

CS0012 Introduction to Computing for the Humanities

Project 1

Lab 1

Overview

The Prisoner's Dilemma is the basis for one of the most famous, and most fundamental, problems in mathematical game theory – a field that underlies the work of the quantitative social sciences. It has been used extensively as a model for the way people behave collectively under numerous conditions including inter-continental arms races, the adoption of different technologies by different groups of people, and food sharing within communities. You will be building a simulator to compare different strategies that could be involved by people who find themselves in the Prisoners Dilemma. To be able to build a useful simulator, you must understand the details of the Prisoner's Dilemma.

The Prisoner's Dilemma can be stated as follows. A pair of partners in crime have been arrested and they are coming up for trial. They are individually offered the chance to negotiate their sentences by cooperating with the authorities, but the amount of time they will spend in jail depends not only on their own decision but also on that of their partner. The authorities have separated the criminals so that they cannot communicate with one another as they discuss their plea bargains. The deal is as follows:

- If both partners cooperate with the authorities, each of their sentences will be set at 4 years.
- If neither partner cooperates, their sentences will be set at 2 years each.
- If only one partner cooperates and the other stays silent, the cooperating partner will receive absolutely no jail time, while the silent partner will be sentenced to 6 years in prison.

You may note that this situation has been constructed such that each of the prisoners knows that if they act in their own self-interest by trying to minimize the number of years they might spend in prison – that is, if they behave “rationally” in game-theoretic terms – the result may or may not be to their benefit, because it partially depends the actions of their partner.

Background

One thing that our simulation will need to be able to do is pick a random number. Generating random numbers can be tricky, but fortunately someone has already written Python code for us to use. With `print()` and `input()` you have already been using code written by someone else within your programs. The functionality that they provide is used so often that they are built-in

to the Python language. Since the code to generate random numbers is not built-in, we will need to explicitly tell Python that we would like to use it via the `import` statement:

```
from random import randint
```

We can now use `randint()` to generate random numbers! For example, the following line of code will store an integer between 1 and 3 (inclusive, i.e., either 1, 2, or 3) in the variable named `x`:

```
x = randint(1, 3)
```

With `randint()`, we can set to building our simulation. Note that `randint()` is one of the many, many things already programmed for you in the Python Standard Library. We will be covering other parts of the Standard Library later in the course.

Lab 1

Part 1: Creating the basic structure of our model

In this first iteration of our project, the user will play the part of one of the partners, while the computer will play the part of the other partner. You will program the computer to pick between the two options at random. Your program should proceed as follows:

Use the `import` statement to tell Python we will be using `randint()`. Present the user with the choice to either “cooperate” (Option 1), or “stay silent” (Option 2) Read in the user’s selection (either 1 or 2), and store the result in a variable named `partnerAChoice`. Use `randint()` to select one of these two options for the partner controlled by the computer and store it in a variable named `partnerBChoice`. Print to the screen the decisions made by both user and the computer.

Here is the output from several runs of the desired program:

```
You have the following two choices:
Option1: Cooperate with the authorities
Option2: Stay silent
Enter 1 or 2: 1
You chose 1
The computer chose 2
```

```
You have the following two choices:
Option1: Cooperate with the authorities
Option2: Stay silent
Enter 1 or 2: 1
You chose 1
The computer chose 2
```

```
You have the following two choices:
Option1: Cooperate with the authorities
Option2: Stay silent
Enter 1 or 2: 1
You chose 1
The computer chose 2
```

Once you have finished, show the lab instructor that you have Lab 1 working.