Population Based Metaheuristics

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Outline

- Single Point vs. Population Based Search Algorithms
- Single Point Search Framework
- Population Based Search Algorithms

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Search Algorithms

- single point search algorithms **X** population based search algorithms
- single point search algorithms: work on one candidate solution
- population based search algorithms: work on multiple candidate solution

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Single Point Search Framework

```
generate initial candidate solution s
evaluate s
while stopping criteria not met do
{
      apply operators on s to generate s'
      evaluate s'
      if s' accepted then
            s = s'
}
```

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Single Point Search Framework

```
generate initial population of n candidate solutions P
evaluate P
while stopping criteria not met do
{
       apply operators on P to generate P'
       evaluate P'
       P = select n candidate solutions from (P+P')
}
```

- P and P': population of candidate solutions
- n: population size (i.e., number of candidate solutions in a population)

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Population Based Search Algorithms

- metaheuristics
- evolutionary algorithms (e.g. genetic algorithms)
- ant colony optimization algorithms
- particle swarm optimization algorithm
- artificial immune system algorithm
- …

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Population Based Search Algorithms

- perturbative search algorithms
  - evolutionary algorithms (e.g., genetic algorithms)
  - particle swarm optimization algorithm
  - artificial immune system algorithm
  - ...
- constructive search algorithms
  - ant colony optimization algorithm

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