

## INC491 Homework 1 Search on the sliding puzzle

Due: Sep 8, 2022 in LEB2 (<https://leb2.kmutt.ac.th>)

What to submit: One pdf file that contains 3 sections as follows

1. Explanation of the BFS source code in each part and answer 4 questions below.
2. A modified source code that implement A\* search (print on a paper) and explanation
3. Comparison of the depth that your computer can reach within 10 minutes run time.

I provide you with a Python source code that is an implementation of a breadth-first search (BFS) on the 3x3 sliding puzzle. Your main objective is to study the code and see how a search is implemented. Also, I want to get you start learning Python. Please search Google on “Python tutorial”. At least, you should understand the difference between lists and numpy arrays.

You have to do three things in a report.

1. Divide the code into sections, explain in details how they work. Answer the following questions.

1.1 What datatype is the variable ‘Node’?

1.2 What does function ‘swap’ do?

1.3 What does variable ‘nodelist’ do?

1.4 what does variable ‘costlist do?

2. Modify the code to use A\* search. This should reduce the number of nodes a lot. Use heuristic h2 (Manhattan distance) that you learned in the class. Print out your source code and explain what has been modified by you.

3. Test the performance of A\* by comparing it with the BFS. Make initial positions that require solutions with different number of moves. Record the time used and the number of nodes generated for both BFS and A\* like in this table. Do not wait for more than 15 minutes. Make the table as long as you see appropriate.

Depth	BFS	A*
10	20 secs (10 nodes)	1 sec (10 nodes)
11	5 mins (20 nodes)	1 sec (20 nodes)
12	8 mins (30 nodes)	2 sec (30 nodes)
13	10 mins (40 nodes)	1 min (40 nodes)
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Example only