

CMPUT 174 Lab 7: SimCity Land Value Calculator

Theme of this lab: SimCity!



Do you know what SimCity is? It's a video game where you control a city and its inhabitants. The city is divided into a grid of squares, each of which has a certain amount of land. The city is controlled by a player who can buy land, sell land, and build houses and businesses.

The goal of the game is to make the most money by building businesses that generate money.

You have the data about land values. But, unfortunately, some values are missing!

Your goal is to fill in the missing values.

You must use nested lists to represent the grid.

Learning Outcomes

- Use nested lists to operate multi-dimensional data

- Employ user-defined functions to decompose computational problems
- Identify appropriate parameters and return values for user-defined functions
- Use file input-output to read data from disk
- Use unit tests to ensure correctness of a program
- Apply evolutionary prototyping to design programs step by step

Software Quality Requirements

For this lab, you must apply **all** [software quality requirements](#), **except** Section 7 (User-defined Classes).

Tasks

The following tasks are versions of the same problem. We're learning to write code in an incremental way. Start with the simplest version, and then add more functionalities to make your code more complex. Please do the tasks in order, starting with the first one.

1. [Version 1: Read and display land values](#)
2. [Version 2: Find neighbors](#)
3. [Version 3: Estimate missing land values](#)
4. [Version 4: Calculate statistics](#)

Reflection Questions

Once you're done coding, use these questions to think about your code. It's an essential part of learning because we can never write good code if we don't think about the problem and consider different ways of solving it.

When you demo your lab, a TA may ask some of these questions.

1. Can you represent a three-dimensional data structure in Python (think of a Rubik's cube, with a value in each "box")? How would you do it?
2. In the input files, the first two rows contain the number of rows and columns. What if we provided you with **only** the number of rows? Would it be sufficient to read the data into a grid?
3. Lists are mutable, and it can be a problem for the `fill_gaps()` function. Why?

4. In version 3, we recommended you to use the `deepcopy()` function to create a copy of a list. What is the difference between the following two code fragments?

```
first_list = [1, 2, 3]
second_list = first_list
```

and

```
from copy import deepcopy
first_list = [1, 2, 3]
second_list = deepcopy(first_list)
```

Resources

Use the following data files to test your code:

- [data 0.txt](#)
- [data 1.txt](#)
- [data 2.txt](#)
- [data 3.txt](#)

Marking

The are no part marks, no in-between marks

4/4	Your code clearly meets all requirements of Version 4 and all software quality requirements. You clearly understand your code and your answers are correct.
3/4	One of the following: <ul style="list-style-type: none">a) Your code meets all requirements of Version 3 and all related software quality requirements. You clearly understand your code and your answers are correct.b) Your code meets most Version 4 requirements and most software quality requirements; it runs and does what is expected. However, some minor requirements are missing, or some details in your answers are missing or incorrect.
2/4	One of the following: <ul style="list-style-type: none">a) Your code meets all requirements of Version 2 and all related software quality requirements. You clearly understand your code and your answers are correct.b) Your code meets most Version 3 requirements and most software quality requirements; it runs and does what is expected. However, some minor

	requirements are missing, or some details in your answers are missing or incorrect.
1/4	<p>One of the following:</p> <ul style="list-style-type: none"> a) Your code meets all requirements of Version 1 and all related software quality requirements. You clearly understand your code and your answers are correct. b) Your code meets most Version 2 requirements and most software quality requirements; it runs and does what is expected. However, some minor requirements are missing, or some details in your answers are missing or incorrect. c) You put effort into your lab assignment, but your code doesn't run at all or runs with major problems. Missing major requirements, or your answers are mainly incorrect.
0/4	<p>One of the following:</p> <ul style="list-style-type: none"> a) Incomplete, or very insufficient code, or no submission. b) Code submitted but no show, or no answers, or irrelevant answers.

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