

# Project Name: Traveling & Shipment Routing Using Genetic Algorithm (3)

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## Introduction

This project implements a desktop GUI tool for solving Traveling Salesman / shipment routing problems using a Genetic Algorithm (GA). The GUI accepts a graph description (adjacency list or adjacency matrix), visualizes the graph, runs a GA with configurable parameters, and shows the best route and fitness over generations.

## Requirements

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Python 3.8+ (recommended)

Required packages:

- numpy
- networkx
- matplotlib
- python-docx (for this documentation file)
- tkinter (for GUI; often included with standard Python installs)

## How to Run

How to Run

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1. Save the GUI code into a file, e.g. `project3\_ga\_tsp.py`.
2. Install required packages:  
pip install numpy networkx matplotlib python-docx
3. Run the program:  
python project3\_ga\_tsp.py
4. If tkinter is not available in your environment, a headless demo runs instead and saves a PNG.

## Sample Graph Description

Sample Graph Description (ready to paste into the GUI's Graph Description box)

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Adjacency Matrix (3 nodes):

```
A B C
A: 1 0 1
B: 1 0 0
C: 0 1 1
```

Adjacency List equivalent (same graph):

```
A: B=1, C=1;
B: A=1;
C: A=1;
```

This small graph connects A to B and C; B and C connect only to A. This is a valid small test that will not trigger a header/matrix size mismatch.

## Explanation

Explanation of Sample

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The adjacency matrix above uses symmetric weights. The parser accepts either adjacency list or matrix formats. For matrix with header labels, the number of rows of data must match the number of header labels.

## Expected Output

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When you paste the sample into the GUI and press Create Graph, the following should happen:

- The graph description box will show the sample text.
- The canvas will display the 3-node graph with edge weights.
- Running the GA will produce a best route and a fitness plot (best fitness over generations).

## GUI

