CMSC 671 (Introduction to AI) – Fall 2016

Homework 1: Python and AI

Due: 9/19 at 11:59pm.

Turnin: Blackboard.

Please submit Parts I and II together as a **single PDF file** named *yourlastname*_hw1.pdf.

Please submit Part III as a single **.py** file, named *yourlastname*_hw1.py, containing all functions specified in the assignment. This file should not contain a main function.

All files must start with your last name.

PART I. WHAT IS AI? (15 PTS)

Reading: Read John McCarthy's paper, "What is AI?"
http://tiny.cc/mc-what-is-ai
Reading: Read the (very) recent 100-year retrospective *through section II*:
http://ai100.stanford.edu/2016-report

Assignment: Answer the following questions in a short *essay* (1–2 pages, single spaced)

- Based on both papers:
  - What did you think "AI" meant before the reading?
  - Did anything you read change your mind? How?
- On McCarthy:
  - Does McCarthy see the primary goal of AI as modeling human intelligence?
  - Does McCarthy think that this goal is achievable? Why or why not?
  - Do you agree on what the primary goal of AI should be, and whether it is achievable?
- Summarize some of the key challenges in achieving human-level intelligence.

PART II. AI NOW (15 PTS.)

Assignment: Answer the following questions (1-3 sentences per question)

1. What current research trend do you think shows the most *promise*, that is, seems most likely to produce interesting and important results?
2. Why is that your choice?
3. What current area (research trend OR application area) of AI are you most excited about?
4. Why?
5. Based on what you read, what area or trend do you think is least promising, or should not be pursued?
6. Why?

PART III. INTRODUCTION TO PYTHON (40 PTS)

If you are not familiar with Python, there are lots of online resources; any resource where you look at code samples should be cited in the comments at the beginning of the program.

We are happy to assist with finding resources.

Documentation and error checking are essential in this class, so although these problems are very simple, your code must be documented, and error cases must be handled. (For example, what if someone passes a non-coordinate string to 4(b)?)

We are using Python 2, not 3, for this course.

Problem 1: Hello World (6 points)

Write a short function called hello_world that, when called, prints the string:

Hello World!

On stdout. Capitalization and punctuation should be exact.

Problem 2: Lists, Sets, Tuples, and Libraries (16 points)

(a) Import the random library. *1*

(b) Write a short function called world_shuffle that: *3*

1. Populates a list with the individual characters of "Hello World!" ('H', 'e', 'l', 'l', etc.)
2. Uses random.shuffle to randomly permute the elements of the list.
3. Concatenates all the elements of the shuffled list into a single string; and
4. Prints the result.

Here is an example of one possible output:

world_shuffle() ⇒ rleWHoold !l

(c) Write a short function called shuffle_set that: *4*

1. Creates an empty set.
2. Populates the set with the individual characters of "Hello World!" ('H', 'e', 'l', 'l', etc.)
3. Concatenates the elements of the set into a string; and
4. Prints the result.

(d) Write a short function called make_map that: *8*

1. Creates an empty list.
2. Populates the list with 25 two-element tuples representing *pairs* of numbers ranging from 1-5 and 1-5. (I.e.: (1,1), (1,2), ... (1,5), (2,1), (2,2), ..., (5,5).)
3. Prints the resulting list, five items per line.c

Here are the first two lines of the expected output:

```
(1, 1) (1, 2) (1, 3) (1, 4) (1, 5)
(2, 1) (2, 2) (2, 3) (2, 4) (2, 5)
```

These tuples are coordinates into a grid-based map (shown below).

Problem 3: Dictionaries and Manhattan Distance (18 points)

(a) Write a function called map_dict that: *6*

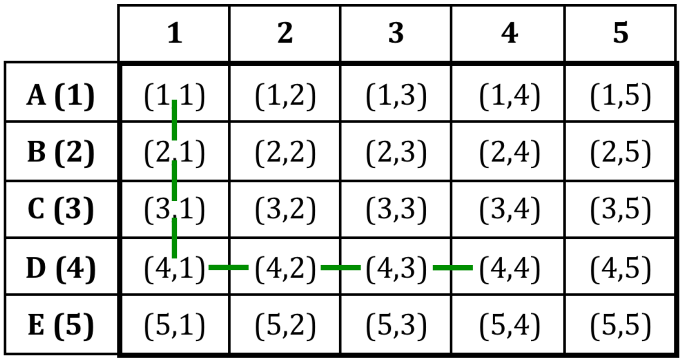
1. Creates a dictionary containing 25 key/value pairs labeling the map spaces.
   a. Key: string label, e.g., “A1”, “A2”, …, “E5”
   b. Value: the tuple containing the tuple of coordinates for that space.
   c. Prints this dictionary. (You may also return the dictionary as a value.)

(b) Write a function called manhattan_dist that: *12*

1. Takes two map coordinate labels as arguments.
2. Calculates the *Manhattan distance* between those coordinates: the number of steps you would have to take to get between them if you cannot go diagonally.
3. Prints *and* returns this distance.

Here is an example of one possible output:

manhattan_dist(“A1”, “D4”) ⇒ 6



	1	**2**	**3**	**4**	**5**
A (1)	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)
B (2)	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)
C (3)	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)
D (4)	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)
E (5)	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)