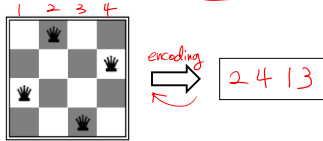


## Genetic algorithms

- Local beam search + generate successors from pairs of states
- GAs require states encoded as strings
- The objective function  $h$  is the number of **NONE** attacking pairs
- Goal: maximizing  $h$ 
  - # attacking pairs +
  - # None attac. pairs  $\Rightarrow \binom{n}{2}$



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## Genetic algorithms

- 4-state approach (8 queens problem)
- Better 'gene' has more 'chance' to survive.

24748552
32752411
24415124
32543213

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## Genetic algorithms

- 4-state approach
- Better 'gene' has more 'chance' to survive.
  - uniform random
  - # of None attacking pairs
  - $r = \text{rand}()$   $0 \leq r < 1$
  - if  $r < 0.31 \Rightarrow$  select A
  - elif  $r < 0.6 \Rightarrow$  select B
  - elif  $r < 0.86 \Rightarrow$  select C
  - else  $\Rightarrow$  select D
  - $0.91 \leq r < 1 \Rightarrow$  select A

A	24748552	24	31%	32752411
B	32752411	23	29%	24748552
C	24415124	20	26%	32752411
D	32543213	11	14%	24415124

Fitness Selection Pairs  
 $\frac{24}{24+23+20+11} = 0.31$  (for each state select gene)

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## Genetic algorithms

- 4-state approach
- Better 'gene' has more 'chance' to survive.

24748552	24	31%	32752411	32748552
32752411	23	29%	24748552	24752411
24415124	20	26%	32752411	32752124
32543213	11	14%	24415124	24415411

Fitness Selection Pairs Cross-Over

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## Genetic algorithms

- 4-state approach
- Better 'gene' has more 'chance' to survive.
  - $r = \text{randint}(0,9)$   $0 \leq r \leq 8$
  - 1 2 3 ... 8
  - random
  - randomly chosen current state

24748552	24	31%	32752411	32748552	32748552
32752411	23	29%	24748552	24752411	24752411
24415124	20	26%	32752411	32752124	32752124
32543213	11	14%	24415124	24415411	24415411

Fitness Selection Pairs Cross-Over  
 $\binom{8}{2} = \frac{8 \cdot 7}{2} = 28 \leftarrow \text{optimal fit. value}$

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