TRAVELING SALESMAN PROBLEM

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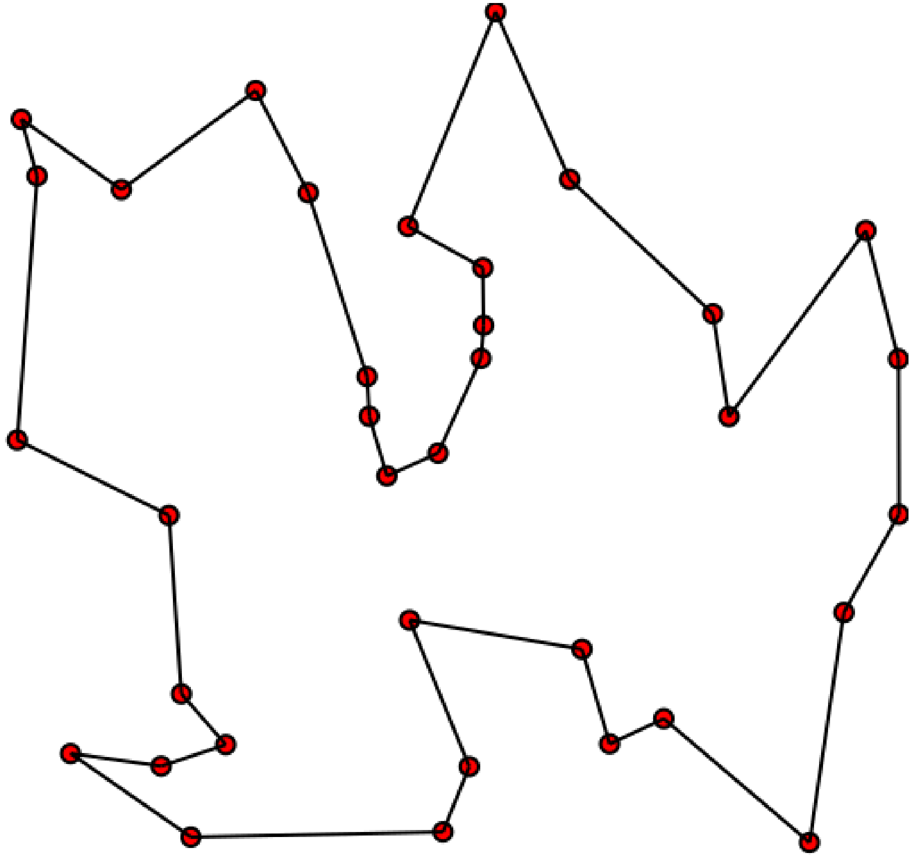
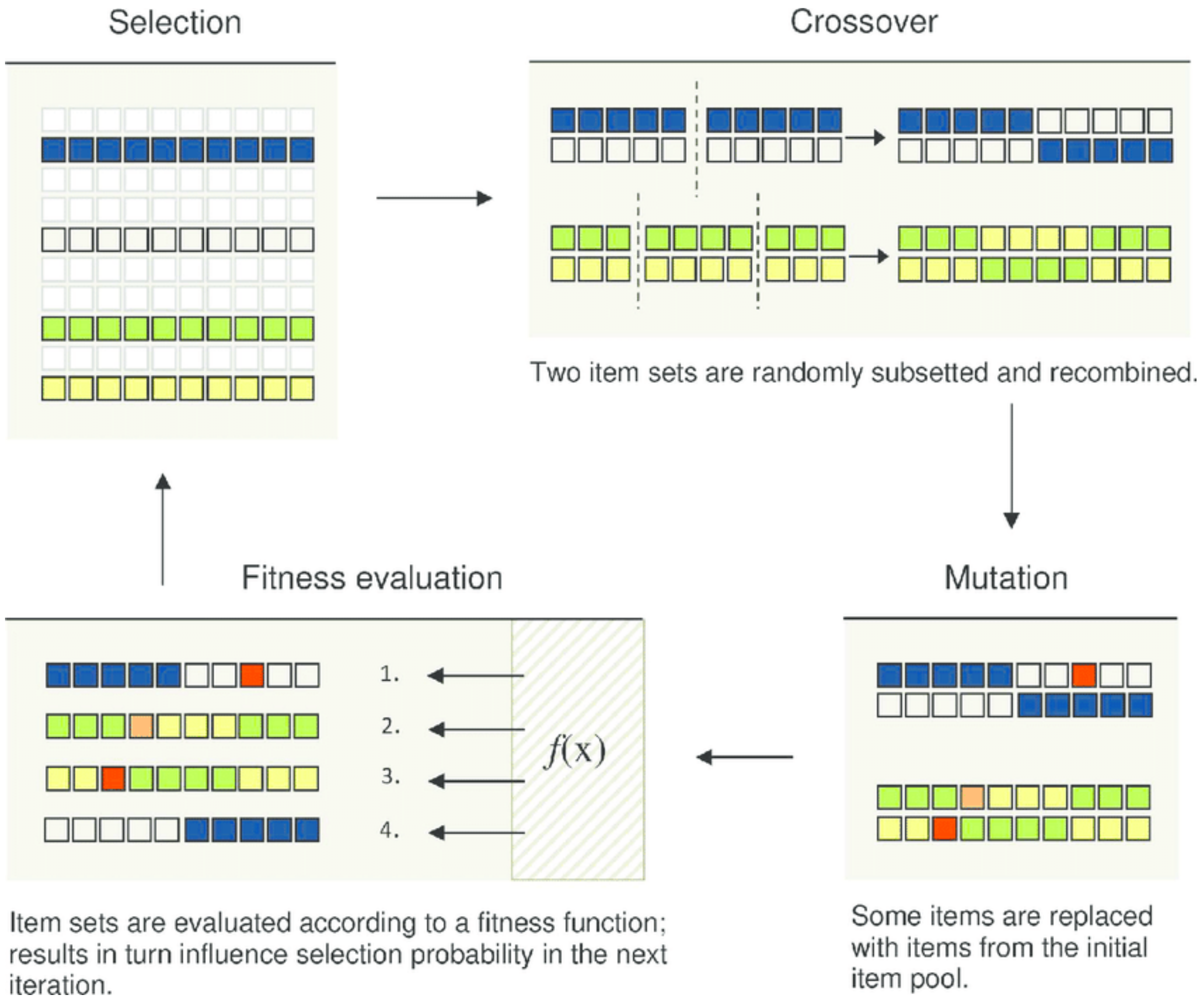
PROBLEM DESCRIPTION

The **travelling salesman problem** (**TSP**) asks the following question: "Given a list of cities and the distances between each pair of cities, what is the shortest possible route that visits each city and returns to the origin city?" It is an NP-hard problem in combinatorial optimization, important in operations research and theoretical computer science.

(Source: [Wikipedia])



APPROACH: GENETIC ALGORITHMS



Source

IMPLEMENTATIONS

We tried 2 different implementations

CROSSOVER

Ziyao's Crossover

Odd Index from Father

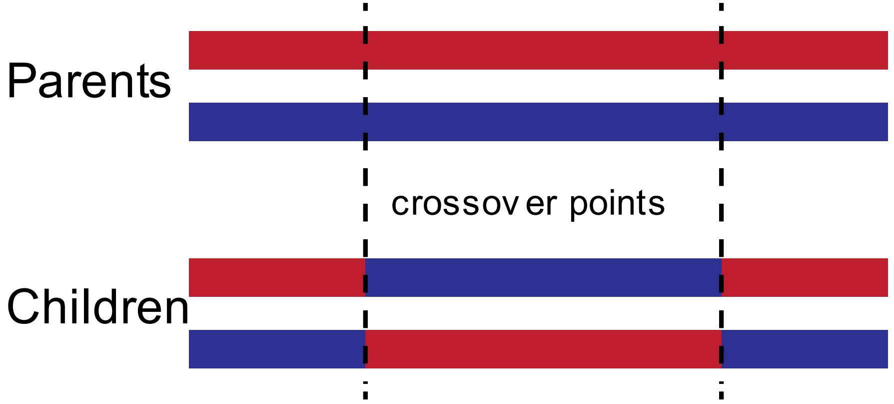
Even Index from Mother

Zhonghao's Crossover

Get average weight from Mother & Father

If weight(m) == weight(f):

Use weight(m)



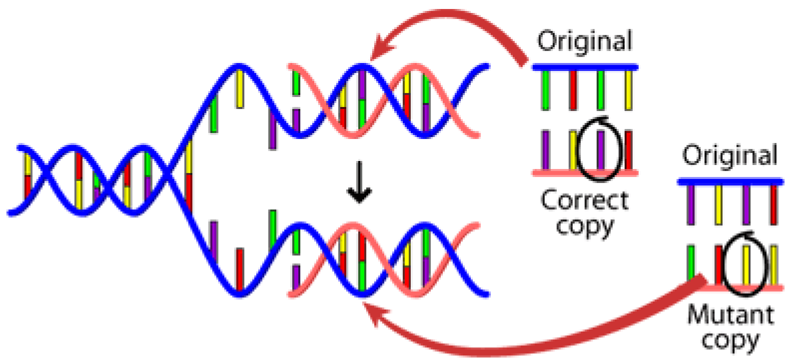
MUTATION

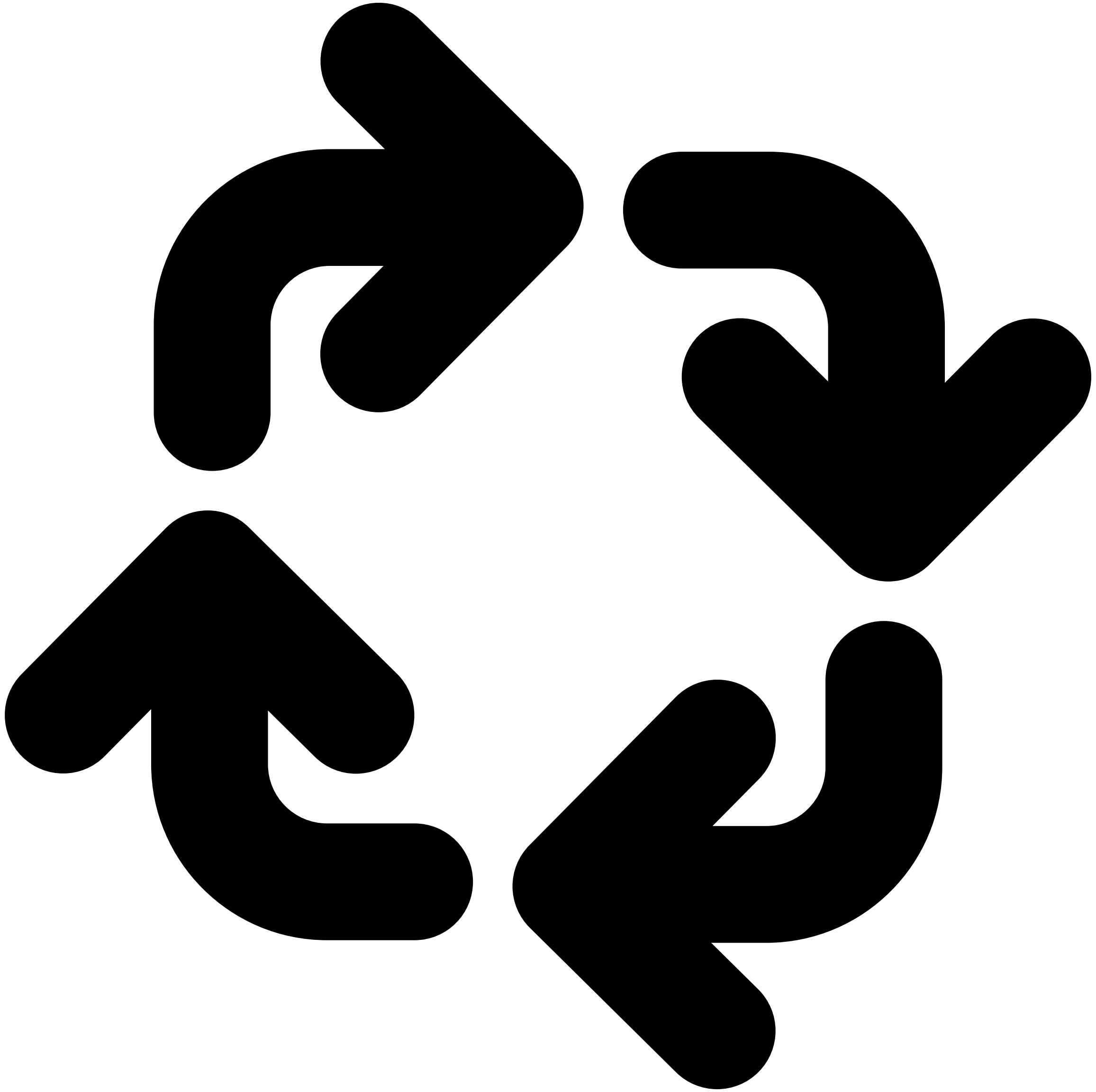
Ziyao's Mutation

Swap 2 points

Zhonghao's Mutation

Swap 2 weights





FITNESS

Same and intuitive: total distance of the path

CULLING

Ziyao's Mutation

Drop 40% of Population;

If population > size * 4:

Drop additional 50%

Zhonghao's Mutation

Crossover gets (size + 1) * size population

Leave population / (size + 1):

Constant size of population

RESULT

Both implementations work

But similar limitation applies:

1. When the mutation rate is high: the result is not stable

2. When the mutation rate is low: the result converges quickly at some good but not best point