



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA

## COS 314: Artificial Intelligence

### *Project 1: Uninformed and Informed Search*

*Due Date: 30 March 2018, 16:00*

In class we have studied both uninformed and informed searches. The purpose of this assignment is to implement and compare the performance of the following searches to solve the *travelling salesman problem*:

- Depth first search with iterative deepening
- Breadth first search
- A\* Algorithm

The travelling salesman problem involves producing the route that the salesman must travel so that:

- Each city is visited by the salesman.
- Each city is visited only once.
- The salesman begins and ends his travel at the same city.
- A minimum distance is travelled by the salesman.

The version of the problem that you must solve is the *symmetric travelling salesman* problem. In this version the distance between any two cities A and B is the same as the distance between B and A. The performance of the searches must be compared on the three problem instances of differing difficulty contained in this folder:

Problem Instance	Known Optimum
wi29	27603
dj38	6656
eil51	426

The *known optimum* is the known minimum distance for the problem instance. The documentation for the benchmark set, *tsp95.pdf*, which describes the format of the problem instance files is also included in this folder.

The performance of the searches must be compared in solving the three problem instances using the following criteria:

- Time taken to produce a solution path.
- The number of states expanded in finding the solution path.

Please note that this comparison must be performed by implementing the searches and running simulations to solve the three problem instances. The results from the simulations should be used to compare the performance.

The following must be submitted:

- A program which implements each of the three searches to solve the symmetric travelling salesman problem. The program must present the user with a menu to choose the search to apply and the problem instance. The program must output the path and the total distance travelled. This must be output to a text file. The program must be written in Java or C++ and run on a Windows machine independent of an IDE. In the case of Java the class containing the main method, the method (and required arguments if any) for running the program and the version of JDK used must be specified in a *readme* file. In the case of a C++ program the program must be correctly compiled to run on a machine without the libraries.
- A report (pdf file) describing the heuristic used for the A\* algorithm, listing the results of the simulations, i.e. the runtimes and number of states expanded for each of the problem instances, for each search and a discussion of the results.

**Submission procedure:** The program and report files must be submitted as a single .zip file via the assignment submission system.

**Mark breakdown:**

Depth first search with iterative deepening: 10

Breadth first search: 10

A\* algorithm: 10

Ease of use of program: 5

Report: 10

**Total marks:** 45