

# **COMP 200: Data Structures and Algorithms**

## **Fall 2020**

### **Programming Assignment 1**

In this assignment, we are going to simulate a river ecosystem with two types of creatures, bears and fish. Consider the following points while designing your simulation.

1. Model the river as a very large Python list e.g. 10,000 or more elements.
2. Randomly populate this list with fishes and bears such that fish constitute about 50% of the list while bears constitute about 2% of the list while the remaining list is empty. You can do this using `random.random()` for each element in your list. If the number is less than 0.02, populate that element with a bear object, if the number is between 0.02 and 0.52, populate it with a fish object, otherwise leave it empty.
3. At each time instance, there is a 50% chance that the animal would try to move to an adjacent location.
4. If a bear and a fish collide in the same cell, then the fish dies (disappears).
5. If two animals of the same type collide, then a new animal of that type is born only if they are of different gender. The newborn is placed in a random empty location in the river.
6. If two animals of the same type and the same gender collide, then only the one with larger strength survives.
7. Run your simulation for 100,000 time steps and report the populations of fish and bears at the end of this time period.
8. Re-run your simulation 5 times and report populations of bears and fish each time.

Hint: It would probably be a good idea to have an Animal class with the required attributes.

Hint: To simulate randomness, generate a number between 0 and 1 using Python's `random.random()`.