc460399611)

[Data Types 21](#_Toc460399612)

[Insert Values into Database 22](#_Toc460399613)

[Read from a Database Table 22](#_Toc460399614)

[Parameterized Queries 22](#_Toc460399615)

[DataFrame (pandas) 23](#_Toc460399616)

[Add a column to a DataFrame 23](#_Toc460399617)

[Add a row to a DataFrame 24](#_Toc460399618)

[Apply a function, with arguments 24](#_Toc460399619)

[Change column names 24](#_Toc460399620)

[Change Column Data Type 25](#_Toc460399621)

[Change values in one column based on values in a different column 26](#_Toc460399622)

[Concatenate two data frames 26](#_Toc460399623)

[Convert a DataFrame to a numpy.ndarray 27](#_Toc460399624)

[Copy a column from another DataFrame 27](#_Toc460399625)

[Copy a DataFrame 28](#_Toc460399626)

[Correlation between columns 28](#_Toc460399627)

[Count the distinct values in a DataFrame column 28](#_Toc460399628)

[Create a DataFrame from scratch 29](#_Toc460399629)

[Create a DataFrame which has only one column 29](#_Toc460399630)

[Delete Rows Having Nulls in Certain Columns 30](#_Toc460399631)

[Extract a column from a DataFrame into a Series 30](#_Toc460399632)

[Get the rows in a DataFrame having a null in some column 30](#_Toc460399633)

[Fast update of a DataFrame column 31](#_Toc460399634)

[Filter out na values from a column 31](#_Toc460399635)

[Find the Row Index in a DataFrame with a Particular Value 31](#_Toc460399636)

[Get DataFrame column names 31](#_Toc460399637)

[Get DataFrame column values 33](#_Toc460399638)

[Get dimensions of a DataFrame 33](#_Toc460399639)

[Get row count from a DataFrame 33](#_Toc460399640)

[Get rows from a DataFrame by index 33](#_Toc460399641)

[Get Rows from a DataFrame which Match an Element of a List 34](#_Toc460399642)

[Get unique values from a DataFrame column 34](#_Toc460399643)

[GroupBy Functionality 35](#_Toc460399644)

[Extract the values from a GroupBy 35](#_Toc460399645)

[Insert a column into a DataFrame 35](#_Toc460399646)

[Max value of a DataFrame column 35](#_Toc460399647)

[Randomly Split a DataFrame 36](#_Toc460399648)

[Read a CSV file into a DataFrame 36](#_Toc460399649)

[Parse formatted dates while reading a CSV 37](#_Toc460399650)

[Select a cell from a DataFrame 37](#_Toc460399651)

[Select rows from a DataFrame by value of a column 37](#_Toc460399652)

[Select rows from a DataFrame by values of multiple columns 37](#_Toc460399653)

[Select rows from a DataFrame by values of multiple columns 39](#_Toc460399654)

[Sort a DataFrame 39](#_Toc460399655)

[Split a DataFrame into train and test sets 39](#_Toc460399656)

[Substitute for na values in a column 39](#_Toc460399657)

[Summary statistics for a DataFrame 41](#_Toc460399658)

[Write a DataFrame to a csv file 41](#_Toc460399659)

[Wrapping CSV file columns in quotes 41](#_Toc460399660)

[Date Functions 42](#_Toc460399661)

[Add a time interval to a datetime 42](#_Toc460399662)

[Calculate a time interval 42](#_Toc460399663)

[Calculate a time interval in seconds, days 42](#_Toc460399664)

[Convert a datetime to Epoch Seconds 43](#_Toc460399665)

[Convert an Epoch to a time 43](#_Toc460399666)

[Convert string to date 43](#_Toc460399667)

[Microseconds 44](#_Toc460399668)

[Date Time Format Strings 45](#_Toc460399669)

[Another method: 45](#_Toc460399670)

[Create an arbitrary datetime 45](#_Toc460399671)

[datetime with time zone 46](#_Toc460399672)

[Get the current datetime 46](#_Toc460399673)

[Get year, month, day, hour, minute, second, milliseconds, weekday 46](#_Toc460399674)

[ISO Weekday 47](#_Toc460399675)

[Time Zone Names 47](#_Toc460399676)

[Dictionaries 47](#_Toc460399677)

[Convert a DataFrame to a Dictionary 47](#_Toc460399678)

[Create a dictionary 47](#_Toc460399679)

[Get a value for a key in the dict 47](#_Toc460399680)

[Get the keys from a dictionary 48](#_Toc460399681)

[Is a key in a dictionary? 48](#_Toc460399682)

[Directories 48](#_Toc460399683)

[Check if a Directory exists 48](#_Toc460399684)

[Concatenate a Directory and File Name 48](#_Toc460399685)

[Create a Directory 49](#_Toc460399686)

[Delete all the files and folders in a directory 49](#_Toc460399687)

[Delete all the files in a directory 49](#_Toc460399688)

[Get the Current Working Directory 49](#_Toc460399689)

[Read the files in a directory. 49](#_Toc460399690)

[Read the files in a directory with a specific extension 50](#_Toc460399691)

[Set the working directory 50](#_Toc460399692)

[Exception Handling 50](#_Toc460399693)

[try-except 50](#_Toc460399694)

[Print the traceback and stack trace 50](#_Toc460399695)

[Files 52](#_Toc460399696)

[Copy a file between from one directory to another 52](#_Toc460399697)

[Delete a file 52](#_Toc460399698)

[Does a file exist? 52](#_Toc460399699)

[Extract the file name from a path 52](#_Toc460399700)

[Open File dialog 52](#_Toc460399701)

[Read a text file into a string 52](#_Toc460399702)

[Read all the lines in a file into a list 53](#_Toc460399703)

[Read a text file line by line 53](#_Toc460399704)

[Read a CSV file 53](#_Toc460399705)

[Write to a Text File 53](#_Toc460399706)

[Geocoding 53](#_Toc460399707)

[Geography 54](#_Toc460399708)

[Distance between two coordinates 54](#_Toc460399709)

[Hash Functions 54](#_Toc460399710)

[Installing packages 54](#_Toc460399711)

[easy\_install 54](#_Toc460399712)

[json 55](#_Toc460399713)

[Pretty Print JSON 55](#_Toc460399714)

[Reading a json file into a dict 55](#_Toc460399715)

[Lambdas 55](#_Toc460399716)

[Conditional Lambdas 55](#_Toc460399717)

[Libraries 55](#_Toc460399718)

[Find the Function Available in a Library 55](#_Toc460399719)

[Lists 56](#_Toc460399720)

[Apply Math Functions to the Elements of a List 56](#_Toc460399721)

[Average of items in a list 56](#_Toc460399722)

[Concatenate 2 lists 56](#_Toc460399723)

[Copy a list 56](#_Toc460399724)

[Create a list containing a number of constants 56](#_Toc460399725)

[Count the Number of Occurences of an Item in a List 56](#_Toc460399726)

[Creating and Appending to a List 56](#_Toc460399727)

[Last items in a List 58](#_Toc460399728)

[Randomly Split a List 58](#_Toc460399729)

[Remove Null Values from a List 58](#_Toc460399730)

[Replace an item in a list 58](#_Toc460399731)

[Sort a list 59](#_Toc460399732)

[Shuffle the items in a list 59](#_Toc460399733)

[Subtract the Elements in 2 Lists 59](#_Toc460399734)

[Standard Deviation of items in a list 59](#_Toc460399735)

[Using lambda and map on a list 59](#_Toc460399736)

[Machine Learning 59](#_Toc460399737)

[Create Word Count columns 59](#_Toc460399738)

[Euclidean Distance 59](#_Toc460399739)

[One-Hot Encoder 60](#_Toc460399740)

[Math Functions 60](#_Toc460399741)

[Exponentiation 60](#_Toc460399742)

[Largest float 61](#_Toc460399743)

[Median 61](#_Toc460399744)

[Modulo 61](#_Toc460399745)

[pi 61](#_Toc460399746)

[Random Numbers 61](#_Toc460399747)

[Random float 61](#_Toc460399748)

[Rounding 61](#_Toc460399749)

[General rounding 61](#_Toc460399750)

[Round to half-even 61](#_Toc460399751)

[Round to {x.0, x.5} intervals 63](#_Toc460399752)

[Square Root 63](#_Toc460399753)

[Test for nan 63](#_Toc460399754)

[Matrices 64](#_Toc460399755)

[Number of rows in a matrix 64](#_Toc460399756)

[Read a Matrix from a file 64](#_Toc460399757)

[Read the contents of a matrix column into an array 64](#_Toc460399758)

[Scale matrix columns 64](#_Toc460399759)

[Methods 65](#_Toc460399760)

[Method Header Template 65](#_Toc460399761)

[numpy 65](#_Toc460399762)

[Covariance 65](#_Toc460399763)

[r-squared 66](#_Toc460399764)

[Variance 66](#_Toc460399765)

[Object Serialization 66](#_Toc460399766)

[Create an object from a stored serialization 66](#_Toc460399767)

[Serialize and Store an Object 66](#_Toc460399768)

[pandasql 66](#_Toc460399769)

[Installing pandasql 67](#_Toc460399770)

[Querying using pandasql 68](#_Toc460399771)

[Plotting 68](#_Toc460399772)

[Histograms 68](#_Toc460399773)

[Scatter plot 69](#_Toc460399774)

[Program Execution 70](#_Toc460399775)

[Stopping program execution 70](#_Toc460399776)

[Regular expressions 70](#_Toc460399777)

[Remove punctuation 70](#_Toc460399778)

[Random Numbers 71](#_Toc460399779)

[Random number in a range 71](#_Toc460399780)

[Create a list containing some random numbers 71](#_Toc460399781)

[REST Services 71](#_Toc460399782)

[Consume a REST service 71](#_Toc460399783)

[scikit-learn 71](#_Toc460399784)

[Linear regression 71](#_Toc460399785)

[Series (pandas) 72](#_Toc460399786)

[Check if a Series value is null 72](#_Toc460399787)

[Convert a Series to a DataFrame 72](#_Toc460399788)

[Create a Series of random numbers 72](#_Toc460399789)

[Get the value of a Series element 72](#_Toc460399790)

[SFrame 72](#_Toc460399791)

[Add a Column Based on Other Columns 72](#_Toc460399792)

[Convert an SFrame to features and labels in a numpy array 72](#_Toc460399793)

[Copy an Sframe 73](#_Toc460399794)

[First n rows of an Sframe 73](#_Toc460399795)

[One-Hot Encoding of an Sframe 73](#_Toc460399796)

[Random Split an SFrame 74](#_Toc460399797)

[Remove a Column from an Sframe 74](#_Toc460399798)

[Select Rows from an Sframe 74](#_Toc460399799)

[Statistics 74](#_Toc460399800)

[Applying lowess smoothing 74](#_Toc460399801)

[Precision, recall, F1, support 75](#_Toc460399802)

[Strings 75](#_Toc460399803)

[Concatenate strings 75](#_Toc460399804)

[Convert a character to its ASCII integer 75](#_Toc460399805)

[Convert to float 75](#_Toc460399806)

[Convert to lower case 75](#_Toc460399807)

[Find a sub-string 75](#_Toc460399808)

[Formatted strings 76](#_Toc460399809)

[Remove Punctuation 76](#_Toc460399810)

[Replace a substring 77](#_Toc460399811)

[String Literals 77](#_Toc460399812)

[Sub-strings 77](#_Toc460399813)

[Tokenize a string 77](#_Toc460399814)

[Trim leading and trailing characters 77](#_Toc460399815)

[Trim white space 77](#_Toc460399816)

[Timers 78](#_Toc460399817)

[Sleep 78](#_Toc460399818)

[Timing Code Execution 78](#_Toc460399819)

[Tuples 78](#_Toc460399820)

[Cartesion product of two tuples 78](#_Toc460399821)

[Product of the elements in a tuple 78](#_Toc460399822)

[User Input 78](#_Toc460399823)

[Get user input from the keyboard 78](#_Toc460399824)

# Arrays (numpy)

## Add a column to an array

>>> N = 3

>>> A = np.eye(N)

>>> A

array([[ 1., 0., 0.],

[ 0., 1., 0.],

[ 0., 0., 1.]])

>>> np.c\_[A, np.zeros(N)]

array([[ 1., 0., 0., 0.],

[ 0., 1., 0., 0.],

[ 0., 0., 1., 0.]])

>>>

## Add a dimension to an array

>>> import numpy as np

>>> x = np.array([1,2])

>>> x

array([1, 2])

>>> x.shape

(2L,)

>>> y = np.expand\_dims(x, axis=0)

>>> y

array([[1, 2]])

>>> y.shape

(1L, 2L)

## Apply a function to every element of an array

get\_pred = np.vectorize(lambda x: 1 if x > 0 else -1)

y\_hat = get\_pred(scores) # scores is type numpy.ndarray

print y\_hat

output:

[ 1 -1 1 ..., -1 1 -1]

## Change the Data Type of an Array

>>> x = np.array([1, 2, 2.5])

>>> x

array([ 1. , 2. , 2.5])

>>> x.astype(int)

array([1, 2, 2])

## Concatenate Arrays

>>> a = np.array([[1, 2], [3, 4]])

>>> b = np.array([[5, 6]])

>>> np.concatenate((a, b), axis=0)

array([[1, 2],

[3, 4],

[5, 6]])

>>> np.concatenate((a, b.T), axis=1)

array([[1, 2, 5],

[3, 4, 6]])

## Convert a DataFrame to an Array

input\_nda = corr\_input\_df.values

## Convert a list to an array

>>> blist = [2,4,6,8]

>>> b\_array = np.array(blist)

>>> b\_array

array([2, 4, 6, 8])

## Count the number of equal items in two arrays

import numpy as np

a = np.array([1, 2, 3, 4])

b = np.array([1, 2, 4, 3])

np.sum(a == b) # (a == b) returns [True, True, False, False], but

# np.sum() interprets the Trues as 1

output:

2

(a == b).sum()

output:

2

## Create an array of constants

import numpy as np

a = np.empty(10)

a.fill(55)

## Create an array of zeros

>>> import numpy as np

>>> np.zeros(10)

array([ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])

### 2D

>>> test = np.zeros((10,10))

>>> test

array([[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],

[ 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]])

## Create and add rows to an array

import numpy as np

arr = np.empty((0,3), float) # arr is type numpy.ndarray

arr = np.append(arr, np.array([[1,2,3]]), axis=0)

arr = np.append(arr, np.array([[4,5,6]]), axis=0)

print arr

>>>

[[ 1. 2. 3.]

[ 4. 5. 6.]]

>>>

## Dimensions of an array

>>> X\_train.shape

(80L, 5L)

## Dot Product of 2 arrays

u = np.arange(0, 5, .5)

v = np.arange(5, 10, .5)

u: [ 0. 0.5 1. 1.5 2. 2.5 3. 3.5 4. 4.5]

v: [ 5. 5.5 6. 6.5 7. 7.5 8. 8.5 9. 9.5]

dotProduct = np.dot(u,v)

dotProduct

183.75

You can also do this for a matrix and array.

Note that numpy will automatically transpose the second argument, if needed, to make the two arguments consistent.

## Element-wise Multiplication

u = np.arange(0, 5, .5)

v = np.arange(5, 10, .5)

elementWise = u \* v

u: [ 0. 0.5 1. 1.5 2. 2.5 3. 3.5 4. 4.5]

v: [ 5. 5.5 6. 6.5 7. 7.5 8. 8.5 9. 9.5]

elementWise

[ 0. 2.75 6. 9.75 14. 18.75 24. 29.75 36. 42.75]

## Expand the Rank (number of dimensions) of an array

>>> import numpy as np

>>> x = np.array([1,2])

>>> x

array([1, 2])

>>> x.shape

(2L,)

>>> y = np.expand\_dims(x, axis=0)

>>> y

array([[1, 2]])

>>> y.shape

(1L, 2L)

>>> len(x.shape)

1

>>> len(y.shape)

2

## Flatten a numpy Array

>>> a = np.array([[1,2], [3,4]])

>>> a.flatten()

array([1, 2, 3, 4])

>>> a.flatten('F')

array([1, 3, 2, 4])

## Load a CSV file into a numpy array

from numpy import genfromtext

filepath = "eta\_corr\_owner\_veh\_km-rem\_mins-rem\_pace\_lat\_lon\_hr\_day\_mo\_no-dupe.csv"

my\_data = genfromtxt(filepath, delimiter=',', skip\_header=1) # assumes 1 header row

## print() options

### print entire array

np.set\_printoptions(threshold=np.inf)

## Select a Subset of Columns

X = input\_nda[:, [6, 9, 10, 11, 12, 14, 15]] # Selects columns 6, 9, …

## Select a Subset of Rows

import numpy as np

data = np.array([

[100002, 2006, 1.1, 0.01, 6352],

[100002, 2006, 1.2, 0.84, 304518],

[100002, 2006, 2, 1.52, 148219],

[100002, 2007, 1.1, 0.01, 6292],

[10002, 2006, 1.1, 0.01, 5968],

[10002, 2006, 1.2, 0.25, 104318],

[10002, 2007, 1.1, 0.01, 6800],

[10002, 2007, 4, 2.03, 25446],

[10002, 2008, 1.1, 0.01, 6408] ])

subset1 = data[data[:,0] == 100002]

subset1:

array([[ 1.00002e+05, 2.006e+03, 1.10e+00, 1.00e-02, 6.352e+03],

[ 1.00002e+05, 2.006e+03, 1.20e+00, 8.40e-01, 3.04518e+05],

[ 1.00002e+05, 2.006e+03, 2.00e+00, 1.52e+00, 1.48219e+05],

[ 1.00002e+05, 2.007e+03, 1.10e+00, 1.00e-02, 6.292e+03]])

## Select Rows from an Array which Match a List of Values for some Column

import numpy as np

training\_shipments, test\_shipments = train\_test\_split(unique\_shipment\_id\_array,

test\_size=0.3,

random\_state=0)

print all\_data.shape

training\_data = all\_data[np.logical\_or.reduce([all\_data[:,9] == x

for x in training\_shipments])]

print my\_data.shape

(63L, 18L)

(53L, 18L)

## Shuffle an Array

Note that both these code segments shuffle a feature and target array, in unison.

idx = np.arange(X.shape[0])

np.random.seed(13)

np.random.shuffle(idx)

X = X[idx]

y = y[idx]

or

# Shuffle the data before starting

permutation = np.random.permutation(len(feature\_matrix))

feature\_matrix = feature\_matrix[permutation,:]

sentiment = sentiment[permutation]

## Slicing an Array

### Return the last 3 elements

features = np.array([1, 2, 3, 4])

print 'features:\n{0}'.format(features)

# The last three elements of features

lastThree = features[-3:]

print '\nlastThree:\n{0}'.format(lastThree)

features:

[1 2 3 4]

lastThree:

[2 3 4]

## Standardize an Array

mean = X.mean(axis=0)

std = X.std(axis=0)

X = (X - mean) / std

## Sort a numpy.ndarray

>>> unique\_dates

array(['2014-10-21', '2014-10-11', '2014-10-14', '2014-10-15',

'2014-10-16', '2014-10-17', '2014-10-18', '2014-10-20',

'2014-10-06', '2014-10-07', '2014-10-09', '2014-10-10',

'2014-10-08', '2014-09-26', '2014-10-13', '2014-10-12',

'2014-10-05', '2014-10-19', '2014-09-30', '2014-10-03',

'2014-10-01', '2014-10-02'], dtype=object)

>>> import numpy as np

>>> np.sort(unique\_dates)

array(['2014-09-26', '2014-09-30', '2014-10-01', '2014-10-02',

'2014-10-03', '2014-10-05', '2014-10-06', '2014-10-07',

'2014-10-08', '2014-10-09', '2014-10-10', '2014-10-11',

'2014-10-12', '2014-10-13', '2014-10-14', '2014-10-15',

'2014-10-16', '2014-10-17', '2014-10-18', '2014-10-19',

'2014-10-20', '2014-10-21'], dtype=object)

## Split an Array into 2 parts

import numpy as np

x = np.arange(9)

train = x[:4]

print train

val = x[4:]

print val

>>>

[0 1 2 3 4 5 6 7 8]

>>> ================================ RESTART ================================

[0 1 2 3]

[4 5 6 7 8]

## Transpose a numpy.ndarray

>>> a = np.array([[1, 2], [3, 4]])

>>> a

array([[1, 2],

[3, 4]])

>>> a.transpose()

array([[1, 3],

[2, 4]])

# Classes

class Dog:

def \_\_init\_\_(self, name):

self.name = name

self.tricks = [] # creates a new empty list for each dog

def add\_trick(self, trick):

self.tricks.append(trick)

>>> d = Dog('Fido')

>>> e = Dog('Buddy')

>>> d.add\_trick('roll over')

>>> e.add\_trick('play dead')

>>> d.tricks

['roll over']

>>> e.tricks

['play dead']

## Class static methods

""" CongregExtractor: Contains the CongregExtractor class """

class CongregExtractor:

""" CongregExtractor class """

def \_\_init\_\_(self):

self.congreg = []

@staticmethod

def stops\_to\_congreg(stop\_list):

congreg\_list = ["list"]

return(congreg\_list)

Invoke like:

from CongregExtractor import CongregExtractor as ce

my\_congregations = ce.stops\_to\_congreg(my\_items\_list)

# Control Statements

## for-next loops

>>> for x in xrange(0,3):

print(x)

0

1

2

### for-next over multiple variables

import itertools

for i,j in itertools.product(range(3), range(2)):

print i,j

>>>

0 0

0 1

1 0

1 1

2 0

2 1

## while loops

count = 0

while (count < 9):

print 'The count is:', count

count = count + 1

print "Good bye!"

# CSV Files

## Read from a CSV file

import csv

with open(‘test\_tag\_speed\_km\_mins\_pace\_hour\_day\_6mos\_end\_2012\_05\_22.csv', 'rb') as csvfile:

myreader = csv.reader(csvfile, delimiter=',')

for row in myreader:

print(row) # each row is a list containing the fields

>>> df = pd.read\_csv('outlier\_data/journey\_owner\_duration\_end\_date\_with\_history.csv')

>>> df.shape

(14410, 6)

>>> type(df)

<class 'pandas.core.frame.DataFrame'>

## Write to a CSV file

import csv

with open('eggs.csv', 'wb') as csvfile:

spamwriter = csv.writer(csvfile, delimiter=' ',

quotechar='|', quoting=csv.QUOTE\_MINIMAL)

spamwriter.writerow(['Spam'] \* 5 + ['Baked Beans'])

spamwriter.writerow(['Spam', 'Lovely Spam', 'Wonderful Spam'])

# Database Functions

## 

## Postgres

import psycopg2

import psycopg2.extensions

### Connect to a Postgres database

def get\_db\_conn():

conn = None

try:

conn = psycopg2.connect("dbname='dbanalytics' " +

"user='analytics' " +

"host='analytics.ca9tgiacgkgn.us-west-2.rds.amazonaws.com' " +

"password='<password-here>'")

print "Connected to dbanalytics database"

except:

print "Unable to connect to database"

return(conn)

### Execute SQL query on Postgres

conn = get\_db\_conn()

cur = conn.cursor()

with open('UC1\_query.sql', 'r') as uc1\_query\_file:

uc1\_query = uc1\_query\_file.read()

cur.execute(uc1\_query)

test\_output = cur.fetchall()

df = pd.DataFrame(test\_output)

df.columns = ['sap\_shipment\_id', 'status\_code', 'status\_reason',

'status\_dt\_utc', 'status\_lat', 'status\_lng',

'sap\_shipping\_point', 'orig\_lat', 'orig\_lon',

'dest\_lat', 'dest\_lon', 'driver\_eta\_utc',

'lat\_lon\_corr\_names', 'sap\_ship\_so',

'planned\_shipment\_end\_date\_utc\_c',

'actual\_shipment\_end\_date\_utc',

'sap\_message\_date\_utc\_c']

## SQLite3

### Create a SQLite3 Database

import sqlite3

conn = sqlite3.connect("lat\_lon\_db")

cursor = conn.cursor()

cursor.execute("create table address(name text PRIMARY\_KEY, latitude real, longitude real)")

conn.commit()

conn.close()

## Data Types

Each value stored in an SQLite database (or manipulated by the database engine) has one of the following storage classes:

•NULL. The value is a NULL value.

•INTEGER. The value is a signed integer, stored in 1, 2, 3, 4, 6, or 8 bytes depending on the magnitude of the value.

•REAL. The value is a floating point value, stored as an 8-byte IEEE floating point number.

•TEXT. The value is a text string, stored using the database encoding (UTF-8, UTF-16BE or UTF-16LE).

•BLOB. The value is a blob of data, stored exactly as it was input.

### Insert Values into Database

import sqlite3

conn = sqlite3.connect("lat\_lon\_db")

conn.text\_factory = lambda x: unicode(x, 'utf-8', 'ignore')

cursor = conn.cursor()

cursor.execute("insert into address (name, latitude, longitude) values (?,?,?)",

("4704 Nelson Brogdon Blvd Ne Sugar Hill GA 30518", 34.1025827, -84.02279469999999))

conn.commit()

conn.close()

Note: failure to use the above text\_factory setting has resulted in errors like: “ProgrammingError: You must not use 8-bit bytestrings unless you use a text\_factory that can interpret 8-bit bytestrings (like text\_factory = str). It is highly recommended that you instead just switch your application to Unicode strings.”

### Read from a Database Table

import sqlite3

conn = sqlite3.connect("lat\_lon\_db")

cursor = conn.cursor()

result = cursor.execute("select \* from address")

print(result.fetchall())

### Parameterized Queries

import sqlite3

conn = sqlite3.connect("lat\_lon\_db")

cursor = conn.cursor()

result = cursor.execute("select \* from address where street\_address = ?", ['1439 Buckeye Court Auburn CA 95603'])

x = result.fetchall()

conn.close()

# DataFrame (pandas)

## Add a column to a DataFrame

from pandas import DataFrame

>>> loc\_data\_frame.shape

(86, 11)

>>> loc\_data\_frame['predict'] = np.zeros(86)

>>> loc\_data\_frame.shape

(86, 12)

-or-

>>> from pandas import DataFrame

>>> test=DataFrame()

>>> my\_list = [1,2,3]

>>> test['col\_name'] = my\_list

>>> test

col\_name

0 1

1 2

2 3

-or-

from pandas import DataFrame

import numpy as np

test=DataFrame()

my\_list = [1,2,3]

test['number'] = my\_list

test['squared'] = test['number'] \*\*2

test['is\_even'] = np.where(test.squared % 2 == 0, True, False)

test['is\_odd'] = test.apply(lambda row: (row.squared % 2 == 1), axis=1)

print test

>>>

number squared is\_even is\_odd

0 1 1 False True

1 2 4 True False

2 3 9 False True

## Add a row to a DataFrame

>>> mydf = DataFrame(columns=("A", "B"))

>>> mydf

Empty DataFrame

Columns: [A, B]

Index: []

>>> mydf.loc[len(mydf)] = [18,19]

>>> mydf

A B

0 18 19

df637 = DataFrame(columns=('status\_dt\_utc',))

df637.loc[0] = [datetime(2016, 4, 27, 12, 0, 0)]

df637.loc[1,['status\_dt\_utc']] = datetime(2016, 4, 27, 12, 1, 0)

print df637

output:

status\_dt\_utc

0 2016-04-27 12:00:00

1 2016-04-27 12:01:00

## Apply a function, with arguments

df958 = DataFrame(columns=("SOME\_LAT", "SOME\_LON"))

df958.loc[0] = [38.896, -121.077] # Auburn, CA, in LA time zone

df958['TZ'] = df958.apply(get\_tz, args=('SOME\_LAT', 'SOME\_LON'), axis=1)

assert df958.TZ[0] == 'America/Los\_Angeles'

## Change column names

df = pd.DataFrame(test\_output)

df.columns = ['sap\_shipment\_id', 'status\_code']

## Change Column Data Type

a = [['a', '1.2', '4.2'], ['b', '70', '0.03'], ['x', '5', '0']]

df = pd.DataFrame(a, columns=['one', 'two', 'three'])

df

Out[16]:

one two three

0 a 1.2 4.2

1 b 70 0.03

2 x 5 0

df.dtypes

Out[17]:

one object

two object

three object

df[['two', 'three']] = df[['two', 'three']].astype(float)

df.dtypes

Out[19]:

one object

two float64

three float64

## Change values in one column based on values in a different column

from pandas import DataFrame, read\_csv, Series

df = DataFrame(columns=('A', 'B', 'C'))

df.loc[0] = [1,2,3]

df.loc[1] = [1,2,4]

df.loc[2] = [1,7,8]

print df

df.loc[df['B'] == 2, 'C'] = 13

print df

>>>

2015-08-31 03:22:56,512 tzwhere.py <module> 42 INFO Application started..

A B C

0 1 2 3

1 1 2 4

2 1 7 8

A B C

0 1 2 13

1 1 2 13

2 1 7 8

## Concatenate two data frames

from pandas import concat

>>> df1

A B C

0 1 2 3

1 3 2 1

>>> df2

D E F

0 5 6 7

1 7 6 5

>>> concat([df1, df2], axis=1)

A B C D E F

0 1 2 3 5 6 7

1 3 2 1 7 6 5

## Convert a DataFrame to a numpy.ndarray

from pandas import DataFrame

df = DataFrame(columns=('A', 'B', 'C'))

df.loc[0] = [1, 2, 3]

df.loc[1] = [4, 5, 6]

print df

v = df.values

print v

print type(v)

Output:

>>>

A B C

0 1 2 3

1 4 5 6

[[ 1. 2. 3.]

[ 4. 5. 6.]]

<type 'numpy.ndarray'>

## Copy a column from another DataFrame

# note input\_df will be a DataFrame

input\_df = read\_csv(input\_fname, header=0, quotechar='"',

quoting=csv.QUOTE\_ALL )

corr\_names = DataFrame(input\_df, columns=['CORRIDOR'])

## Copy a DataFrame

DataFrame.**copy**(deep=True)[¶](http://pandas.pydata.org/pandas-docs/stable/generated/pandas.DataFrame.copy.html#pandas.DataFrame.copy)

Make a copy of this objects data.

|  |  |
| --- | --- |
| **Parameters:** | **deep** : boolean or string, default True  Make a deep copy, including a copy of the data and the indices. With deep=False neither the indices or the data are copied.  Note that when deep=True data is copied, actual python objects will not be copied recursively, only the reference to the object. This is in contrast to copy.deepcopy in the Standard Library, which recursively copies object data. |
| **Returns:** | **copy** : type of caller |

## Correlation between columns

import pandas as pd

import matplotlib.pylab as plt

df = pd.read\_csv('winequality-red.csv', sep=';')

print(df.corr())

## Count the distinct values in a DataFrame column

from pandas import DataFrame, Series

import pandas as pd; import numpy as np

frame = DataFrame(records)

frame['tz'].value\_counts()

America/New\_York 1251

521

America/Chicago 400

America/Los\_Angeles 382

America/Denver 191

Europe/London 74

Asia/Tokyo 37

Pacific/Honolulu 36

Europe/Madrid 35

America/Sao\_Paulo 33

Europe/Berlin 28

Europe/Rome 27

America/Rainy\_River 25

Europe/Amsterdam 22

America/Indianapolis 20

...

Europe/Ljubljana 1

Asia/Riyadh 1

## Create a DataFrame from scratch

from pandas import DataFrame

df = DataFrame(columns=('A', 'B', 'C'))

df

Empty DataFrame

Columns: [A, B, C]

Index: []

>>> df.loc[0] = [1, 2, 3]

>>> df

A B C

0 1 2 3

### Create a DataFrame which has only one column

>>> df = DataFrame(columns=('A',))

>>> df

Empty DataFrame

Columns: [A]

Index: []

## Delete Rows Having Nulls in Certain Columns

from pandas import DataFrame

import pandas as pd

df = DataFrame(columns=('A', 'B', 'C'))

df.loc[0] = [1, 2, None]

df.loc[1] = [2, 4, 6]

print df, "\n"

missing = df.dropna(subset = ['C'])

print missing

A B C

0 1 2 None

1 2 4 6

A B C

1 2 4 6

## Extract a column from a DataFrame into a Series

my\_series = frame.al # al is one of the column names

my\_series

0 en-US,en;q=0.8

1 NaN

2 en-US

3 pt-br

4 en-US,en;q=0.8

5 en-US,en;q=0.8

6 pl-PL,pl;q=0.8,en-US;q=0.6,en;q=0.4

7 bg,en-us;q=0.7,en;q=0.3

## Get the rows in a DataFrame having a null in some column

mins\_rem\_missing\_df = input\_df[pd.isnull(input\_df['MINS\_REMAINING'])]

yields

status\_dt\_utc MINS\_REMAINING KM\_REMAINING HOUR\_OF\_DAY\_UTC \

489 2015-07-08 12:13:51 NaN 326.425442 12

490 2015-07-08 12:28:22 NaN 324.009080 12

491 2015-07-08 12:30:18 NaN 323.348925 12

492 2015-07-08 12:45:13 NaN 323.348202 12

## Fast update of a DataFrame column

from pandas import DataFrame, read\_csv

from cStringIO import StringIO

def append\_something(input):

return(input + "!")

df = read\_csv("test\_df\_data.txt", header=0)

print df

column\_series = df['header3']

modified\_df = column\_series.apply(append\_something)

df['header3'] = modified\_df

print df

>>>

header1 header2 header3

0 a b c

1 d e f

header1 header2 header3

0 a b c!

1 d e f!

>>>

## Filter out na values from a column

frame.al.dropna() # al is a column name in frame

## Find the Row Index in a DataFrame with a Particular Value

import pandas as pd

import numpy as np

df = pd.DataFrame(np.arange(1,7).reshape(2,3),

columns = list('abc'),

index=pd.Series([2,5], name='b'))

print(df)

# a b c

# b

# 2 1 2 3

# 5 4 5 6

print(np.where(df.index==5)[0])

# [1]

print(np.where(df['c']==6)[0])

# [1]

## Get DataFrame column names

list(df)

-or-

>>> from pandas import DataFrame

>>> journey\_data.columns.values

array(['OWNER', 'VEHICLE\_NUMBER', 'CORRIDOR\_NAME', 'JOURNEY\_NUMBER',

'JOURNEY\_DURATION\_HRS', 'ARRIVAL\_TIME'], dtype=object)

## Get DataFrame column values

from pandas import DataFrame, read\_csv, Series

df = DataFrame(columns=('A', 'B', 'C'))

df.loc[0] = [1,2,3]

df.loc[1] = [1,2,4]

df.loc[2] = [1,7,8]

print df.B.values

print type(df.B)

[ 2. 2. 7.]

<class 'pandas.core.series.Series'>

>>>

## Get dimensions of a DataFrame

>>> type(journey\_data)

<class 'pandas.core.frame.DataFrame'>

>>> journey\_data.shape

(14410, 6)

## Get row count from a DataFrame

>>> len(journey\_data)

14410

## Get rows from a DataFrame by index

>>> import pandas as pd

>>> df[2:4]

OWNER VEHICLE\_NUMBER CORRIDOR\_NAME \

2 Ragos KBH255J BUSIA-KAMPALA

3 COUNTRYMOTORS KBW990K BUSIA-KAMPALA

JOURNEY\_NUMBER JOURNEY\_DURATION\_HRS \

2 SGS-160868-KSM-02 5

3 SGS-KRA-2014NKUC11588-KRA-2014NKUC11588-01 14

ARRIVAL\_TIME

2 11-OCT-13 12.57.19.000000000 PM

3 26-MAR-14 03.08.02.000000000 AM

>>> type(df[2:4])

<class 'pandas.core.frame.DataFrame'>

## Get Rows from a DataFrame which Match an Element of a List

In [5]: df = DataFrame({'A' : [5,6,3,4], 'B' : [1,2,3, 5]})

In [6]: df

Out[6]:

A B

0 5 1

1 6 2

2 3 3

3 4 5

In [7]: df[df['A'].isin([3, 6])]

Out[7]:

A B

1 6 2

2 3 3

## Get unique values from a DataFrame column

from pandas import DataFrame, read\_csv, Series

df = DataFrame(columns=('A', 'B', 'C'))

df.loc[0] = [1,2,3]

df.loc[1] = [1,2,4]

df.loc[2] = [1,7,8]

unique\_val\_list = list(set(df.B))

print unique\_val\_list

>>> corr\_names = DataFrame(journey\_data, columns=['CORRIDOR\_NAME'])

>>> corr\_names

CORRIDOR\_NAME

0 ACCRA SGS OFFICE-ADENTA-MR TANKIA

1 ACCRA SGS OFFICE-PIG FARM JUNCTION TOTAL-ACCRA

2 BUSIA-KAMPALA

…

[14410 rows x 1 columns]

>>> from pandas import Series

>>> Series(corr\_names.values.ravel()).unique()

array(['ACCRA SGS OFFICE-ADENTA-MR TANKIA',

'ACCRA SGS OFFICE-PIG FARM JUNCTION TOTAL-ACCRA', 'BUSIA-KAMPALA',

'BUSIA-MOMBASA', 'CHASE TEMA-SAKAMAN TOTAL-ACCRA', …

## GroupBy Functionality

<http://chrisalbon.com/python/pandas_apply_operations_to_groups.html>

groupby\_carrier = corr\_subset\_df['abs\_err\_mins'].groupby(corr\_subset\_df['carrier'])

print groupby\_carrier.median()

Output:

carrier

DART 116.810555

SCNN 48.376467

USXI 89.106971

Also, mean, std, min, max, count, describe()

### Extract the values from a GroupBy

groupBy.max().values

groupby\_shipment = corr\_df['actual\_stationary\_sec\_rem'].groupby(corr\_df['sap\_shipment\_id'])

print type(groupby\_shipment)

test\_series = groupby\_shipment.max()

print test\_series

print type(test\_series.values)

print test.values[0:10]

Output:

<class 'pandas.core.groupby.SeriesGroupBy'>

sap\_shipment\_id

305983891 53778.058568

305983892 46943.959868

305983893 54163.514338

...

306192132 25738.955543

306192133 59705.278771

306194785 41280.000000

Name: actual\_stationary\_sec\_rem, Length: 100, dtype: float64

<type 'numpy.ndarray'>

[ 53778.05856769 46943.95986826 54163.51433815 0.

124016.33373177 90999.37652502 75965.70095359 0.

51818.71226756 43008.00886809]

## Insert a column into a DataFrame

owner\_codes = get\_owner\_codes(veh\_subset\_df)

output\_df.insert(1, 'OWNER\_CODE', owner\_codes, allow\_duplicates=True)

## Max value of a DataFrame column

from pandas import DataFrame, read\_csv, Series

df = DataFrame(columns=('A', 'B', 'C'))

df.loc[0] = [1,2,3]

df.loc[1] = [1,2,4]

df.loc[2] = [1,7,8]

print df

print max(df['B'])

A B C

0 1 2 3

1 1 2 4

2 1 7 8

7.0

## Randomly Split a DataFrame

import numpy as np

import pandas as pd

df = pd.DataFrame(np.random.randn(10, 2))

msk = np.random.rand(len(df)) < 0.8

train = df[msk]

test = df[~msk]

print df

print msk

print type(train)

print train

0 1

0 0.171749 0.556087

1 0.744720 0.923194

2 0.209449 -0.539187

3 0.231416 1.674134

4 -1.426739 -0.492131

5 -0.919245 -0.203287

6 -0.656182 -1.516310

7 1.053216 -0.445366

8 1.641810 0.066485

9 0.449852 -2.599164

[ True False True True True False True True True False]

<class 'pandas.core.frame.DataFrame'>

0 1

0 0.171749 0.556087

2 0.209449 -0.539187

3 0.231416 1.674134

4 -1.426739 -0.492131

6 -0.656182 -1.516310

7 1.053216 -0.445366

8 1.641810 0.066485

## Read a CSV file into a DataFrame

<http://pandas.pydata.org/pandas-docs/stable/generated/pandas.read_csv.html>

from pandas import read\_csv

df = read\_csv('eta\_exp\_2/eta\_corr\_owner\_veh\_kph\_km-rem\_mins-rem\_pace\_lat\_lon\_hr\_day\_min.csv', header=0)

// note header=0 means the column names are read from the first row of the input file

## Parse formatted dates while reading a CSV

DATE\_FORMAT\_STRING\_MB = r'%d-%b-%y %I.%M.%S.%f000 %p'

test\_output\_df = read\_csv('mb11\_jrny\_chckpnt\_data.csv',

header=0,

parse\_dates=['FEED\_DT',

'LEG\_PLANNED\_ARR\_DT',

'LEG\_ACTUAL\_ARR\_DT'],

date\_parser = lambda x: pd.to\_datetime(x,

format=DATE\_FORMAT\_STRING\_MB,

coerce=True)

## Select a cell from a DataFrame

>>> journey\_data[1:2]

OWNER VEHICLE\_NUMBER CORRIDOR\_NAME \

1 Total Ghana ITDEMO ACCRA SGS OFFICE-PIG FARM JUNCTION TOTAL-ACCRA

JOURNEY\_NUMBER JOURNEY\_DURATION\_HRS \

1 SGS-ITDEMO-20140722-01 2

ARRIVAL\_TIME

1 22-JUL-14 03.47.05.000000000 PM

>>> journey\_data.iloc[1][0]

'Total Ghana'

>>> journey\_data.iloc[1]['CORRIDOR\_NAME']

'ACCRA SGS OFFICE-PIG FARM JUNCTION TOTAL-ACCRA'

## Select rows from a DataFrame by value of a column

>>> journey\_data.shape

(14410, 6)

>>> subset = journey\_data[journey\_data['CORRIDOR\_NAME'] == 'MOMBASA-NAIROBI']

>>> subset.shape

(4481, 6)

## Select rows from a DataFrame by values of multiple columns

from pandas import DataFrame

df = DataFrame(columns=('A', 'B', 'C'))

df.loc[0] = [1,2,3]

df.loc[1] = [1,2,4]

df.loc[2] = [1,7,8]

print df

A B C

0 1 2 3

1 1 2 4

2 1 7 8

df2 = df[(df['A'] == 1) & (df['B'] == 2)]

print df2

A B C

0 1 2 3

1 1 2 4

## Select rows from a DataFrame by values of multiple columns

import pandas as pd

from random import randint

df = pd.DataFrame({'A': [x for x in xrange(10)],

'B': [x \* 10 for x in xrange(10)],

'C': [x \* 100 for x in xrange(10)]})

print df

subset\_df = df.loc[(df["B"] == 40) & (df["C"] == 400)]

print subset\_df

>>>

A B C

0 0 0 0

1 1 10 100

2 2 20 200

3 3 30 300

4 4 40 400

5 5 50 500

...

9 9 90 900

A B C

4 4 40 400

## Sort a DataFrame

>>> mydf

A B

0 18 19

1 3 4

>>> sorted = mydf.sort(["A", "B"])

>>> sorted

A B

1 3 4

0 18 19

## Split a DataFrame into train and test sets

import pandas as pd

import numpy as np

from sklearn.cross\_validation import train\_test\_split

train, test = train\_test\_split(df, test\_size = 0.2)

## Substitute for na values in a column

from pandas import DataFrame, Series

import pandas as pd; import numpy as np

frame = DataFrame(records)

frame['tz'].value\_counts()

clean\_tz = frame['tz'].fillna('Missing')

clean\_tz

8

9

10 America/Los\_Angeles

11 America/New\_York

12 America/New\_York

13 Missing

## Summary statistics for a DataFrame

import pandas as pd

df = pd.read\_csv('winequality-red.csv', sep=';', header=0)

df.describe()



## Write a DataFrame to a csv file

veh\_data\_subset.to\_csv(out\_file\_name, index=False) # index=False suppresses row\_id

### Wrapping CSV file columns in quotes

import csv

output\_df.to\_csv('lat\_lon\_epoch\_weather4.csv', index=False, **quoting=csv.QUOTE\_ALL** )

# Date Functions

## Add a time interval to a datetime

Definition: relativedelta.relativedelta(self, dt1=None, dt2=None,

years=0, months=0, days=0, leapdays=0, weeks=0, hours=0, minutes=0,

seconds=0, microseconds=0, year=None, month=None, day=None,

weekday=None, yearday=None, nlyearday=None, hour=None, minute=None,

second=None, microsecond=None)

>>> from dateutil.relativedelta import relativedelta

>>> import datetime

>>> today = datetime.datetime.today()

>>> today

datetime.datetime(2014, 11, 20)

>>> one\_day\_relative = relativedelta(days=1)

>>> today + one\_day\_relative

datetime.date(2014, 11, 21)

# Add minutes

>>> from dateutil.relativedelta import relativedelta

>>> jetzt = datetime.now()

>>> jetzt

datetime.datetime(2014, 12, 14, 6, 24, 12, 475000)

>>> twenty\_mins\_relative = relativedelta(minutes=20)

>>> twenty\_mins\_relative

relativedelta(minutes=+20)

>>> jetzt + twenty\_mins\_relative

datetime.datetime(2014, 12, 14, 6, 44, 12, 475000)

## Calculate a time interval

>>> from datetime import date, timedelta

>>> date.today()

datetime.date(2014, 8, 25)

>>> thirty\_days\_ago = date.today() - timedelta(days=30)

>>> thirty\_days\_ago

datetime.date(2014, 7, 26)

## Calculate a time interval in seconds, days

>>> t1 = datetime.now()

>>> t1

datetime.datetime(2014, 10, 22, 14, 44, 43, 868000)

>>> t2 = datetime.now()

>>> t2 - t1

datetime.timedelta(0, 20, 740000)

>>> from datetime import datetime

>>> datetime.now()

datetime.datetime(2014, 10, 22, 14, 48, 20, 878000)

t1 = datetime(2015, 9, 9, 0, 0, 0, 0)

t2 = datetime(2015, 9, 9, 0, 2, 0, 0)

assert minutes\_between(t1, t2) == 2

>>> (t2-t1).total\_seconds()

20.74

>>> type(t2-t1)

<type 'datetime.timedelta'>

>>> from datetime import timedelta

>>> test = datetime.now()

>>> test2 = datetime.now()

>>> test

datetime.datetime(2014, 11, 20, 6, 0, 42, 884000)

>>> test2

datetime.datetime(2014, 11, 20, 6, 0, 57, 274000)

>>> d = test2 - test

>>> d

datetime.timedelta(0, 14, 390000)

>>> d.seconds

14

>>> d.days

0

## Convert a datetime to Epoch Seconds

int((datetime.datetime(2012,04,01,0,0) - datetime.datetime(1970,1,1)).total\_seconds())

1333238400

## Convert an Epoch to a time

>>> import time

>>> time.gmtime(1423371600)

time.struct\_time(tm\_year=2015, tm\_mon=2, tm\_mday=8, tm\_hour=5, tm\_min=0, tm\_sec=0, tm\_wday=6, tm\_yday=39, tm\_isdst=0)

## Convert string to date

import datetime

>>> datetime.datetime.strptime("02/05/2014", "%m/%d/%Y").date()

datetime.date(2014, 2, 5)

>>> datetime.datetime.strptime("2/5/2014", "%m/%d/%Y").date()

datetime.date(2014, 2, 5)

>>> datetime.strptime('26-MAR-14 03.08.02.000000000 AM', '%d-%b-%y %I.%M.%S.000000000 %p')

datetime.datetime(2014, 3, 26, 3, 8, 2)

from datetime import datetime

status\_dt = datetime.strptime(journey\_subset\_df.iloc[i]['FEED\_DT'],

'%d-%b-%y %I.%M.%S.000000000 %p')

### Microseconds

import datetime

DATE\_FORMAT\_STRING\_MB = r'%d-%b-%y %I.%M.%S.%f000 %p'

print datetime.strptime("19-AUG-15 09.52.14.167842000 AM", DATE\_FORMAT\_STRING\_MB)

2015-08-19 09:52:14.167842

## Date Time Format Strings

| **Directive** | **Meaning** | **Notes** |
| --- | --- | --- |
| %a | Locale’s abbreviated weekday name. |  |
| %A | Locale’s full weekday name. |  |
| %b | Locale’s abbreviated month name. |  |
| %B | Locale’s full month name. |  |
| %c | Locale’s appropriate date and time representation. |  |
| %d | Day of the month as a decimal number [01,31]. |  |
| %H | Hour (24-hour clock) as a decimal number [00,23]. |  |
| %I | Hour (12-hour clock) as a decimal number [01,12]. |  |
| %j | Day of the year as a decimal number [001,366]. |  |
| %m | Month as a decimal number [01,12]. |  |
| %M | Minute as a decimal number [00,59]. |  |
| %p | Locale’s equivalent of either AM or PM. | (1) |
| %S | Second as a decimal number [00,61]. | (2) |
| %U | Week number of the year (Sunday as the first day of the week) as a decimal number [00,53]. All days in a new year preceding the first Sunday are considered to be in week 0. | (3) |
| %w | Weekday as a decimal number [0(Sunday),6]. |  |
| %W | Week number of the year (Monday as the first day of the week) as a decimal number [00,53]. All days in a new year preceding the first Monday are considered to be in week 0. | (3) |
| %x | Locale’s appropriate date representation. |  |
| %X | Locale’s appropriate time representation. |  |
| %y | Year without century as a decimal number [00,99]. |  |
| %Y | Year with century as a decimal number. |  |
| %Z | Time zone name (no characters if no time zone exists). |  |
| %% | A literal '%' character. |  |

Notes:

1. When used with the [**strptime()**](http://docs.python.org/2/library/time.html#time.strptime) function, the %p directive only affects the output hour field if the %I directive is used to parse the hour.
2. The range really is 0 to 61; this accounts for leap seconds and the (very rare) double leap seconds.
3. When used with the [**strptime()**](http://docs.python.org/2/library/time.html#time.strptime) function, %U and %W are only used in calculations when the day of the week and the year are specified.
4. %f indicates microseconds.

### Another method:

>>> from dateutil.parser import \*

>>> from dateutil.tz import \*

>>> parse('2014-09-11 13:11:07+00:00')

datetime.datetime(2014, 9, 11, 13, 11, 7, tzinfo=tzutc())

## Create an arbitrary datetime

datetime.datetime(2014, 10, 22, 14, 48, 20, 878000) # yr, mo, day, hr, min, sec, us

### datetime with time zone

import pytz

dt\_utc = datetime(2015, 10, 21, 4, 40, 0, 0, pytz.UTC)

print dt\_utc

2015-10-21 04:40:00+00:00

## Get the current datetime

>>> from datetime import datetime

>>> datetime.now()

## Get year, month, day, hour, minute, second, milliseconds, weekday

>>> from datetime import datetime

>>> t2

datetime.datetime(2014, 10, 22, 14, 45, 4, 608000)

>>> t2.year

2014

>>> t2.month

10

>>> t2.day

22

>>> t2.hour

14

>>> t2.minute

45

>>> t2.second

4

>>> t2.microsecond

608000

>>> today = datetime.now()

>>> today

datetime.datetime(2014, 10, 23, 9, 30, 37, 743000)

>>> today.weekday()

3

[Note: In python, Monday is 0, Sunday is 6]

## ISO Weekday

ISO weekday is Monday = 1, Sunday = 7

>>> from datetime import datetime

>>> jetzt = datetime.now()

>>> jetzt

datetime.datetime(2015, 3, 2, 9, 33, 14, 907000)

>>> jetzt.isoweekday()

1

## Time Zone Names

<https://en.wikipedia.org/wiki/List_of_tz_database_time_zones>

# Dictionaries

Used as has tables or associative arrays

## Convert a DataFrame to a Dictionary

>>> test = DataFrame(columns=('A', 'B'))

>>> test.loc[0] = ['Turlock', 'CA']

>>> test.loc[1] = ['Lexington', 'KY']

>>> test

A B

0 Turlock CA

1 Lexington KY

>>> test\_dict = test.set\_index('A').to\_dict()

>>> test\_dict

{'B': {'Turlock': 'CA', 'Lexington': 'KY'}}

>>> test\_dict['B']['Turlock']

'CA'

## Create a dictionary

>>> test = {}

>>> test[(1,2)] = 1

>>> (1,2) in test

True

## Get a value for a key in the dict

dict = {'Name': 'Zara', 'Age': 27}

print "Value : %s" % dict.get('Age')

print "Value : %s" % dict.get('Sex', "Never")

Value : 27

Value : Never

## Get the keys from a dictionary

>>> my\_dict = {}

>>> my\_dict['A'] = 1

>>> my\_dict

{'A': 1}

>>> my\_dict.keys() # note: returns a list

['A']

## Is a key in a dictionary?

>>> test = {}

>>> test["something"] = 1

>>> test["something"]

1

>>> "somethingelse" in test

False

>>> "something" in test

True

>>> test["somethingelse"]

Traceback (most recent call last):

File "<pyshell#5>", line 1, in <module>

test["somethingelse"]

KeyError: 'somethingelse'

# Directories

## Check if a Directory exists

import os

print(os.path.isdir("/home/el"))

## Concatenate a Directory and File Name

base\_dir = r'c:\bla\bing'

filename = r'data.txt'

os.path.join(base\_dir, filename)

'c:\\bla\\bing\\data.txt'

## Create a Directory

if not os.path.exists('kept\_models\_by\_corr'):

os.makedirs('kept\_models\_by\_corr')

## Delete all the files and folders in a directory

import os

import shutil

def clear\_dir(folder):

""" Delete all the file sin the specified path name.

Path name will be like '/path/to/folder'

"""

for root, dirs, files in os.walk(folder):

for f in files:

os.unlink(os.path.join(root, f))

for d in dirs:

shutil.rmtree(os.path.join(root, d))

## Delete all the files in a directory

import os

def clear\_dir(folder):

""" Delete all the file sin the specified path name.

Path name will be like '/path/to/folder'

"""

for the\_file in os.listdir(folder):

file\_path = os.path.join(folder, the\_file)

try:

if os.path.isfile(file\_path):

os.unlink(file\_path)

except Exception, e:

print e

## Get the Current Working Directory

>>> import os

>>> os.getcwd()

'C:\\Python27'

## Read the files in a directory.

path=r"C:\Users\bbeauchamp\Documents\Data Analytics\Customers\_and\_Projects\SGS\eta\_raw\parser"

>>> import os

>>> files = os.listdir(path)

File names are returned as elements in a list. Note that this will also read in subdirectories.

## Read the files in a directory with a specific extension

>>> import glob

>>> my\_list = glob.glob(r"C:\Users\bbeauchamp\Documents\Data Analytics\Customers\_and\_Projects\SGS\eta\_raw\parser\\*.arff") # note returns a list

## Set the working directory

>>> import os

>>> os.chdir('c:/dev/python')

>>> os.getcwd()

'c:\\dev\\python'

# Exception Handling

## try-except

**import** **sys**

**try**:

f = open('myfile.txt')

s = f.readline()

i = int(s.strip())

**except** IOError **as** e:

**print** "I/O error({0}): {1}".format(e.errno, e.strerror)

**except** ValueError:

**print** "Could not convert data to an integer."

**except**:

**print** "Unexpected error:", sys.exc\_info()[0]

**raise**

## Print the traceback and stack trace

try:

# Create the scaler

scaler = preprocessing.StandardScaler().fit(X\_for\_scaler)

# Store the scaler serialization for use during prediction

ser\_string = pickle.dumps(scaler, pickle.HIGHEST\_PROTOCOL)

text\_file = open(scaler\_output\_dir + corr\_name + ".txt", "wb")

text\_file.write(ser\_string)

text\_file.close()

except:

print "Error - Unable to generate scaler:", sys.exc\_info()[0]

print "filepath=%s" % filepath

print "X\_for\_scaler:"

for j in xrange(0, len(X\_for\_scaler)):

print "row[%d] = %s" % (j, str(X\_for\_scaler[j]))

print "\*\*\* print\_exc:"

traceback.print\_exc()

raise

# Files

## Copy a file between from one directory to another

from shutil import copyfile

copyfile(filename, new\_file\_name)

## Delete a file

os.remove("corr\_validation.csv")

## Does a file exist?

import os.path

os.path.isfile(fname)

## Extract the file name from a path

>>> pathname = "C:\Users\bbeauchamp\Documents\Data Analytics\Customers\_and\_Projects\SGS\eta\_raw\parser\F000008\_km\_min.arff"

>>> from os.path import basename

>>> print basename(pathname)

F000008\_km\_min.arff

or

import ntpath

ntpath.basename("training\_data\_by\_corr\@GENERIC\_31.37\_-92.41\_39.90\_-84.26\_train.csv")

'@GENERIC\_31.37\_-92.41\_39.90\_-84.26\_train.csv'

## Open File dialog

import Tkinter, tkFileDialog

root = Tkinter.Tk()

root.withdraw()

file\_path = tkFileDialog.askopenfilename()

## Read a text file into a string

with open('model\_train.sql', 'r') as model\_train\_sql\_file:

model\_train\_sql = model\_train\_sql\_file.read()

## Read all the lines in a file into a list

>>> text\_file = open("eta\_corr\_owner\_veh\_km-rem\_mins-rem\_pace\_lat\_lon\_hr\_day\_mo\_no-dupe.csv", "r")

>>> lines = text\_file.readlines()

>>> print len(lines)

614161

>>> print lines[1]

BUSIA-MOMBASA,PURA LOGISTICS,SLMKBN434B,37,397.0563678,1402,7.189250437,-1.49094,37.0571,14,6,9

## Read a text file line by line

filename = 'calamp\_msg\_out\_3.xml'

with open(filename) as f:

for line in f:

print(line)

## Read a CSV file

import csv

with open('C:\\Users\\bbeauchamp\\Documents\\Data Analytics\\Customers\_and\_Projects\\SGS\\' +

'GSM\_fail\_2\_or\_more\_devices\_with\_conn\_pct.csv', 'rb') as csvfile:

myReader = csv.reader(csvfile, delimiter = ',')

print( 'test')

for myRow in myReader:

print', '.join(myRow)

## 

## Write to a Text File

points\_file = open('C:\\Users\\bbeauchamp\\Documents\\Data Analytics\\Customers\_and\_Projects\\SGS\\test\_output', 'w')

points\_file.write('This is a test\n')

points\_file.close()

# Geocoding

import urllib

import json

def get\_lat\_lon(address):

print("starting")

params = { }

# params[ 'key' ] = "AIzaSyAfHtyiQmO7OpAp8WiM8RzGcBlYQqCo67w" # the actual key, of course, is not provided here

params[ 'sensor' ] = "false"

params[ 'address' ] = address

params = urllib.urlencode( params )

print "http://maps.googleapis.com/maps/api/geocode/json?%s" % params

f = urllib.urlopen( "http://maps.googleapis.com/maps/api/geocode/json?%s" % params )

reply = f.read()

decodeddata = json.loads(reply)

latitude = (decodeddata['results'][0]['geometry']['location']['lat'])

longitude = (decodeddata['results'][0]['geometry']['location']['lng'])

return([latitude, longitude])

print(get\_lat\_lon("1439 Buckeye Court Auburn CA"))

# Geography

## Distance between two coordinates

import geopy

from geopy.geocoders import Nominatim

from geopy.distance import vincenty

point\_a = (42.52574, -71.42404)

point\_b = (42.526, -71.42644)

print vincenty(point\_a, point\_b).km

# Hash Functions

>>> import hashlib

>>> print hashlib.sha1("This is a test").hexdigest()

a54d88e06612d820bc3be72877c74f257b561b19 # this is a string object

# Installing packages

## easy\_install

c:\Python27\Scripts>easy\_install googlemaps

Searching for googlemaps

Reading https://pypi.python.org/simple/googlemaps/

Reading http://sourceforge.net/projects/py-googlemaps/

…

zip\_safe flag not set; analyzing archive contents...

Adding googlemaps 2.0 to easy-install.pth file

Installed c:\python27\lib\site-packages\googlemaps-2.0-py2.7.egg

Processing dependencies for googlemaps

Finished processing dependencies for googlemaps

**Note: You must then close IDLE and reopen it.**

# json

## Pretty Print JSON

import JSON

print json.dumps(data, indent=4)

outputs:

{

"accountTotal": 122124.19,

"receivedLateFees": 18.61,

"receivedInterest": 71092.26,

"infundingBalance": 900,

"outstandingPrincipal": 121141.38,

"investorId": 918209,

"receivedPrincipal": 176669.6,

"accruedInterest": 1940.7,

"availableCash": 82.81,

"totalPortfolios": 2,

"totalNotes": 8942

}

## Reading a json file into a dict

import json

fname = r"c:/temp/test6.json"

my\_json\_file = open(fname)

my\_data = json.load(my\_json\_file)

print(my\_data["algorithmData"]["conveyance"]["id"])

# 

# Lambdas

## Conditional Lambdas

products['contains\_perfect'] = products['perfect'].apply(lambda x: 1 if x >0 else 0)

# Libraries

## Find the Function Available in a Library

import math

dir(math)

# Lists

## Apply Math Functions to the Elements of a List

# Convert predicted stationary seconds remaining to sta minutes remaining

rsm\_predictions = [pred\_seconds / 60.0 for pred\_seconds in rs\_sec\_predictions]

## Average of items in a list

l = [15, 18, 2, 36, 12, 78, 5, 6, 9]

sum(l) / float(len(l))

mean = np.average(np.array(tot\_stationary\_mins\_list, dtype=float))

## Concatenate 2 lists

>>> a = [1,2]

>>> b = [3,4]

>>> a+b

[1, 2, 3, 4]

## Copy a list

import copy

new\_list = copy.deepcopy(old\_list)

## Create a list containing a number of constants

>>> [1] \* 10

[1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

>>>

## Count the Number of Occurences of an Item in a List

test = ['A', 'B', 'C', 'A']

print test.count('A')

>>>

2

## 

## Creating and Appending to a List

>>> adds = []

>>> adds

[]

>>> adds.append("a")

>>> adds

['a']

>>> adds.append("b")

>>> adds

['a', 'b']

>>> 'a' in adds

True

>>> 'c' in adds

False

## Last items in a List

a = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12]

a

output:

[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12]

a[-9:]

output:

[4, 5, 6, 7, 8, 9, 10, 11, 12]

## Randomly Split a List

import numpy as np

from sklearn.cross\_validation import train\_test\_split

x = range(11)

print x, type(x)

x\_train, x\_test = train\_test\_split(x, test\_size=0.3, random\_state=0)

print x\_train

print x\_test

[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10] <type 'list'>

[6, 1, 7, 8, 3, 0, 5]

[4, 9, 2, 10]

## Remove Null Values from a List

Use a list comprehension

>>> a = [1,2,3,None]

>>> b = [x for x in a if x is not None]

>>> b

[1, 2, 3]

## Replace an item in a list

import numpy as np

list1 = [1,2,3,None,5]

print list1

for i,val in enumerate(list1):

if val is None:

list1[i] = 17

print list1

>>>

[1, 2, 3, None, 5]

[1, 2, 3, 17, 5]

>>>

## Sort a list

>>> b = [1,4,2,7,3,8]

>>> b

[1, 4, 2, 7, 3, 8]

>>> b.sort()

>>> b

[1, 2, 3, 4, 7, 8]

>>> sorted([5, 2, 3, 1, 4])

[1, 2, 3, 4, 5]

## Shuffle the items in a list

>>> test = [1,2,3,4,5]

>>> from random import shuffle

>>> shuffle(test)

>>> test

[2, 3, 1, 4, 5]

## Subtract the Elements in 2 Lists

import numpy as np

corr\_subset\_df['pred\_error\_mins'] = list(np.array(pred\_mins\_to\_arr\_list) -

np.array(mins\_to\_arr\_actual))

## Standard Deviation of items in a list

import numpy as np

sd = np.std(np.array(tot\_stationary\_mins\_list, dtype=float))

## Using lambda and map on a list

squares = map(lambda x: x\*\*2, range(10))

print squares

output:

[0, 1, 4, 9, 16, 25, 36, 49, 64, 81

# Machine Learning

## Create Word Count columns

# Split out the words into individual columns

for word in important\_words:

products[word] = products['review\_clean'].apply(lambda s : s.split().count(word))

## Euclidean Distance

from sklearn.metrics.pairwise import euclidean\_distances

counts = [

[0, 1, 1, 0, 0, 1, 0, 1],

[0, 1, 1, 1, 1, 0, 0, 0],

[1, 0, 0, 0, 0, 0, 1, 0]

]

print 'Distance between 1st and 2nd documents:', euclidean\_distances(counts[0], counts[1])

print 'Distance between 1st and 3rd documents:', euclidean\_distances(counts[0], counts[2])

print 'Distance between 2nd and 3rd documents:', euclidean\_distances(counts[1], counts[2])

Distance between 1st and 2nd documents: [[ 2.]]

Distance between 1st and 3rd documents: [[ 2.44948974]]

Distance between 2nd and 3rd documents: [[ 2.44948974]]

## One-Hot Encoder

from sklearn.feature\_extraction import DictVectorizer

onehot\_encoder = DictVectorizer()

instances = [

{'city': 'New York'},

{'city': 'San Francisco'},

{'city': 'Chapel Hill'}

]

print onehot\_encoder.fit\_transform(instances).toarray()

# Math Functions

## Exponentiation

>>> 2\*\*3

8

## Largest float

>>> sys.float\_info.max

1.7976931348623157e+308

## Median

>>> import numpy as np

>>> a = np.array([1,2,3,4])

>>> np.median(a)

2.5

## Modulo

>>> 17 % 3

2

## pi

math.pi

## Random Numbers

### Random float

>>> import random

>>> random.seed(0)

>>> random.uniform(0, 0.2)

0.10956309498898086

## Rounding

### General rounding

>>> round(110.574388557174, 3)

110.574

### Round to half-even

import decimal

>>> decimal.Decimal('2.675').quantize(decimal.Decimal('.01'), rounding=decimal.ROUND\_HALF\_EVEN)

Decimal('2.68')

>>> decimal.Decimal('2.665').quantize(decimal.Decimal('.01'), rounding=decimal.ROUND\_HALF\_EVEN)

Decimal('2.66')

Note: **To round to a float equivalent of an integer**, use ‘0’ for the decimal.Decimal() argument.

def round\_half\_even(floating\_point\_str, how\_many\_dec\_points):

""" Rounds the specified floating point value (encoded as a string)

to the specified number of decimal points, using

ROUND\_HALF\_EVEN rounding method.

2.675 rounds to 2.68

2.665 rounds to 2.66

Requires import decimal

"""

rounding\_arg = decimal.Decimal(str(10 \*\* (-1 \* how\_many\_dec\_points)))

rounded = (decimal.Decimal(floating\_point\_str)

.quantize(rounding\_arg,

rounding=decimal.ROUND\_HALF\_EVEN))

return(rounded)

def self\_test():

""" Tests the code in this python program

"""

# test round\_half\_even()

assert round\_half\_even('2.675', 2) == Decimal('2.68')

assert round\_half\_even('2.665', 2) == Decimal('2.66')

print "self test complete"

### Round to {x.0, x.5} intervals

def round\_to\_half(float\_arg):

""" Round a floating point number to the nearest 1/2,

e.g round\_to\_half(1.25) = 1.0 but

round\_to\_half(1.255) = 1.5

"""

twice = float\_arg \* 2.0

rounded = decimal.Decimal(twice).quantize(decimal.Decimal('0'), rounding=decimal.ROUND\_HALF\_EVEN)

return(float(rounded) / 2.0)

## Square Root

import math

math.sqrt(25)

## Test for nan

from math import isnan

nan\_float = float(‘nan’)

>>> math.isnan(nan\_float)

True

# Matrices

## Number of rows in a matrix

row\_count = X\_train.shape[0]

## Read a Matrix from a file

>>> import numpy as np

>>> my\_data = np.genfromtxt(filepath, delimiter=',', skip\_header=8)

(my\_data will be a 2d numpy array)

## Read the contents of a matrix column into an array

>>> mydata

array([[ 1. , 19.91142191, 16. , 74. ],

[ 2. , 17.99404762, 15. , 48. ],

[ 3. , 18.94845361, 16. , 89. ],

[ 4. , 29.55978261, 21.5 , 120. ],

[ 5. , 25.80927835, 18. , 129. ],

[ 6. , 20.21631206, 16. , 16. ],

[ 7. , 18.47900763, 15. , 15. ],

[ 8. , 18.82753165, 15. , 30. ],

[ 9. , 16.14227642, 15. , 21. ],

[ 10. , 18.10933941, 15. , 37. ],

[ 11. , 18.24694377, 14. , 151. ],

[ 12. , 17.70260223, 12. , 79. ]])

>>> rainfall\_mm = mydata[:,3]

>>> rainfall\_mm

array([ 74., 48., 89., 120., 129., 16., 15., 30., 21.,

37., 151., 79.])

## Scale matrix columns

from sklearn import preprocessing

scaler = preprocessing.StandardScaler().fit(X)

X\_scaled = scaler.transform(X)

# Methods

## Method Header Template

def brokenTen(value):

"""Incorrect implementation of the ten function.

Note:

The `if` statement checks an undefined variable `val` instead of `value`.

Args:

value (int): A number.

Returns:

bool: Whether `value` is less than ten.

Raises:

NameError: The function references `val`, which is not available in the local or global

namespace, so a `NameError` is raised.

"""

# numpy

## Covariance

xbar = (6 + 8 + 10 + 14 + 18) / 5

ybar = (7 + 9 + 13 + 17.5 + 18) / 5

cov = ((6 - xbar) \* (7 - ybar) + (8 - xbar) \* (9 - ybar) + (10 - xbar) \* (13 - ybar) +

(14 - xbar) \* (17.5 - ybar) + (18 - xbar) \* (18 - ybar)) / 4

print cov

import numpy as np

print np.cov([6, 8, 10, 14, 18], [7, 9, 13, 17.5, 18])

print np.cov([6, 8, 10, 14, 18], [7, 9, 13, 17.5, 18])[0][1]

22.65

[[ 23.2 22.65]

[ 22.65 24.3 ]]

22.65

## r-squared

from sklearn.linear\_model import LinearRegression

X = [[6], [8], [10], [14], [18]]

y = [[7], [9], [13], [17.5], [18]]

X\_test = [[8], [9], [11], [16], [12]]

y\_test = [[11], [8.5], [15], [18], [11]]

model = LinearRegression()

model.fit(X, y)

print 'R-squared: %.4f' % model.score(X\_test, y\_test)

R-squared: 0.6620

## Variance

import numpy as np

X = [6,8,10,14,18]

print np.var(X, ddof=1)

23.2

# Object Serialization

## Create an object from a stored serialization

# Load the dictionary back from the pickle file.

import pickle

favorite\_color = pickle.load( open( "latlong.p", "rb" ) )

print(favorite\_color["330 Lee Industrial Blvd Austell, Ga 30168"])

print(favorite\_color["330 LEE INDUSTRIAL BLVD AUSTELL, GA 30168"])

## Serialize and Store an Object

tzw\_str = pickle.dumps(tzw, pickle.HIGHEST\_PROTOCOL)

text\_file = open("tzwhere\_tz\_converter.txt", "wb")

text\_file.write(tzw\_str)

text\_file.close()

# pandasql

Uses SQLite3 in the background, so syntax permitted by SQLite3 should work

## Installing pandasql

c:\>pip install -U pandasql

Collecting pandasql

Downloading pandasql-0.6.3.tar.gz

Installing collected packages: pandasql

Running setup.py install for pandasql

Successfully installed pandasql-0.6.3

## Querying using pandasql

import pandas as pd

from pandasql import sqldf

from pandasql import load\_births # returns a test dataset

births\_df = load\_births()

q = """

SELECT \*

FROM births\_df b

where b.date > '1976-01-01'

and b.date < '1977-01-01'

"""

births\_1976\_df = sqldf(q, globals())

print births\_1976\_df

>>>

date births

0 1976-01-01 00:00:00 259173

1 1976-01-01 00:00:00 257455

2 1976-02-01 00:00:00 238153

3 1976-02-01 00:00:00 236551

…

21 1976-11-01 00:00:00 258011

22 1976-12-01 00:00:00 265787

23 1976-12-01 00:00:00 265886

>>>

# Plotting

import matplotlib.pyplot as plt

## Histograms

savi\_error = get\_error\_list(df, 'PRED\_MINS\_REM', 'MINS\_REMAINING')

plan\_error = get\_error\_list(df, 'PLAN\_ETA\_MINS\_REM', 'MINS\_REMAINING')

my\_bins = range(-3000, 3000, 100)

plt.hist(savi\_error, histtype='step', color='b', label='Savi',

normed=False, bins=my\_bins)

plt.hist(plan\_error, histtype='step', color='r', label='Plan',

normed=False, bins=my\_bins)

plt.title("ETA Error: Savi ETA vs Planned Arrival Time")

plt.xlabel("Error, minutes")

plt.ylabel("Frequency")

plt.legend()

plt.show()



## Scatter plot

import pandas as pd

import matplotlib.pylab as plt

df = pd.read\_csv('winequality-red.csv', sep=';')

plt.scatter(df['alcohol'], df['quality'])

plt.xlabel('Alcohol')

plt.ylabel('Quality')

plt.title('Alcohol vs Quality')

plt.show()



# Program Execution

## Stopping program execution

from sys import exit

exit('exiting....')

# Regular expressions

## Remove punctuation

import re

mystring = "test !123"

out = re.sub('[^A-Za-z0-9 ]+', '', mystring)

# Random Numbers

## Random number in a range

from random import randint

print randrange(0,10) # rand int in the range 0,10 inclusive

## Create a list containing some random numbers

from random import randint

random\_indices = []

for x in range (0, 1000):

random\_indices.append(randint(0, 999))

# REST Services

## Consume a REST service

import json

import urllib2

json.load(urllib2.urlopen("url"))

# scikit-learn

## Linear regression

from sklearn.linear\_model import LinearRegression

# Training data

X = [[6], [8], [10], [14], [18]]

y = [[7], [9], [13], [17.5], [18]]

# Create and fit the model

model = LinearRegression()

model.fit(X, y)

print 'A 12" pizza should cost: $%.2f' % model.predict([12])[0]

A 12" pizza should cost: $13.68

# Series (pandas)

## Check if a Series value is null

pd.isnull(df\_row[target\_field\_name])

## Convert a Series to a DataFrame

Series.to\_frame(name=None)

## Create a Series of random numbers

s = Series(np.random.randn(5))

## Get the value of a Series element

>>> this\_journey\_number[0:0]

Series([], name: JOURNEY\_NUMBER, dtype: object)

>>> this\_journey\_number.values

array(['SGS-KRA-2014NKUC11588-KRA-2014NKUC11588-01'], dtype=object)

>>> this\_journey\_number.values[0]

'SGS-KRA-2014NKUC11588-KRA-2014NKUC11588-01'

# SFrame

## Add a Column Based on Other Columns

# Add payment\_inc\_ratio

loans['payment\_inc\_ratio'] = loans.apply(lambda row: row['installment'] \* 12.0 / (row['annual\_inc'] + 0.01))

## Convert an SFrame to features and labels in a numpy array

Two arrays are returned: one representing features and another representing class labels.

Note: The feature matrix includes an additional column 'intercept' filled with 1's to take account of the intercept term.

import numpy as np

def get\_numpy\_data(data\_sframe, features, label):

data\_sframe['intercept'] = 1

features = ['intercept'] + features

features\_sframe = data\_sframe[features]

feature\_matrix = features\_sframe.to\_numpy()

label\_sarray = data\_sframe[label]

label\_array = label\_sarray.to\_numpy()

return(feature\_matrix, label\_array)

feature\_matrix\_train, sentiment\_train = get\_numpy\_data(train\_data, important\_words, 'sentiment')

feature\_matrix\_valid, sentiment\_valid = get\_numpy\_data(validation\_data, important\_words, 'sentiment')

## Copy an Sframe

copy\_sframe = some\_frame.copy()

## First n rows of an Sframe

products.head(10)['name']

## One-Hot Encoding of an Sframe

loans\_data = risky\_loans.append(safe\_loans)

for feature in features:

loans\_data\_one\_hot\_encoded = loans\_data[feature].apply(lambda x: {x: 1})

loans\_data\_unpacked = loans\_data\_one\_hot\_encoded.unpack(column\_name\_prefix=feature)

# Change None's to 0's

for column in loans\_data\_unpacked.column\_names():

loans\_data\_unpacked[column] = loans\_data\_unpacked[column].fillna(0)

loans\_data.remove\_column(feature)

loans\_data.add\_columns(loans\_data\_unpacked)

## Random Split an SFrame

train\_data, validation\_data = products.random\_split(.9, seed=1)

## Remove a Column from an Sframe

Sframe.remove\_column(column\_name)

## Select Rows from an Sframe

example\_labels = sframe.SArray([-1, -1, 1, 1, 1])

subset = example\_labels[example\_labels[:] == -1]

print len(subset)

Response: 2

# Statistics

## Applying lowess smoothing

import numpy as np

import pylab as plt

import statsmodels.api as sm

x = np.linspace(0,2\*np.pi,100)

y = np.sin(x) + np.random.random(100) \* 0.2

lowess = sm.nonparametric.lowess(y, x, frac=0.1)

print type(lowess)

print lowess

plt.plot(x, y, '+')

plt.plot(lowess[:, 0], lowess[:, 1])

plt.show()



## Precision, recall, F1, support

import numpy as np

from sklearn.metrics import precision\_recall\_fscore\_support

#y\_true = np.array([0, 1, 0, 0, 1, 0])

#y\_pred = np.array([0, 1, 1, 0, 0, 1])

y\_true = np.array(['early', 'late', 'early', 'early', 'late', 'early','late'])

y\_pred = np.array(['early', 'late', 'late', 'early', 'early', 'late','late'])

precision, recall, f1, x = precision\_recall\_fscore\_support(y\_true, y\_pred, pos\_label='late', average='micro')

print precision, recall, f1

# Strings

## Concatenate strings

>>> 'is' + 'test'

'istest'

## Convert a character to its ASCII integer

>>> ord('A')

65

## Convert to float

>>> test = "123.45"

>>> type(test)

<type 'str'>

>>> test\_float = float(test)

>>> test\_float

123.45

>>> type(test\_float)

<type 'float'>

## Convert to lower case

>>> "Test".lower()

'test'

## Find a sub-string

>>> test = "something"

>>> test.find('me')

2

## Formatted strings

>>> test = "something %s" % "great"

>>> test

'something great'

## Remove Punctuation

>>> test = "some sunava #%^@$#"

>>> import string

>>> test.translate(None, string.punctuation)

'some sunava '

## Replace a substring

>>> test

'out with the old'

>>> test.replace('old', 'new')

'out with the new'

>>>

## String Literals

>>> x = r"\n"

>>> x

'\\n'

>>>

## Sub-strings

>>> x = "Hello World!"

>>> x[2:]

'llo World!'

>>> x[:2]

'He'

>>> x[:-2]

'Hello Worl'

>>> x[-2:]

'd!'

>>> x[2:-2]

'llo Worl'

## Tokenize a string

>>> test = "the world is at my fingertips"

>>> test.split(' ')

['the', 'world', 'is', 'at', 'my', 'fingertips']

## Trim leading and trailing characters

>>> '"Strip the "leading" and "trailing" double quotes"'.strip('"')

'Strip the "leading" and "trailing" double quotes'

>>> test = "A()"

>>> test

'A()'

>>> test.strip("()")

'A'

## Trim white space

>>> test = " something "

>>> len(test)

11

>>> len(test.strip())

9

# Timers

## Sleep

import time

>>> print time.ctime(); time.sleep(10); print time.ctime()

Fri Sep 26 09:09:30 2014

Fri Sep 26 09:09:40 2014

## Timing Code Execution

>>> import time

>>> start\_time = time.time()

>>> print (time.time() - start\_time)

18.8489999771

# Tuples

## Cartesion product of two tuples

import itertools

x = [1, 3, 5]

p = list( itertools.product(x, x))

print str(p)

[(1, 1), (1, 3), (3, 1), (3, 3)]

## Product of the elements in a tuple

from operator import mul

a = (1,2,3,4)

print(reduce(mul, a))

>>>

24

# User Input

## Get user input from the keyboard

>>> test\_var = raw\_input("Enter some data")

Enter some datacomething

>>> test\_var

'comething'

>>>