Introduction to Data Structures in Python

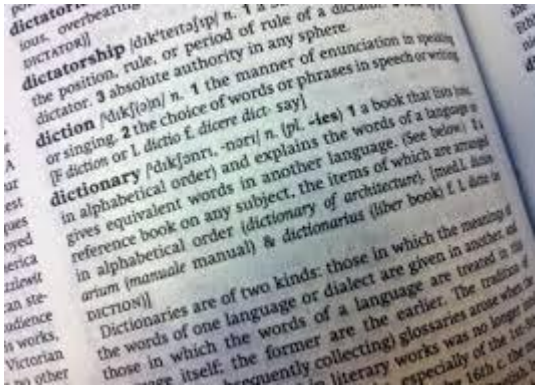
By Eric Schles

Intro to Me

Who am I?

- Adjunct Professor @ NYU
- CTO @ Lyte: www.uselyte.com (yes we are hiring)
  - -Full stack python: Django + sci kit learn
- Researcher @ NYU http://serv.cusp.nyu.edu/projects/mobilesense/
- HUGE python fan boy http://osrc.dfm.io/EricSchles/

Example Data Structures from the real world



English Dictionary
(access)

City Map
(store)

Intro to Data Structures

Fundamental Questions:

- How do we efficiently store data?
- How do we efficiently access data?

In data structures, we think about organizing our data so that it is easy to use and easy to access.

Core thoughts in Data Structures

There are two main ways to think about data structures:

In mathematical terms and through abstract data types

In terms of implementation and code

This shapes our analysis of different structures

Data Structures in theory

x + 2 = 4, what is x?

x is a variable, implicitly representing a set

In data structures we think about ADTs (abstract data types). Here data abstracts away the notions of the standard mathematical sets.

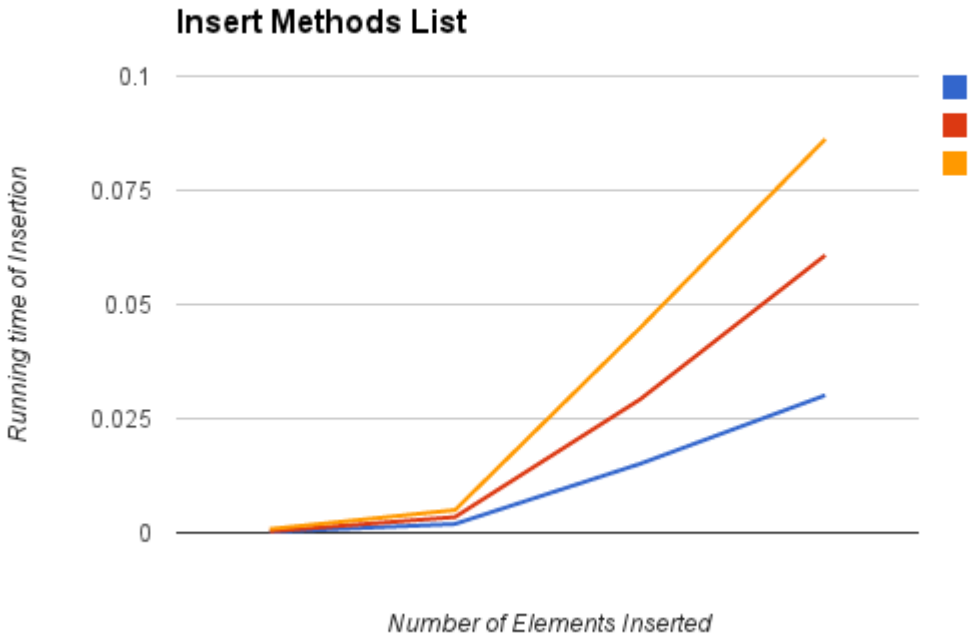
Python Built-in List

Let’s look at inserting and removing data in the built-in python data structure, a list

[Demo - testing_list_insert.py]

Results

blue:
append
red:
extend
yellow:
insert



Results

Pop:

blue

Remove:

red

Building your own Data structures

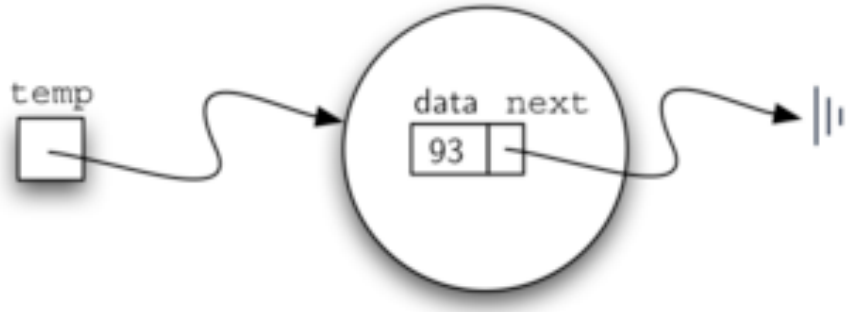


Figure 3: A Node Object Contains the Item and a Reference to the Next Node

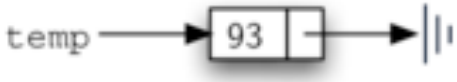


Figure 4: A Typical Representation for a Node

Linked List

[show code]

[demo linked list]