

Machine Learning I

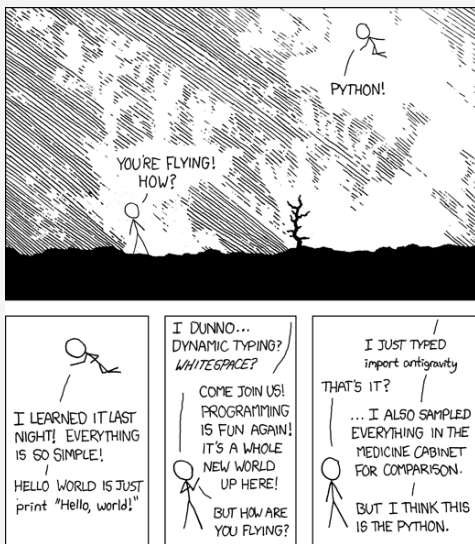
RL Programming Session

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December 18, 2009

Python is Fun!



(<http://xkcd.org>)

Python Introduction

- Python is a script language, no compiler necessary
- object-oriented, dynamic typing, garbage collection
- mark blocks by indentation

```
s = "number"  
for i in range(10):  
    k = i*2  
    print s, k
```

- use package manager (apt-get, fink, ...) or download here <http://www.python.org/download/>
- good tutorial book online available: <http://www.diveintopython.org/>

Python Types

```
Lists a = []  
      a = range(5)  
      a.append(5)  
      print len(a)  
      for i in a: print i  
      b = [i+2 for i in a]
```

Tuples like lists but unchangeable
(1, 4, 6) instead of [1, 4, 6]

```
Dictionaries a = {}  
             a['color'] = 'red'  
             a['shape'] = 'circle'  
             print len(a)  
             print a.keys(), a.values()
```

Python Classes

```
class SomeClass(BaseClass):
    classvar1 = 0
    classvar2 = None
    classvar3 = []

    def __init__(self):
        self.classvar1 = 5

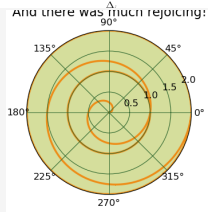
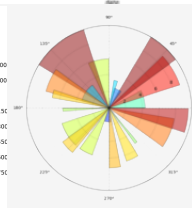
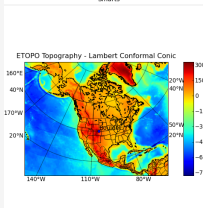
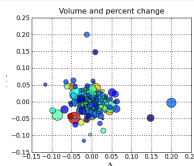
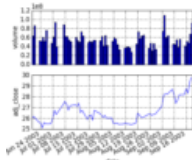
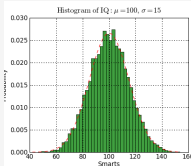
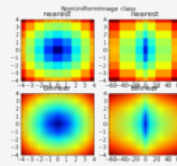
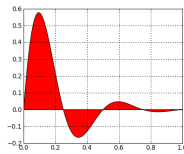
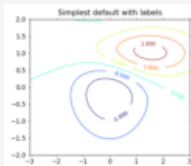
    def somefunc(self, a, b):
        self.classvar2 = a+b
        return True

# --- create object from class and call function
someObject = SomeClass()
someObject.somefunc(1, 2)
```

SciPy – Scientific Python

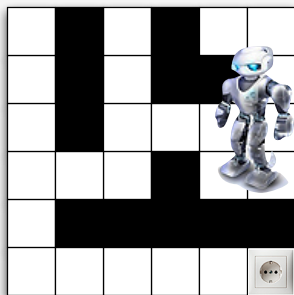
- brings arrays, matrices, vectors, linear algebra, statistics, random numbers, fourier transforms, ...
- array most commonly used: initialize with (nested) list
`a = array([[1, 2, 3], [2, 3, 4], [3, 4, 5]])`
- run most operators on arrays: $+$, $-$, $*$, $/$, \max , \min , mean , ...
- arrays can be n-dimensional (use lists of lists of lists ... to initialize)

matplotlib – Visualization for Python



Programming Session

- find the power outlet in a maze
- Q-Learning algorithm (temporal difference)
- discrete states and actions, reward-only-at-goal
- without / with eligibility traces

**1****0**