Parallelized Genetic Algorithm

Nollan Reed & Norman Morales

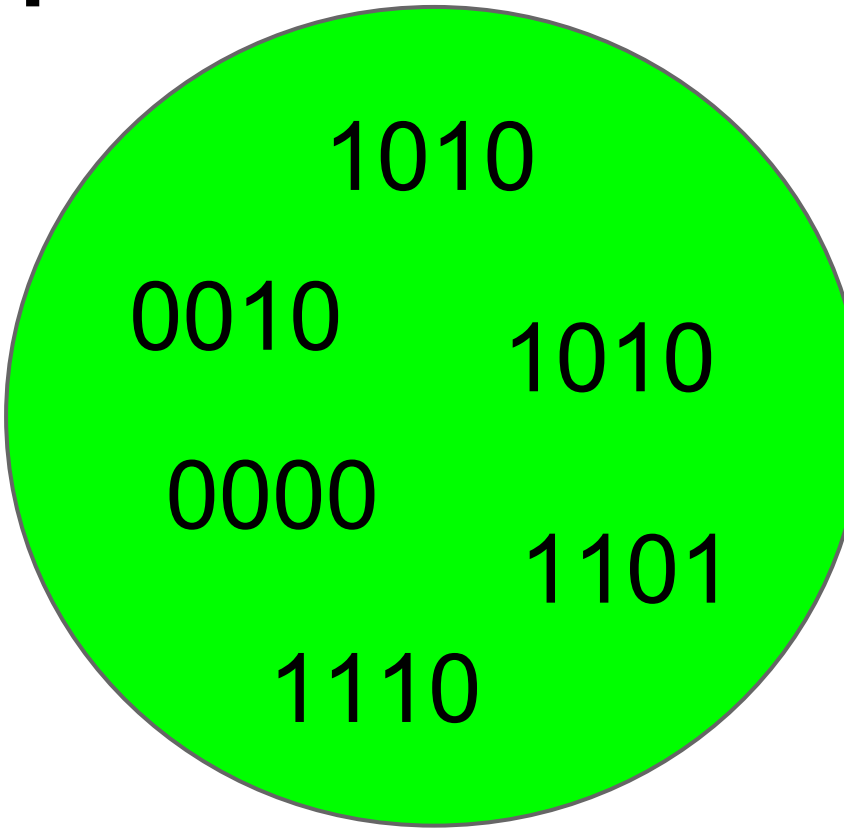
How Genetic Algorithms Work

Example Problem

$$2X = 14$$

Generate a Population

Randomly create strings of binary



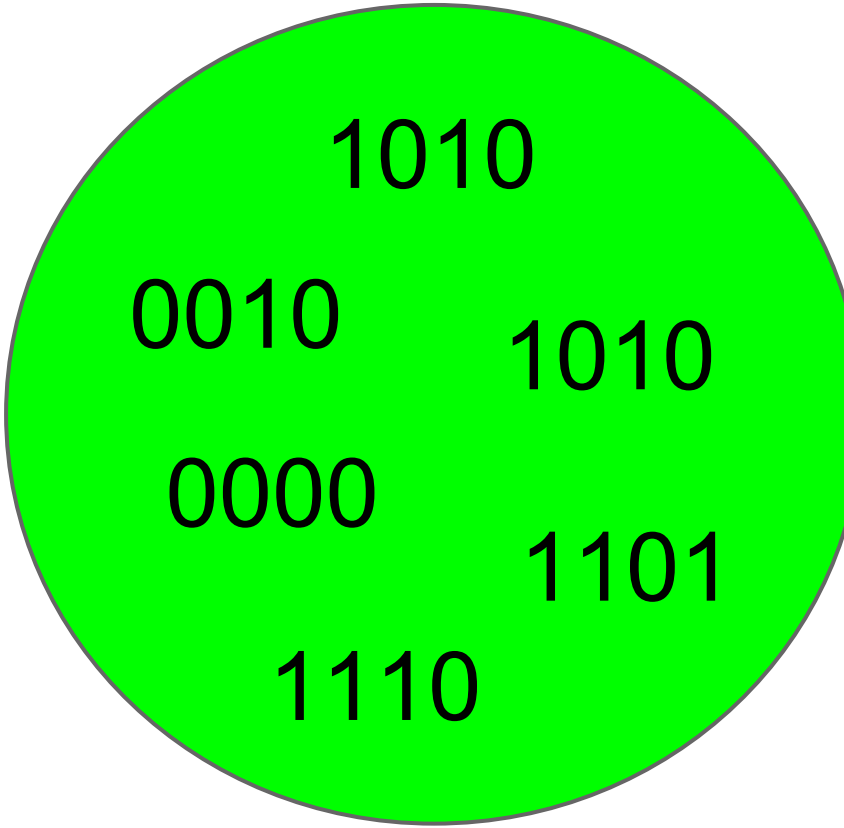
Selection

Determine fitness for all elements in population

Ex. 1101 => 13

Plugging 13 into our equation gives 26

|14-26| = 12



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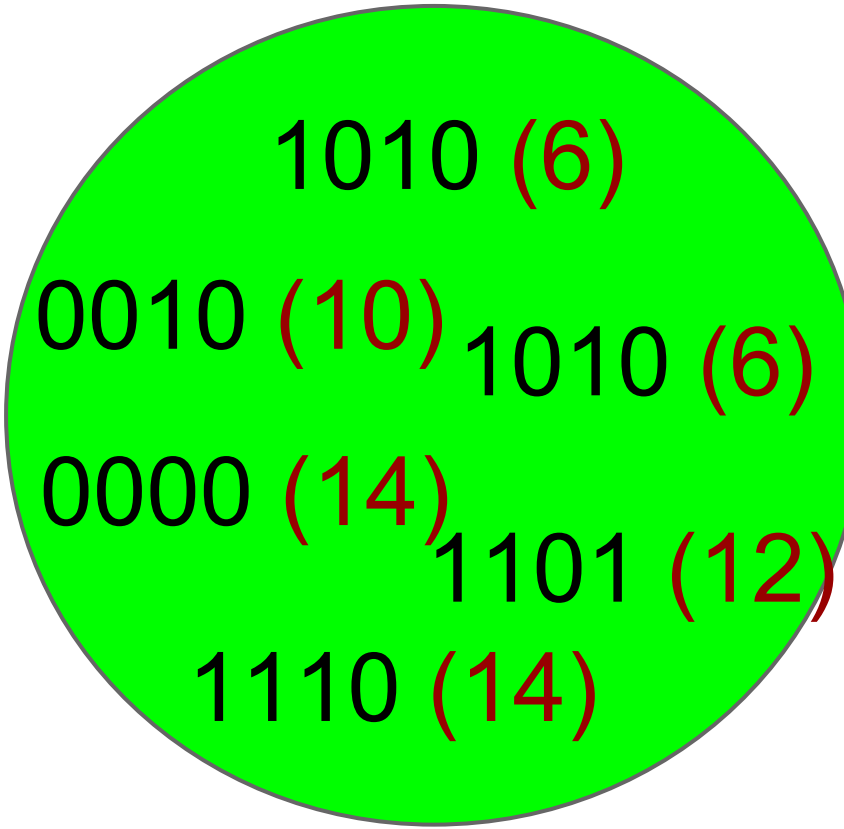
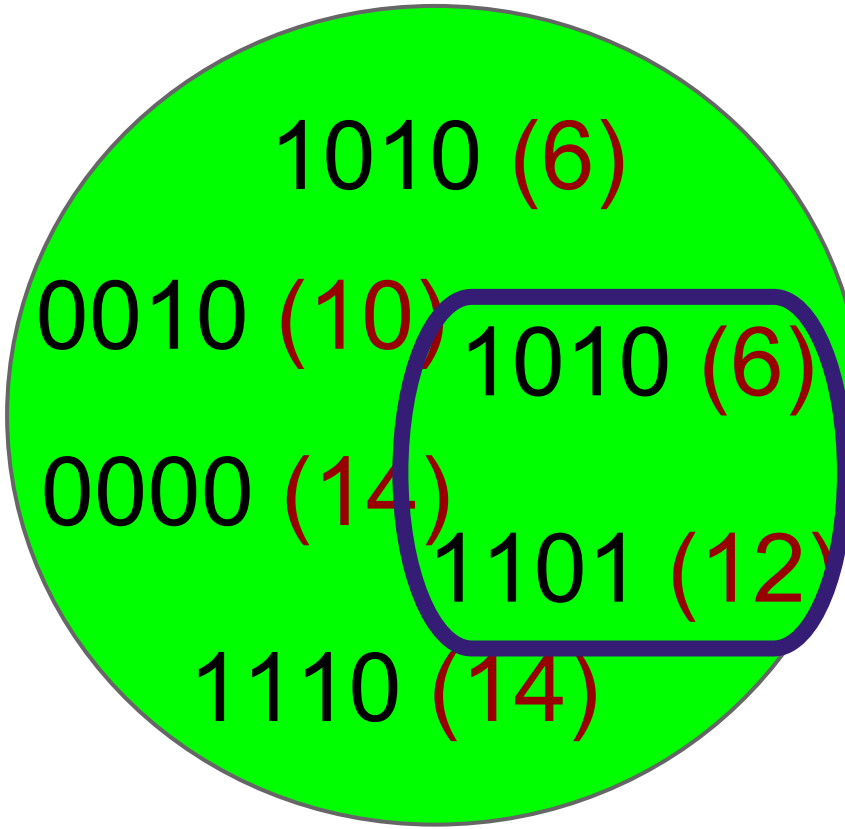


Selection

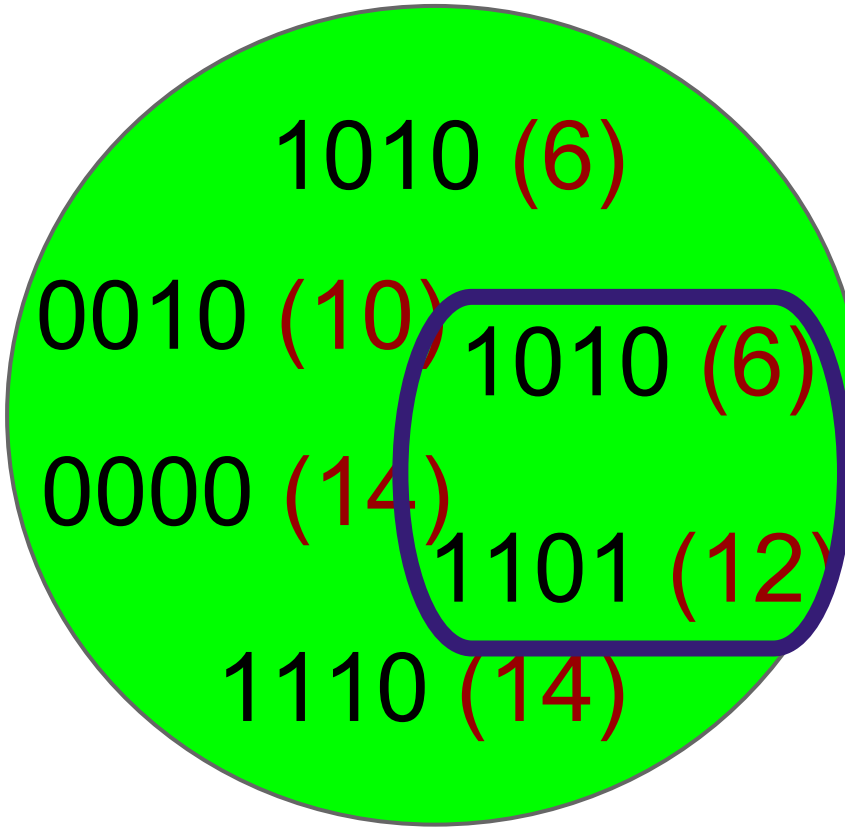
Select 2 elements based on fitness score.



Crossover

Cross strings at random point.

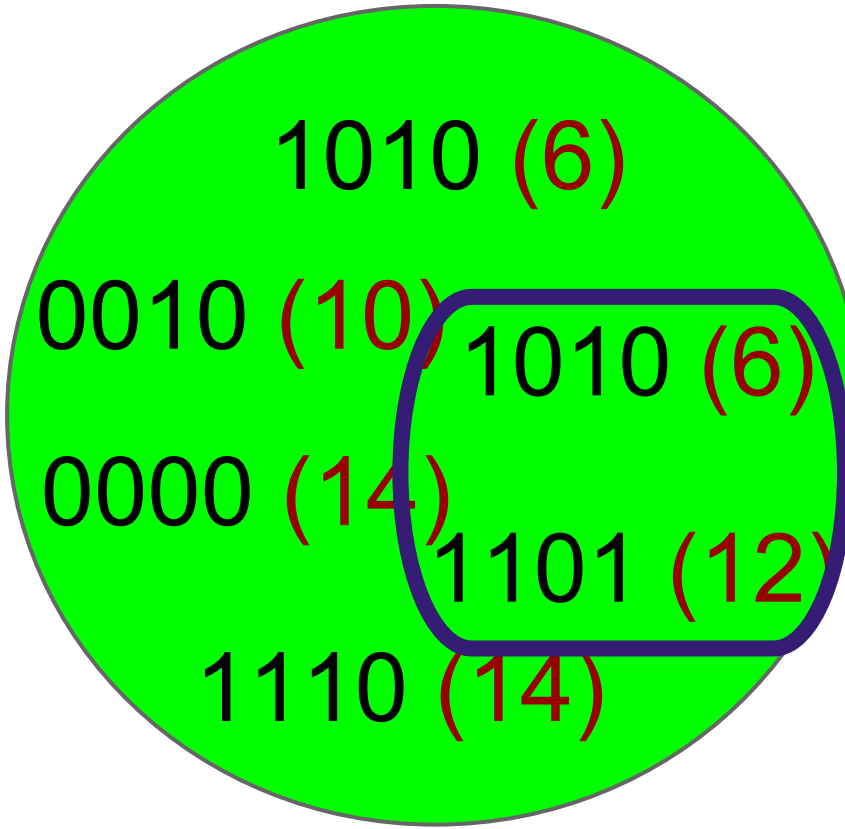
1010 X 1101



Crossover

Cross strings at random point.

10|10 X 11|01



Crossover

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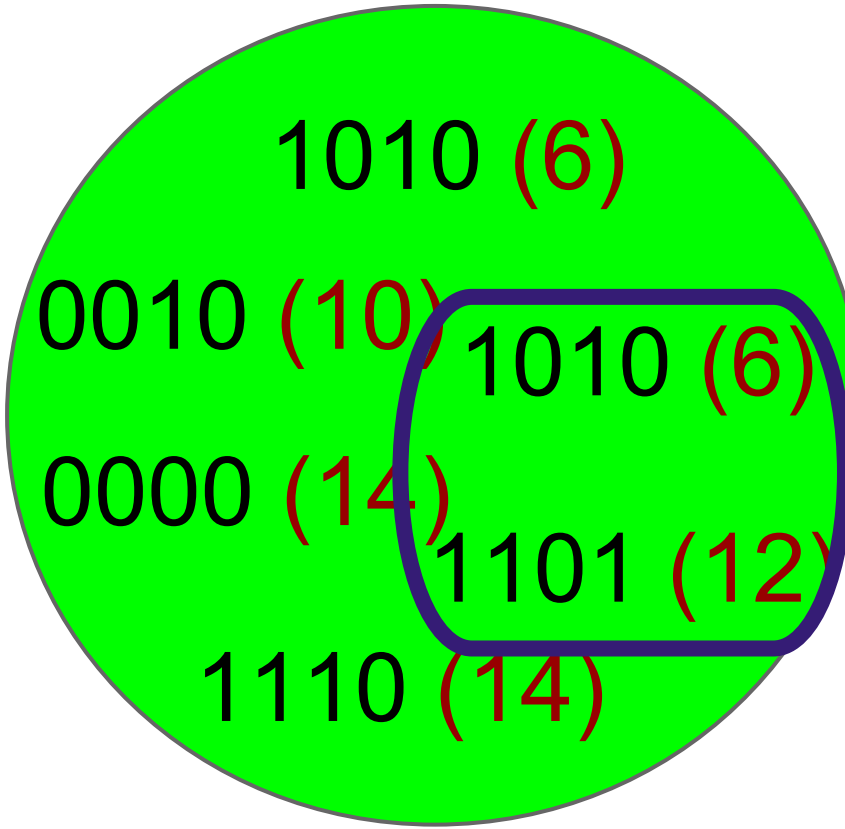
1010 X 1101



Crossover

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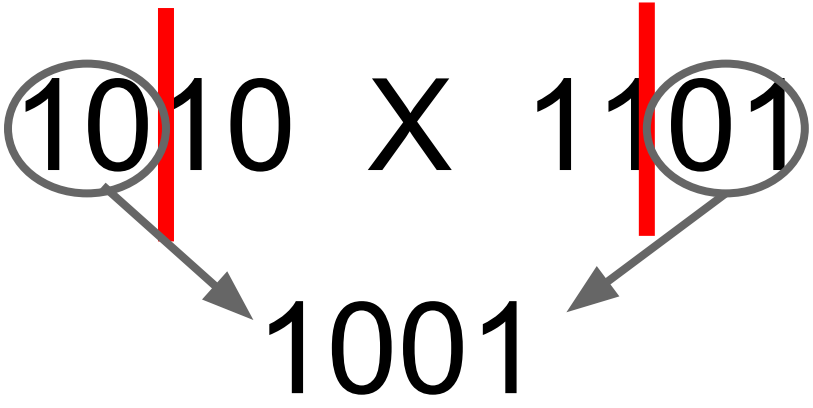
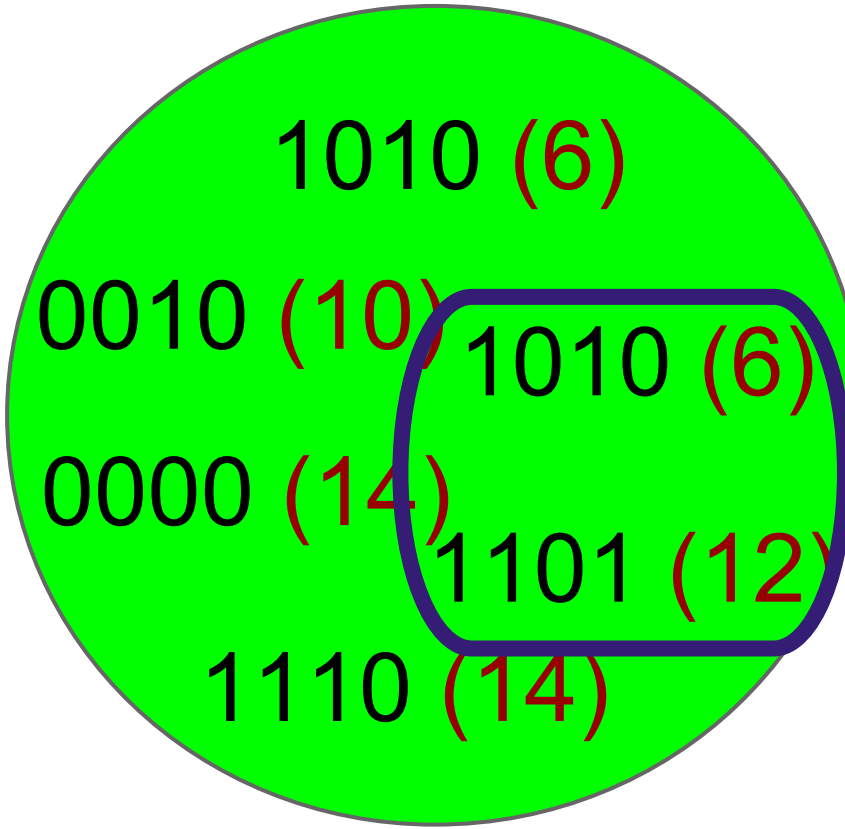
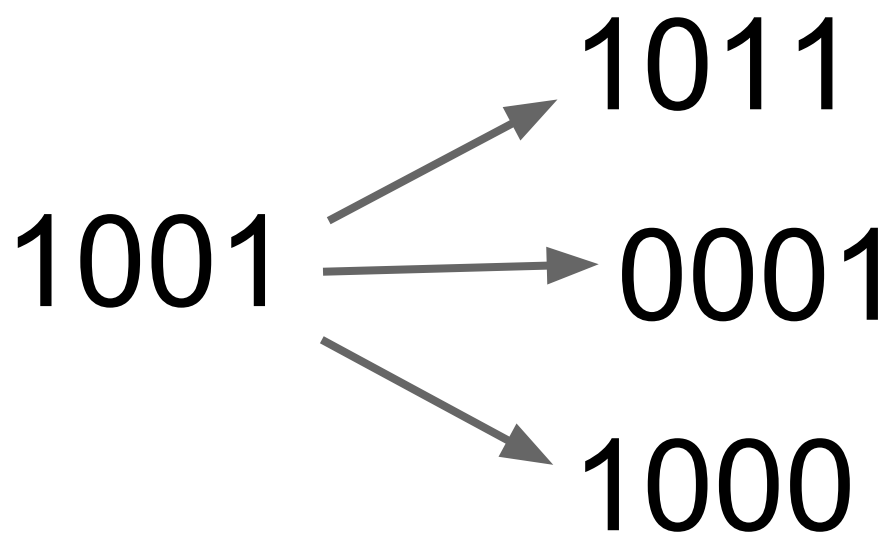


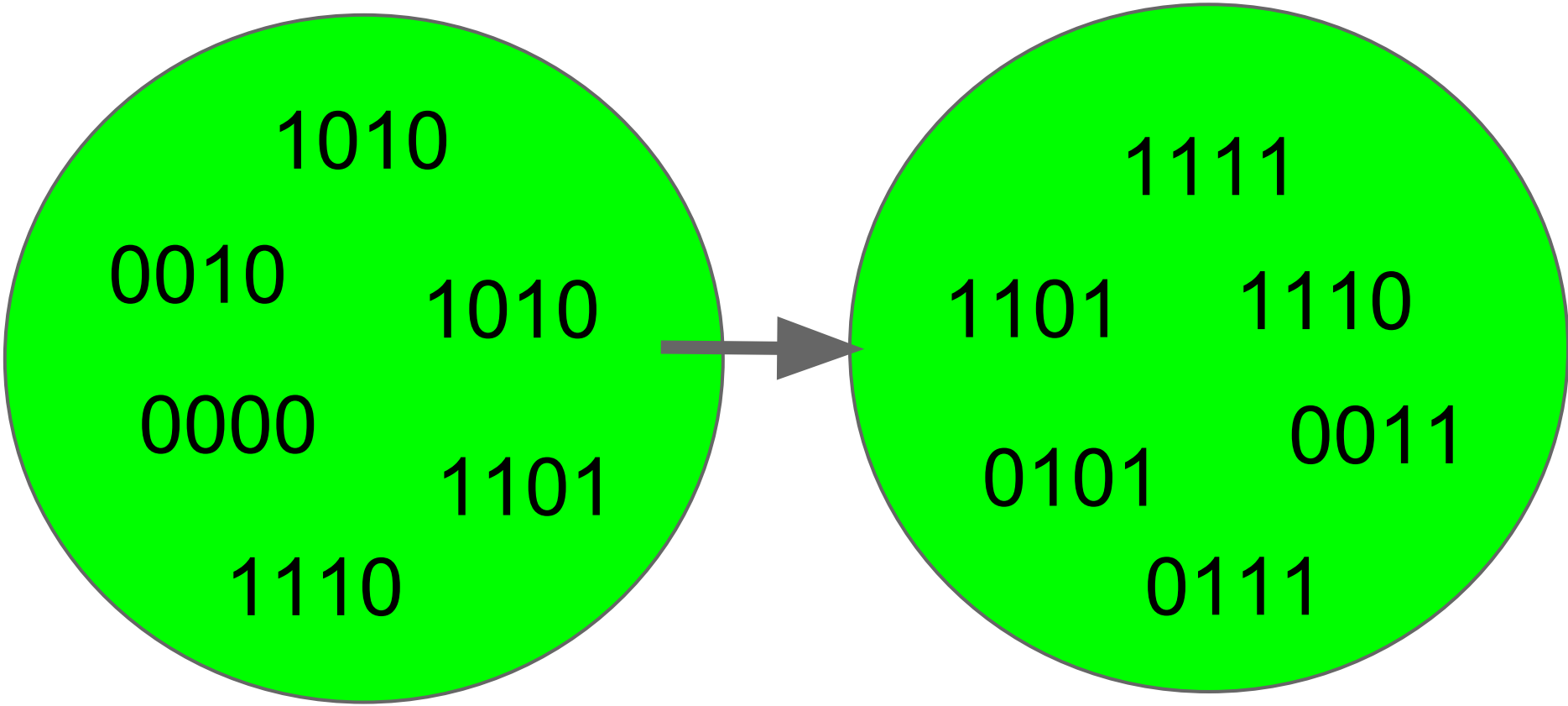


Mutation

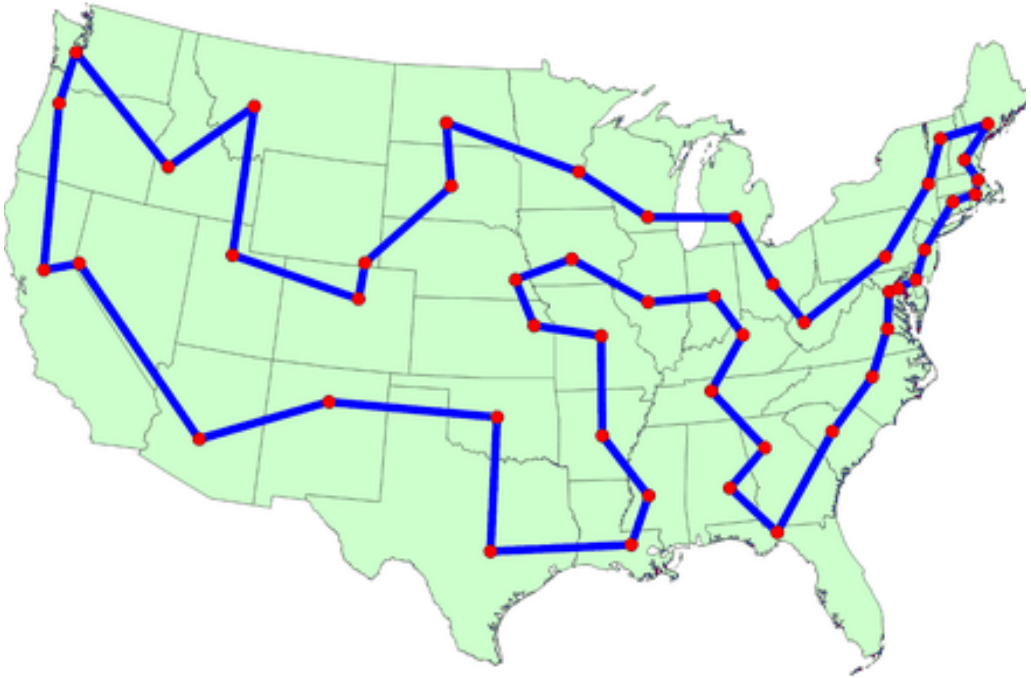
Apply random variation to new element



New Population



Applying a Genetic Algorithm to the Travelling Salesman Problem



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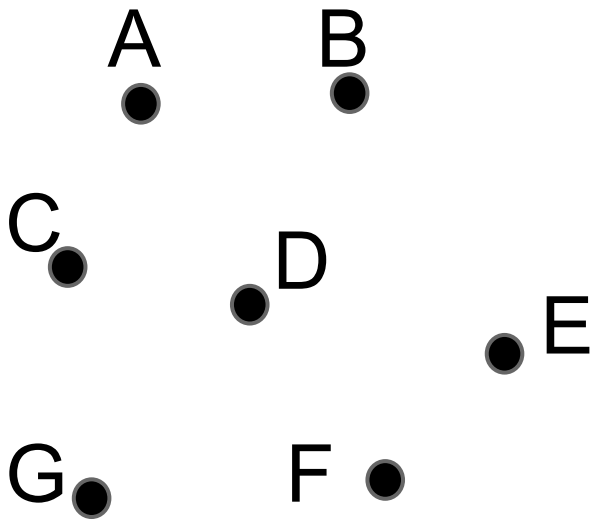

Label Each point

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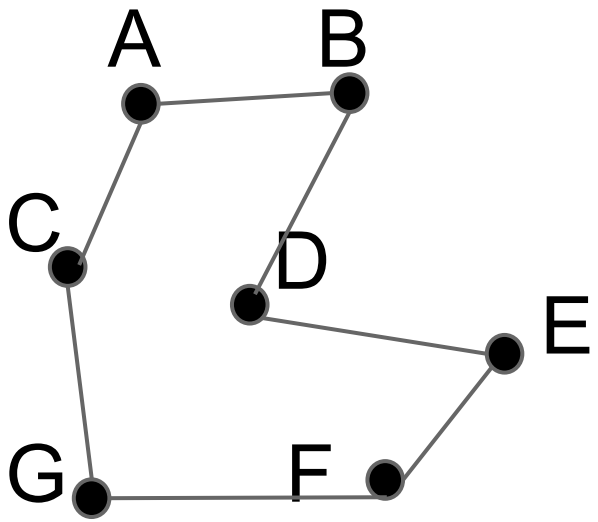


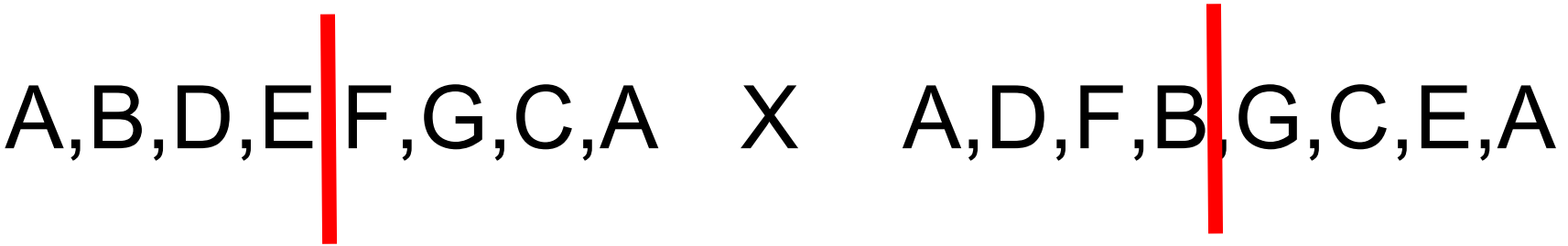
Represent possible routes with strings

A,B,D,E,F,G,C,A

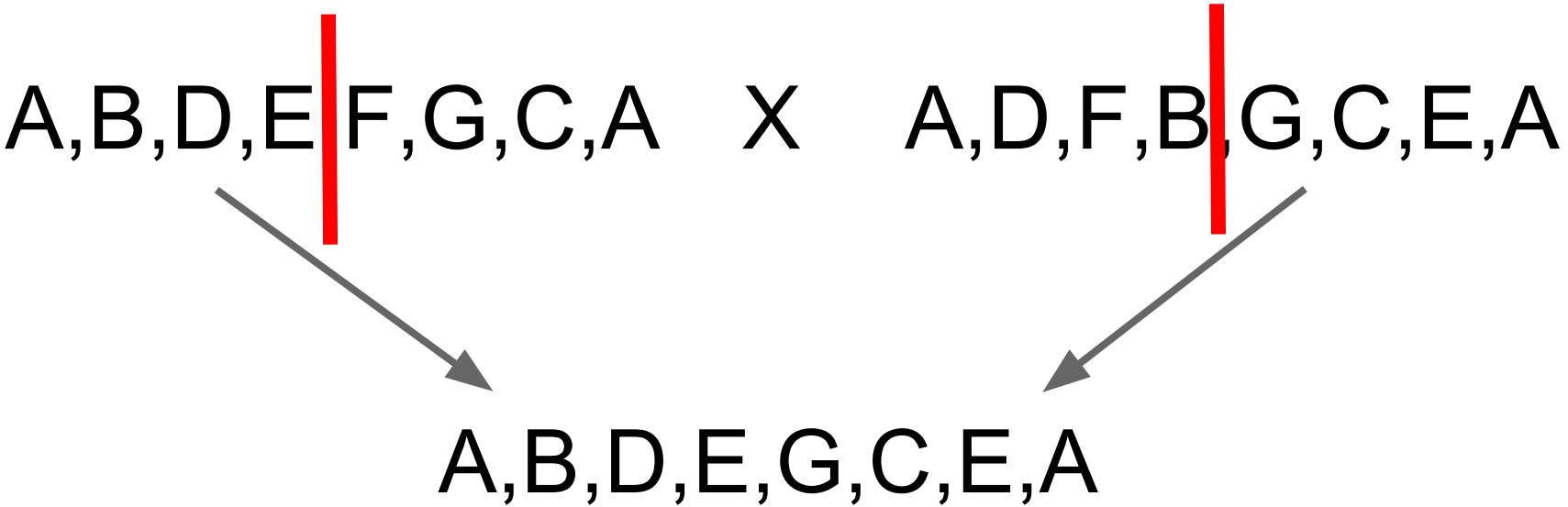
Crossover

A,B,D,E,F,G,C,A X A,D,F,B,G,C,E,A

Crossover



Crossover



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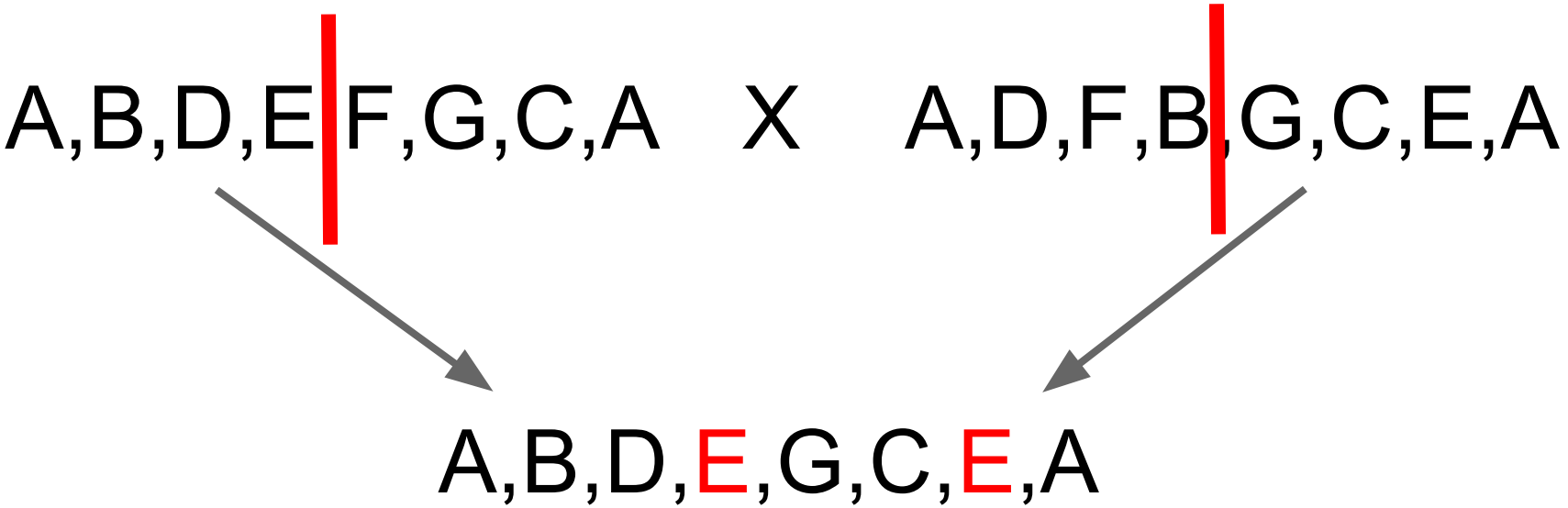

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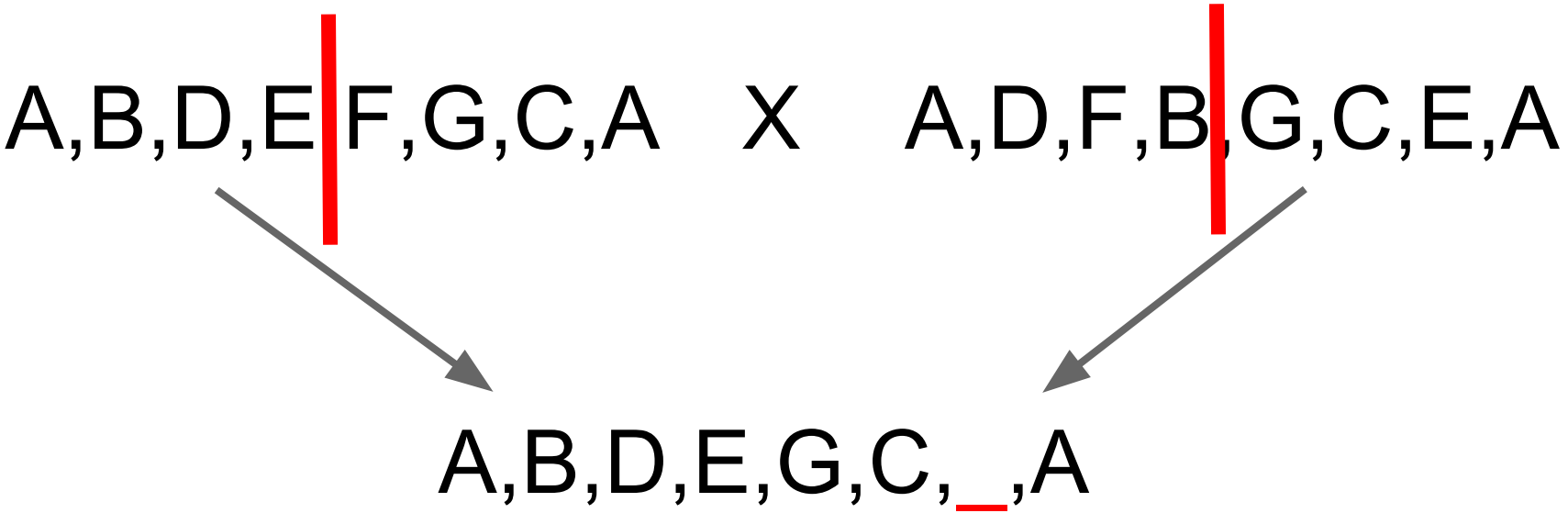

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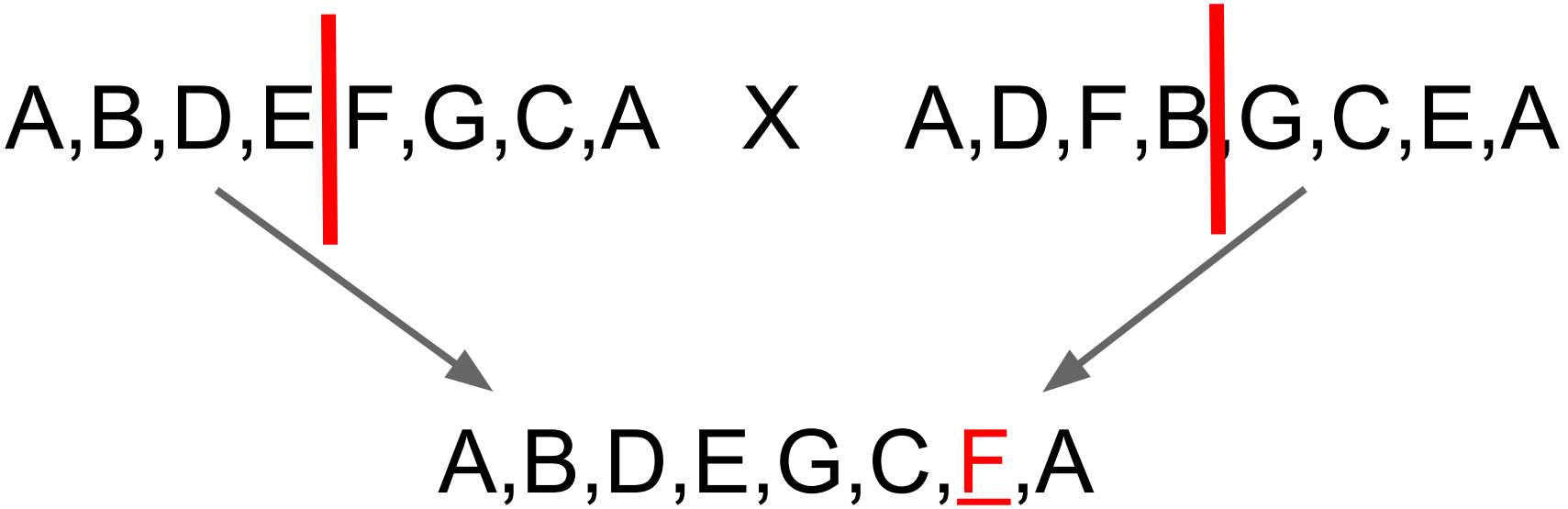
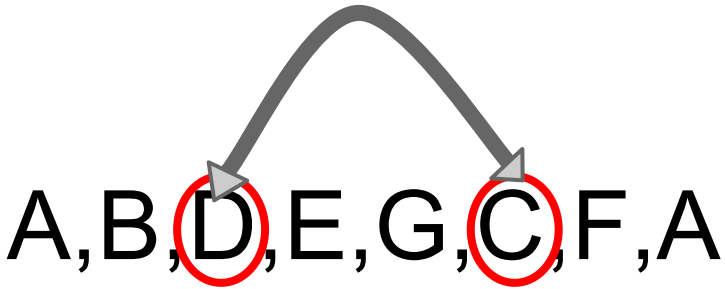


Mutation

A,B,D,E,G,C,F,A

Mutation

Mutation



Mutation

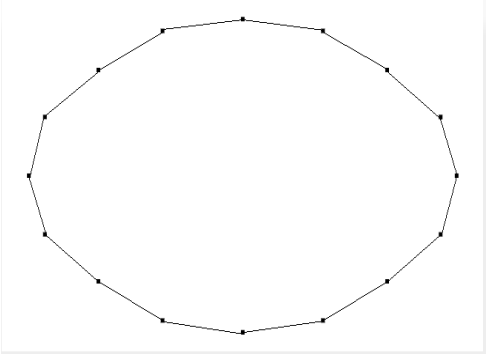
A,B,C,E,G,D,F,A

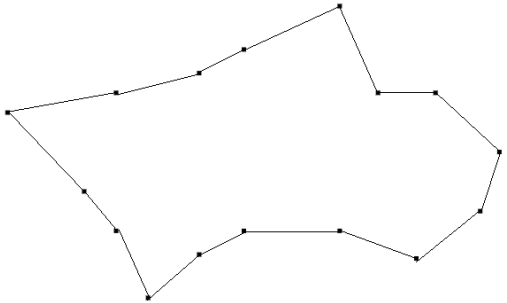
Local Minima Problem

An algorithm can get “stuck” at a local minimum

Testing the local minima

Use paths with known solutions to test how many times the correct solution(global minima) is found





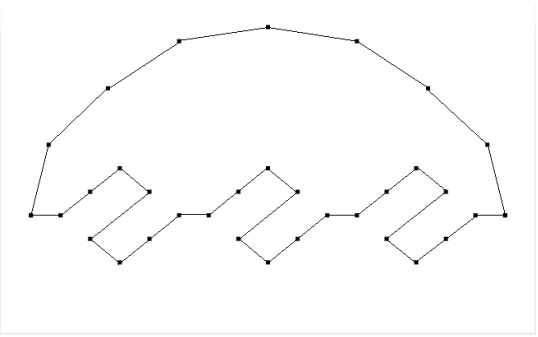
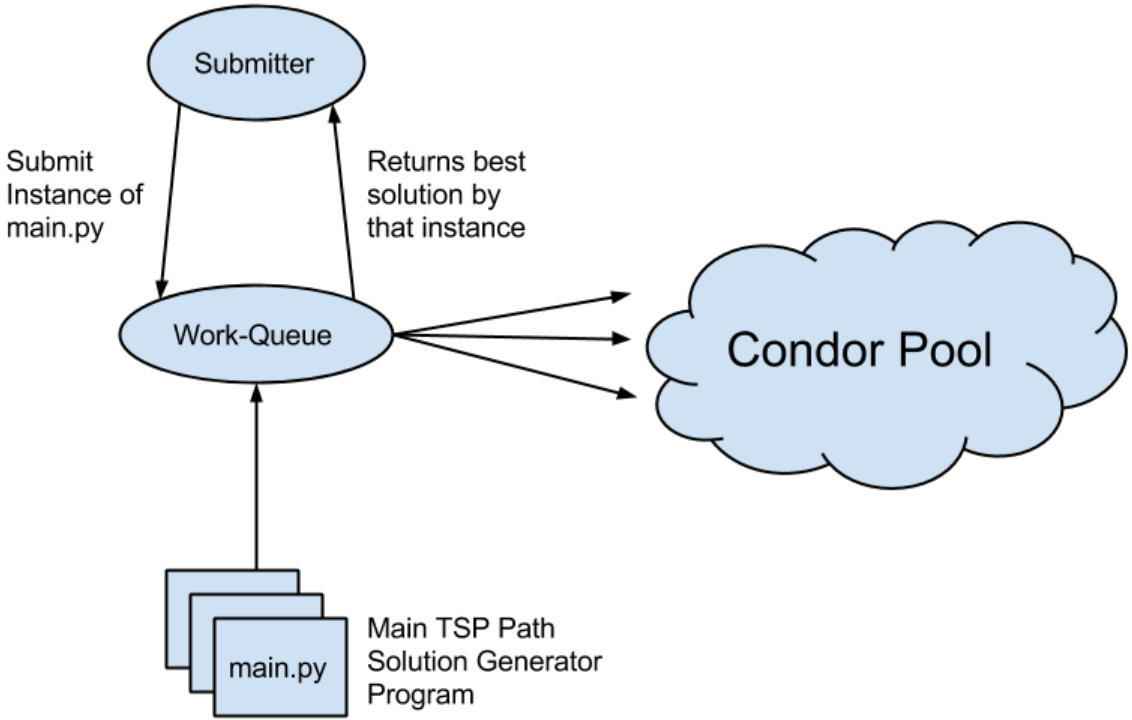


Diagram Of The Components



Questions?