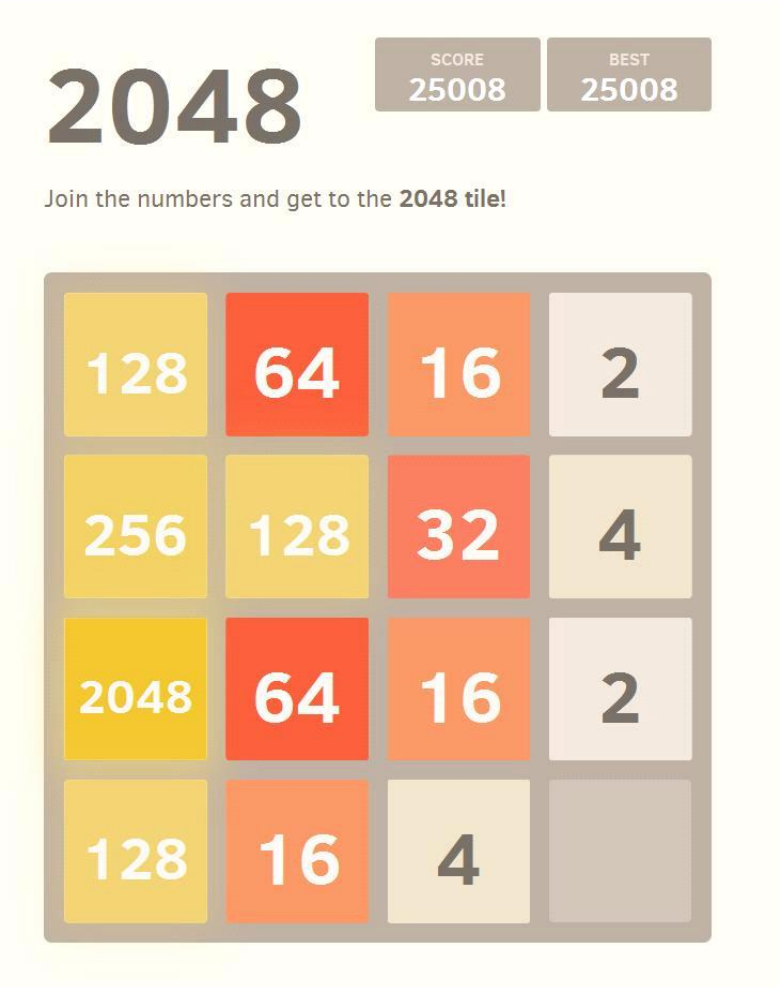
P02 – 2048 game playing agent

1. Background



The game 2048 was developed by Italian programmer Gabriele Cirulli during a week-end, based on 1024 by Veewo Studio and conceptually similar to Threes by Asher Vollmer (you may read his story of the making & rip-offs in game development here: http://asherv.com/threes/threemails/).

The gameplay for 2048 is as follows: You can move the tiles (all of them at once) with your arrow keys. When two tiles with the same number touch, they merge into one, with the new tile having twice the old value. After each board-changing move, a new random

tile spawns, having a value of 2 (90% chance) or 4 (10% chance). You win by creating a tile with the value 2048.

In this lab, you will develop a simple (part 4) as well as a sophisticated AI agent (part 5) to remote control the 2048 game running in your browser. Before, you have to learn (and previously: install) the Python programming environment that we will be using throughout this course (part 2), and configure your browser (part 3).

2. Installing and Using Anaconda

Continue with part 2 if you already have Anaconda installed. Other Python distributions may be used but are not supported (if you know to some degree what you are doing, that is not a problem).

2.1 Background

Anaconda is a scientific Python distribution by Continuum Analytics. Anaconda offers:

- Easy installers for Windows, MacOS & Linux with all necessary libraries included
- A good-enough and clear integrated development environment called “Spyder”

2.2 Downloading Anaconda

- Download the correct version for your system from here (several hundred MB): https://www.anaconda.com/download#downloads
    - Be sure to use the Version for Python 3.x, *not* Python 2.x
    - Take the 64-bit variant if you have a 64-bit system

2.3 Installing Anaconda

- Follow the instructions in the setup process
    - You can safely accept all standard choices
    - On Windows: If you are asked if you want to install for everyone or just yourself, choose “all users”
    - On Windows: If you are asked if Anaconda should be your standard Python 3.x environment, conform with “yes”
    - On MacOS X: if the installer says something like ‘cannot install’, choose ‘just install for me’.

2.4 Working with Spyder

Try the following things:

- Go to the interactive console tab (bottom right, tab “Console”) and use it as a calculator

- Go to `temp.py` in the code editor (left) and write your individual “hello world” script. Run it, modify it, re-run it.

2.5 Update your Anaconda Python installation

Anaconda (Python) needs to be up to date to be used for the labs accompanying this module. Please update it using either the Anaconda Launcher or the following two console commands (from Anaconda install directory):

```
conda update conda
conda update anaconda
```

See also: http://docs.continuum.io/anaconda/install/update-version/

2.6 Learning Python

As a computer scientist it should not be too difficult for you to understand short Python scripts, and from there to start writing own code.

Here are some additional resources to guide your self-study (in order of increasing sophistication):

- Beginner’s cheat sheet: https://groklearning-cdn.com/resources/cheatsheet-python-1.pdf
- Programmer’s cheat sheet: https://perso.limsi.fr/pointal/_media/python:cours:mementopython3-english.pdf
- Official Python 3 tutorial: https://docs.python.org/3/tutorial/
- Python for analytics: https://www.analyticsvidhya.com/learning-paths-data-science-business-analytics-business-intelligence-big-data/learning-path-data-science-python/

3. Configure the Chrome Browser

To play the game you should use Chrome (other solutions are possible but neither recommended nor supported).

1. Download and install Chrome from https://www.google.com/chrome/ (if it is not already installed)

2. To be able to remote control the browser, you need to start Chrome with the command line argument `--remote-debugging-port=9222`
   On Windows:
   - create a new shortcut on your desktop to the Chrome browser
   - Right click the shortcut, open “Properties”