

# COMP 3211 Assignment 1

## Uninformed Search

The code used for this assignment is from the open course, CS188.1x Artificial Intelligence.

Course website: <http://ai.berkeley.edu/home.html>.

In this assignment you will discover the different behavior of three search algorithms: BFS, DFS and UCS using the pacman game. You need to submit a report of your observation.

## Invoking the Python Interpreter

This class assume you use Python 2.7. To see if you have python installed, open 'terminal' on osx/linux, or 'command prompt' on windows, and input command `python --version`. If you see the following output, it means python has been installed on your system.

```
$ python --version
Python 2.7.13
```

Otherwise, you need to follow these instructions:

- Windows:
  - a. Download python windows installer at <https://www.python.org/downloads/>
  - b. Run the installer, choose the location where you want to install Python, for example `C:\Python27\`
  - c. Set the system's PATH variable
    - i. Open the Control Panel (easy way: click in the Windows search on your taskbar and type "Control Panel" then click the icon).
    - ii. In the Control Panel, search for Environment; click Edit the System Environment Variables. Then click the Environment Variables button.
    - iii. In the User Variables section, you will need to either edit an existing PATH variable or create one. Add this line  
`C:\Python27;C:\Python27\Lib\site-packages\;C:\Python27\Scripts\`  
to PATH,
      - 1. If you are creating one, make PATH the variable name and add the following directories to the variable values section as shown, separated by a semicolon.
      - 2. If you're editing an existing PATH, the values are presented on separate lines in the edit dialog. Click New and add one directory per line.
- OSX: <http://docs.python-guide.org/en/latest/starting/install/osx/>

# The Packman Program

Download `assignment1.zip` on canvas, unzip the files to `assignment1`. Use `cd` command to change to our working directory.

```
$ unzip assignment1.zip
$ cd assignment1
$ ls
```

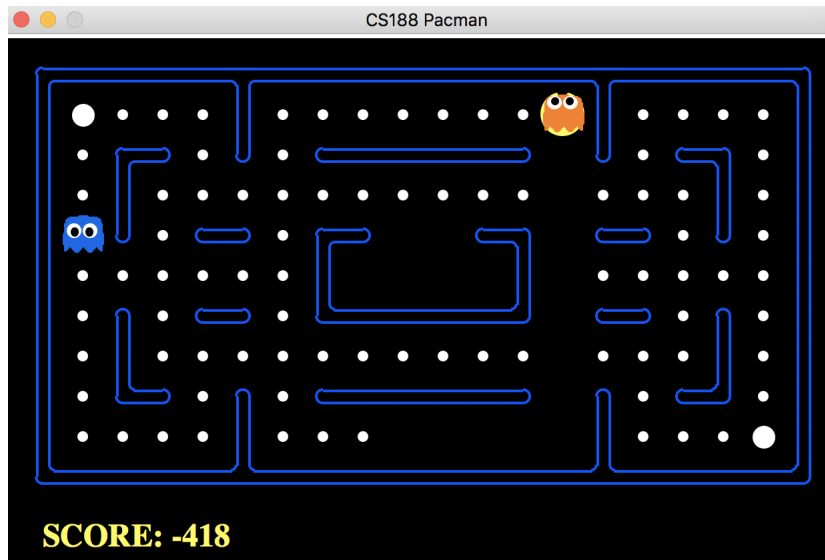
Some useful terminal commands

- For bash (osx/linux)  
<https://www.git-tower.com/learn/git/ebook/en/command-line/appendix/command-line-101>
- For windows command prompt  
<http://www.cs.princeton.edu/courses/archive/spr05/cos126/cmd-prompt.html>

Here's the overview of files in the package, you don't need to read them for completing this assignment.

| Files you may want to read.        |  |
|------------------------------------|--|
| <a href="#">search.py</a>          | All of the search algorithms.  |
| <a href="#">searchAgents.py</a>    | All of the search-based agents interact with the game world.   |
| Supporting files you can ignore:   |  |
| <a href="#">pacman.py</a>          | The main file that runs Pacman games. This file describes a Pacman GameState type, which you use in this project.                      |
| <a href="#">game.py</a>            | The logic behind how the Pacman world works. This file describes several supporting types like AgentState, Agent, Direction, and Grid. |
| <a href="#">util.py</a>            | Useful data structures for implementing search algorithms.   |
| <a href="#">graphicsDisplay.py</a> | Graphics for Pacman  |
| <a href="#">graphicsUtils.py</a>   | Support for Pacman graphics  |
| <a href="#">textDisplay.py</a>     | ASCII graphics for Pacman  |
| <a href="#">ghostAgents.py</a>     | Agents to control ghosts   |
| <a href="#">keyboardAgents.py</a>  | Keyboard interfaces to control Pacman  |
| <a href="#">layout.py</a>          | Code for reading layout files and storing their contents   |

Use command `python pacman.py` to run an interactive pacman game.



You can use options to specify search algorithm and map layout

```
$ python pacman.py -p SearchAgent -a fn=bfs,prob=FoodSearchProblem -l
testMaze
```

Here's some of the useful argument definitions

|                 |  |
|-----------------|--|
| -l, --layout    | choose the map for this game.  |
| -p, --pacman    | choose the pacman type, it can be fixed as SearchAgent   |
| -a, --agentArgs | Comma separated values sent to agent. There's three arguments for SearchAgent  |
|                 | fn: search function, you can choose from bfs(breadth first search) dfs(depth first search) or ucs(uniform cost search) |
|                 | prob: problem type. In this assignment, you need to use <b>FoodSearchProblem</b>                                       |
|                 | heuristic: choose the heuristic function, no use for now.  |

For uniform cost search, the cost is set as depth of the search tree.

All of the supported layouts are under `./layouts/` directory, here's some layout you can use

|               |                  |                 |                |
|---------------|------------------|-----------------|----------------|
| bigCorners    | mediumMaze       | smallSafeSearch | tinySearch     |
| bigMaze       | contoursMaze     | greedySearch    | testMaze       |
| mediumCorners | mediumDottedMaze | smallMaze       | tinySafeSearch |

|          |          |            |             |
|----------|----------|------------|-------------|
| openMaze | tinyMaze | testSearch | tinyCorners |
|----------|----------|------------|-------------|

You can also draw your own map by imitating the existing ones, put it under layouts directory and have fun.

Note that `pacman.py` supports a number of options that can each be expressed in a long way (e.g., `--layout`) or a short way (e.g., `-l`). You can see the list of all options and their default values via:

```
$ python pacman.py -h
```

## Task: Run different program settings and submit a report

In this assignment, you need to choose at least three different layouts, for each layout run three different algorithms: dfs, bfs and ucs. Write a report about the difference between each algorithm, including the path searched by the agent, search nodes expanded, time cost and etc. Please write and submit your report on canvas.

If you have any question, feel free to contact TA, Yan Liang [yliangav@connect.ust.hk](mailto:yliangav@connect.ust.hk).