

LE/EECS 1015

(Section D)

Week 11: Collections III

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This Week...

1. A Review of the Collection Memory Model

- Shallow Copy
- Deep Copy

2. Nested Collections

- Iteration
- Aliasing

Goals of Lab 9

- 1. Writing and debugging scripts that use nested collections.**
- 2. Writing concise, clean code (accounting for time complexity)**

Lab 9 – What You Do....

Task	Points
Follow the Steps (Separate Numbers)	30
Debugging (Debug Correlation)	30
Implementation (Tic-Tac-Toe Game)	20

Lab 9 – Useful Resources

- [Nested loops in Python are easy 🌟 \(Bro Code\)](#)
- [Nested Loops: Visually Explained \(Visually Explained\)](#)

(Recap) Collection Memory Model

- Shallow Copy
 - “Constructs a **new compound object** and then (to the extent possible) inserts **references** into it to the objects found in the original.”
- Deep Copy
 - “Constructs a **new compound object** and then, **recursively**, inserts **copies** into it of the objects found in the original.”

Collection Memory Model

Assume that we have the following 2D List (called, “square”):

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

`from copy import copy, deepcopy`

`square_shallow = copy(square)`

`square_deep = deepcopy(square)`

How will updating `square[0][0] = “A”`
change `square_shallow` and/or
`square_deep`? Explain your answer.

Nested Data Types

- A nested datatype is a collection whose elements consist of other collections themselves.
 - You will be working with **references**; it is important to understand the **Collection Memory Model!**
 - Things can get messy if you do not handle your pointers properly.
- You will need to provide ***n* indexes** to access and/or update an element that is nested ***n* times**.

Nested Loops

- Using nested loops allows us to traverse and/or iterate through nested collections easily.
- For each iteration of the outer loop, the inner loop will run from beginning to end.
- You can write nested summations by leveraging nested loops!

Nested Loops

Write a nested for loop which calculates the following sum:

$$\sum_{i=1}^{10} \sum_{j=1}^{10} i \times j = 3025$$

Nested Loops (ft. Time Complexity)

“If you need more than 3 levels of indentation, you’re screwed anyway, and should fix your program.”

- Linus Torvalds

Thank You!

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