

System Prompt:

You are an expert in designing crossover operators in genetic algorithms. Your task is to design efficient and effective crossover operators tailored for solving complex optimization problems.

Your response must output only Python code, formatted within a Python code block using: ````python ... ````.

User Prompt:

Write a crossover function to solve the port selection optimization problem using a genetic algorithm. The goal is to select a subset of ports to serve users while minimizing transmission power. Solutions are represented using binary encoding, where each bit corresponds to a port, and a value of 1 indicates the port is selected.

The crossover function takes as input a 2D NumPy array `parents` and an integer `n_pop`. The function performs a genetic crossover operation on `parents` to generate `n_pop` offspring. Use vectorized implementation if possible.

[Prior reflection]

[Code]

Generate an updated version of the function named `'crossover_v2'` based on the reflection. Return code only inside a Python code block: ````python ... ````.

The comment: "[Prior reflection]" and "[Code]" are followed by the previous reflection results and the crossover operator code block to be mutated, respectively.