# EECS 202 - Basic Digital Communications with Networking

# Assignment 1 – Uninformed Search

# Due date: 19/02/2020 (23:59)

The 8-puzzle consists of an area that is divided into a grid of size 3x3 (see Figure 1.1 below). On each grid square there is a tile. Eight tiles are numbered 1 through 8. The $9^{th}$ tile is empty. A tile that is next to an empty grid square can be moved into the empty space, leaving its previous position empty.
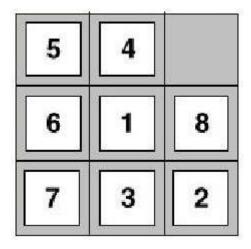


Figure 1.1 – A state of the 8-puzzle game

For this assignment you will solve a simple variation of the 8-puzzle problem where the goal test only requires the empty tile to be located at the center of the board. You may take the initial state to be the one shown in Figure 1.1, which is represented by the following 2D array:

[[5, 4, 0], [6,1,8], [7,3,2]]

You will solve this problem using **breadth-first search**. We have provided you with two skeleton functions.

(a) The first function *expand* takes as input a 2D array representing a state and should return an array of all the successor states (as a python list) that were expanded by your breadth-first search algorithm. For example if the input to the function is the initial state given in Figure 1.1, it should return the following array:

 [  [ [5, 0, 4], [6,1,8], [7,3,2] ],   [ [5, 4, 8], [6,1,0], [7,3,2] ] ]

Note that the return type here is a list of 2D arrays. – **75 points**

(b) The second function *graph_search* takes as input a 2D array representing an initial state and should return a sequence of states (as a python list) to get us from that initial state to a goal state. – **25 points**

You may write additional functions of your own, but make sure that the names of the functions that we have provided you remain unchanged. Prepare and upload one python script which contains these two functions and name this script as *<your first name>_<your last name>_ assignment1.py*