OPTIMIZING SORTING WITH GENETIC ALGORITHMS

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Marcos Sánchez 19-10-2011

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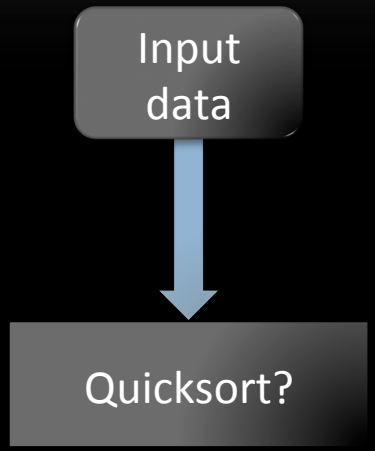

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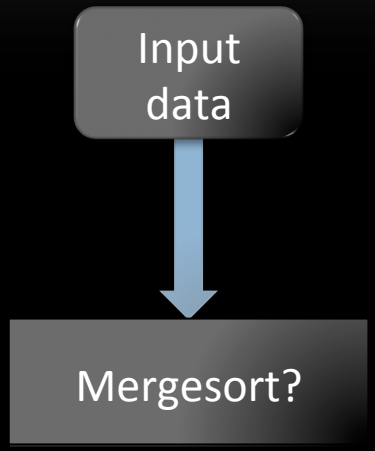

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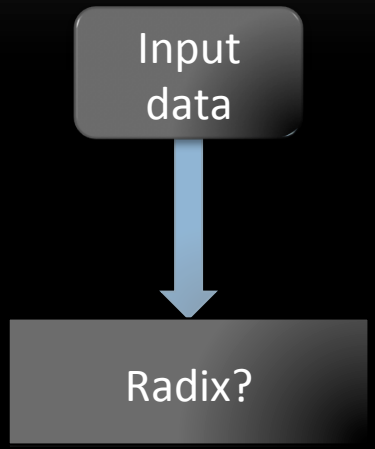

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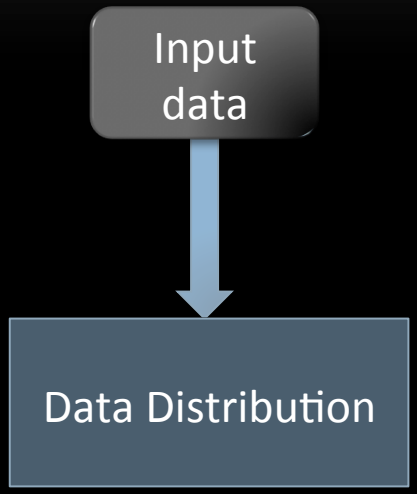

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Sorting

Selection

SORTING PRIMITIVES

Sorting

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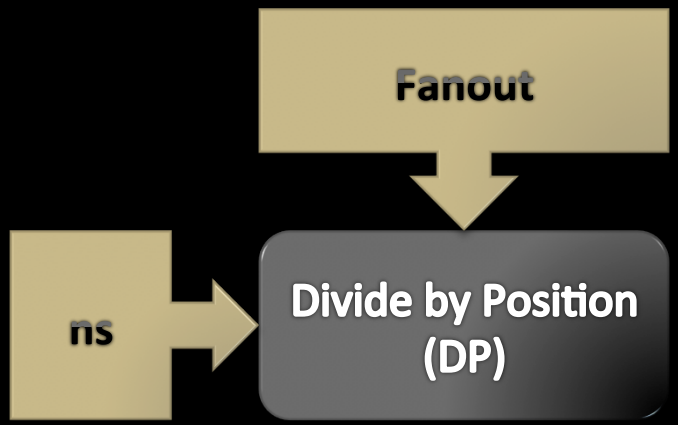

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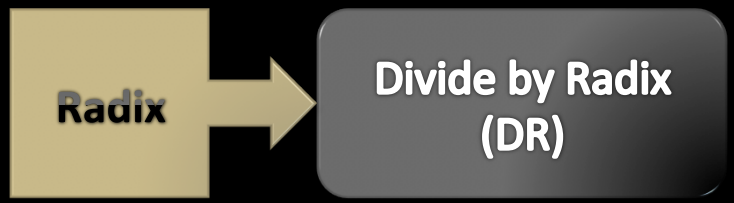

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Selection

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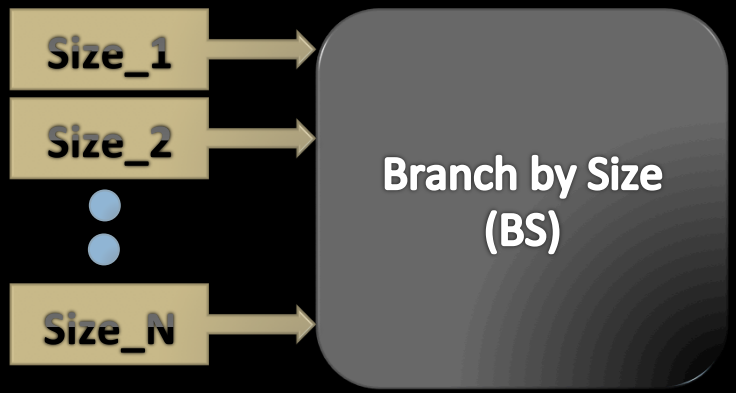

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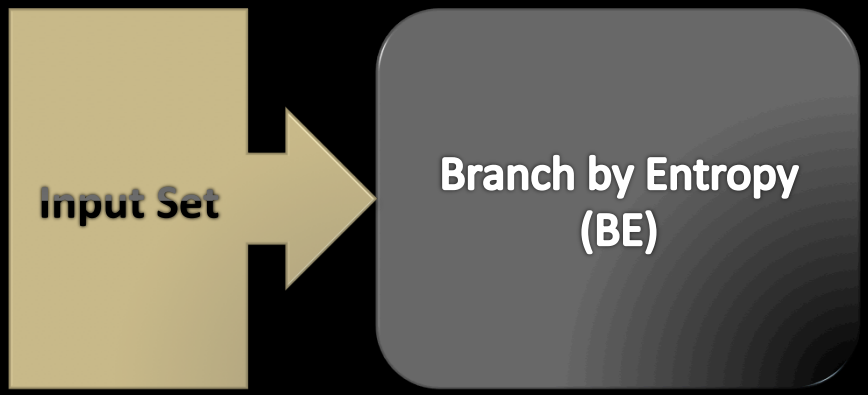

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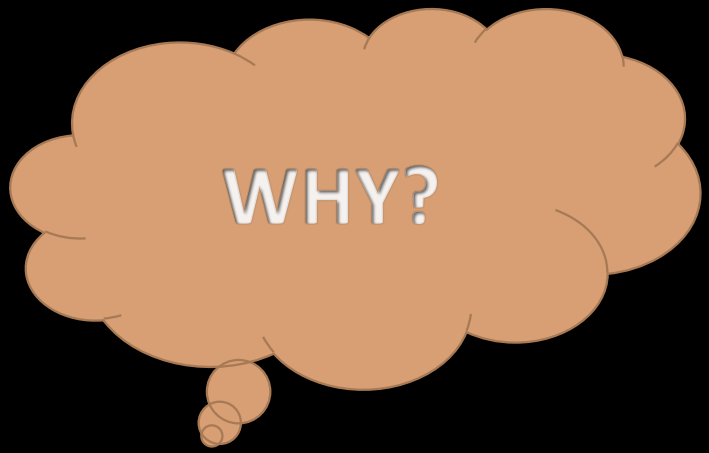
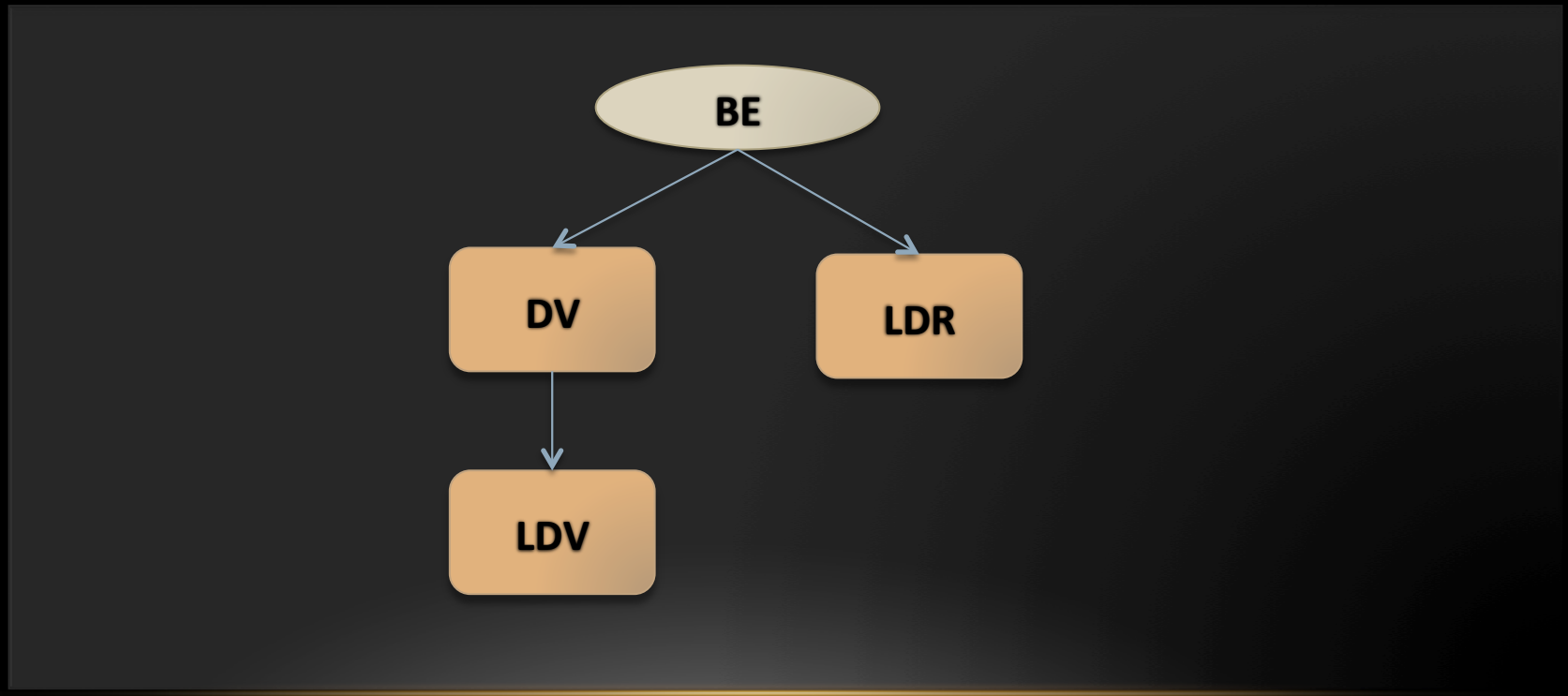
GENE SORT



GENE SORT

Example of a Sorting Algorithm Tree



GENE SORT

Crossover

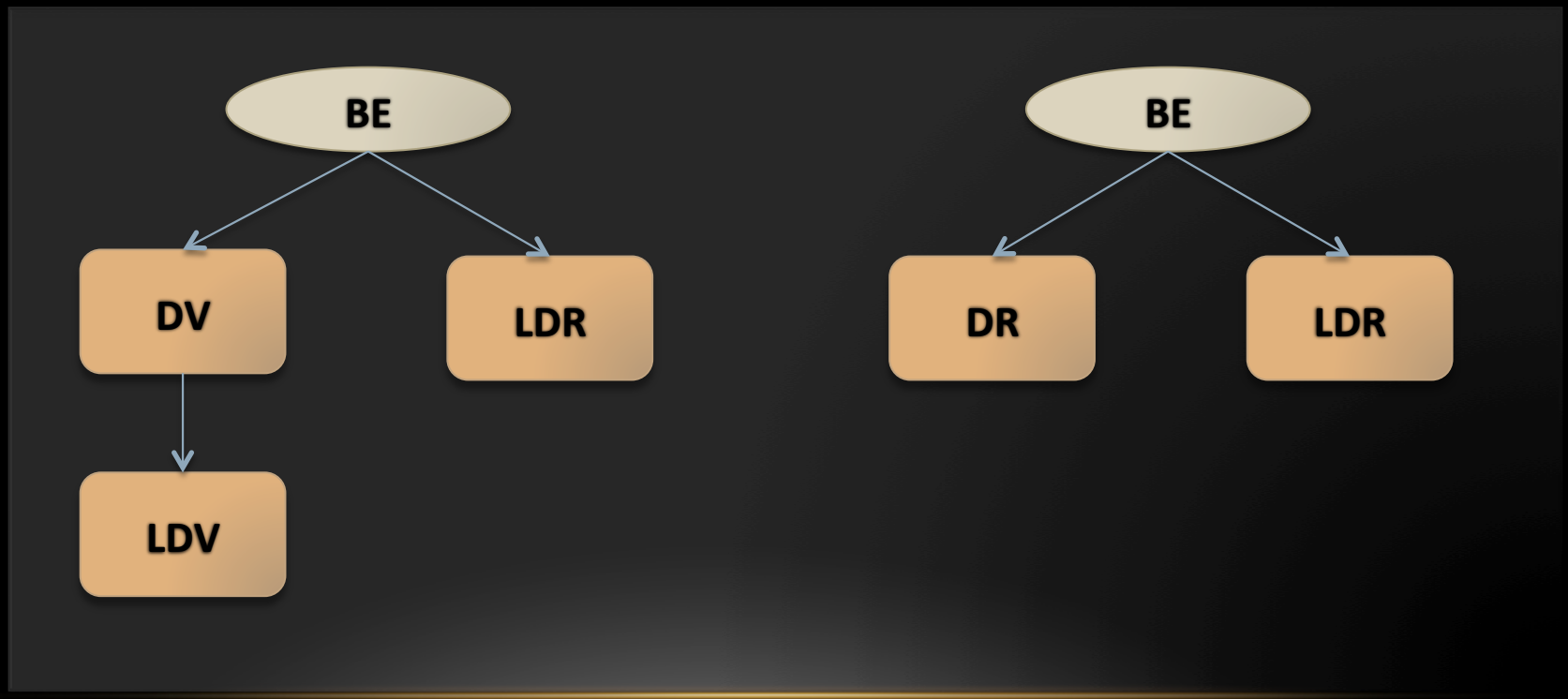
Mutation

GENE SORT

Crossover

GENE SORT

Example of Crossover



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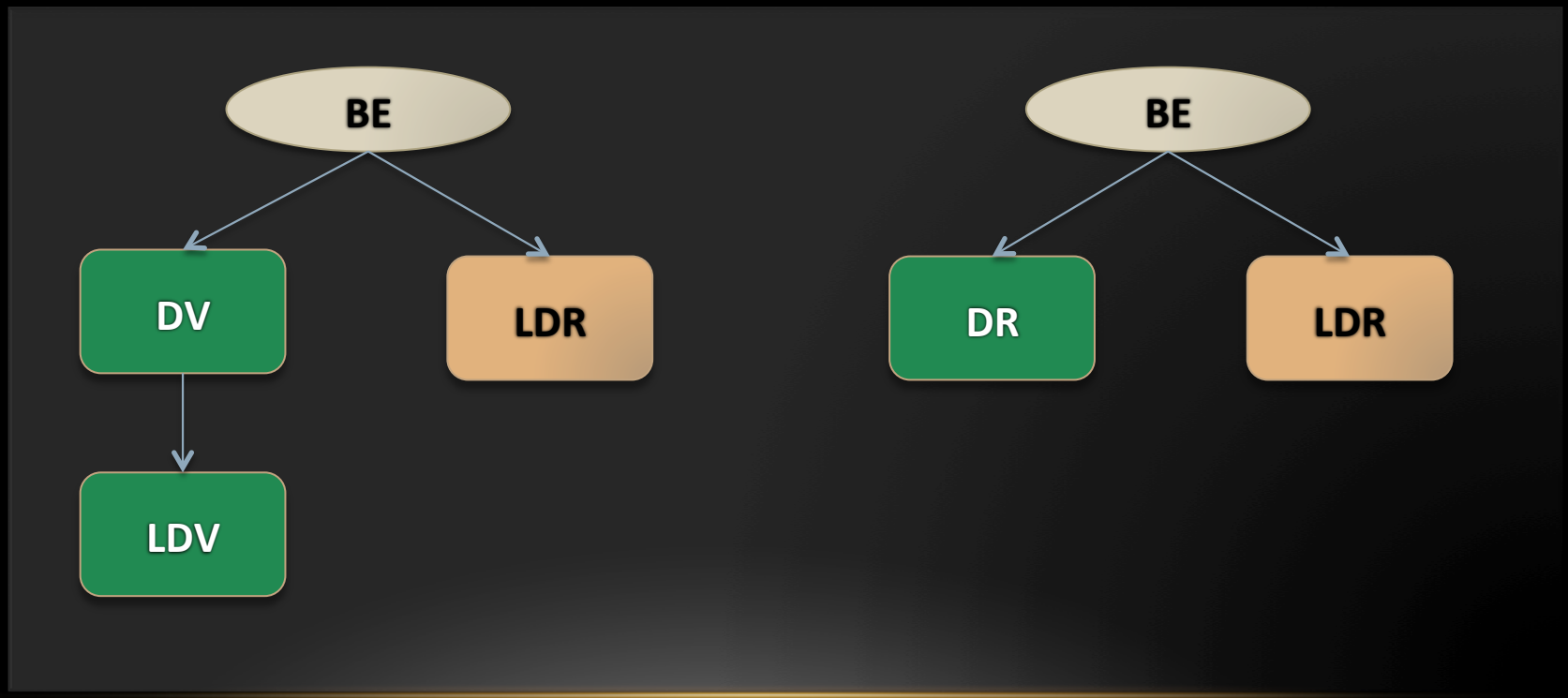

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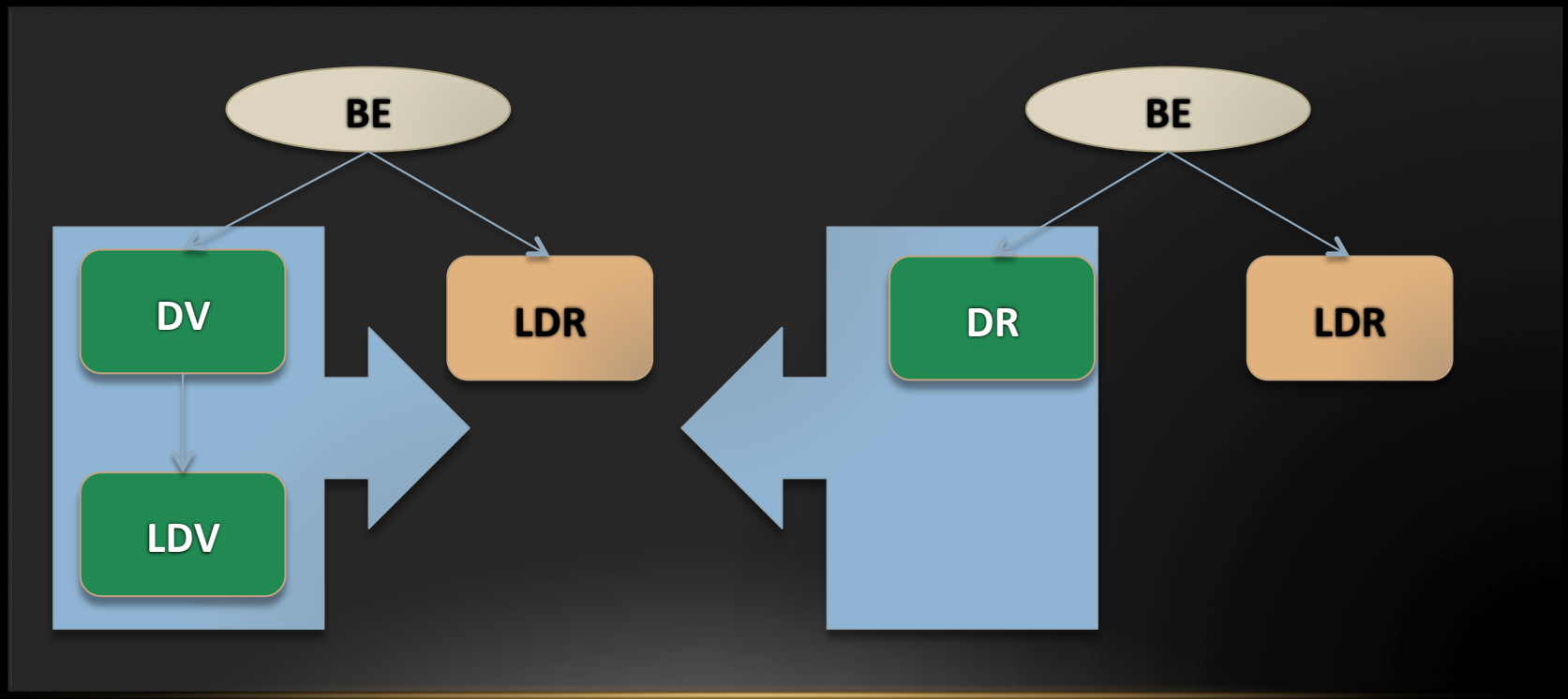

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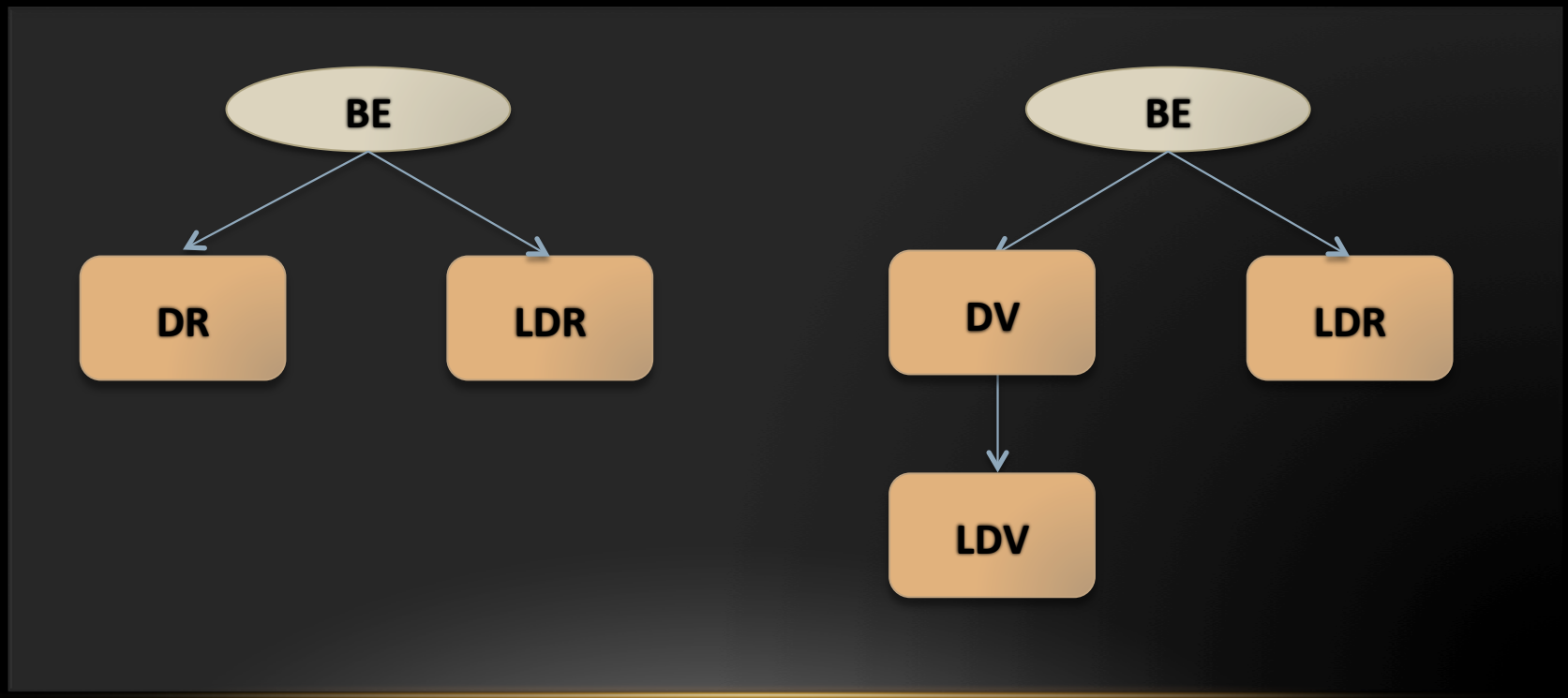


GENE SORT

Mutation

GENE SORT

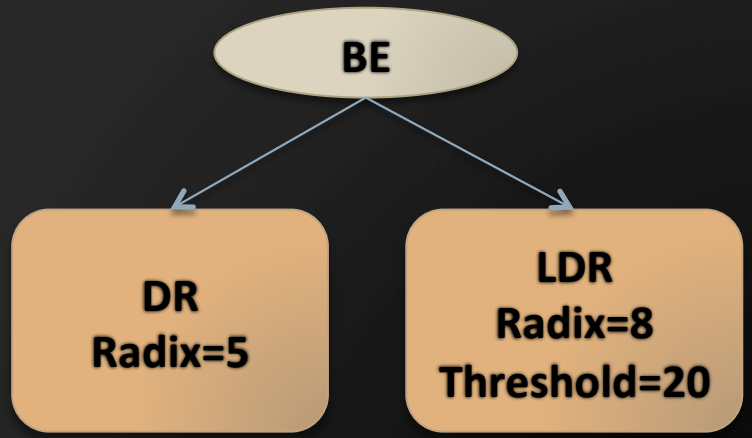
Mutation

- Change values of parameters (randomly)
- Exchange two subtrees
- Add a new subtree
- Remove a subtree

GENE SORT

Mutation

Change values of parameters (randomly)



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Mutation

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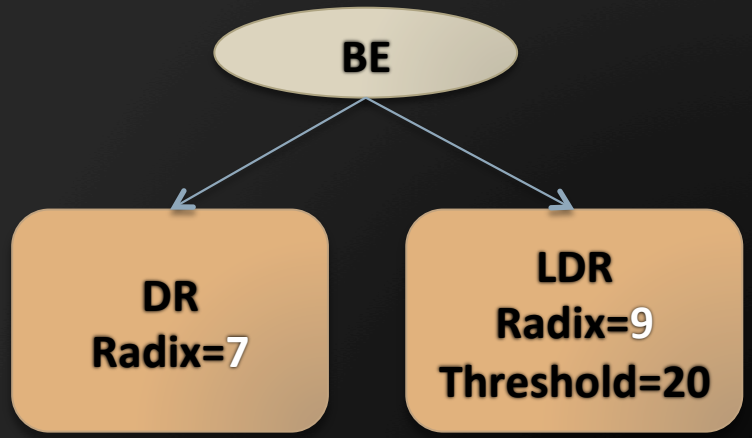

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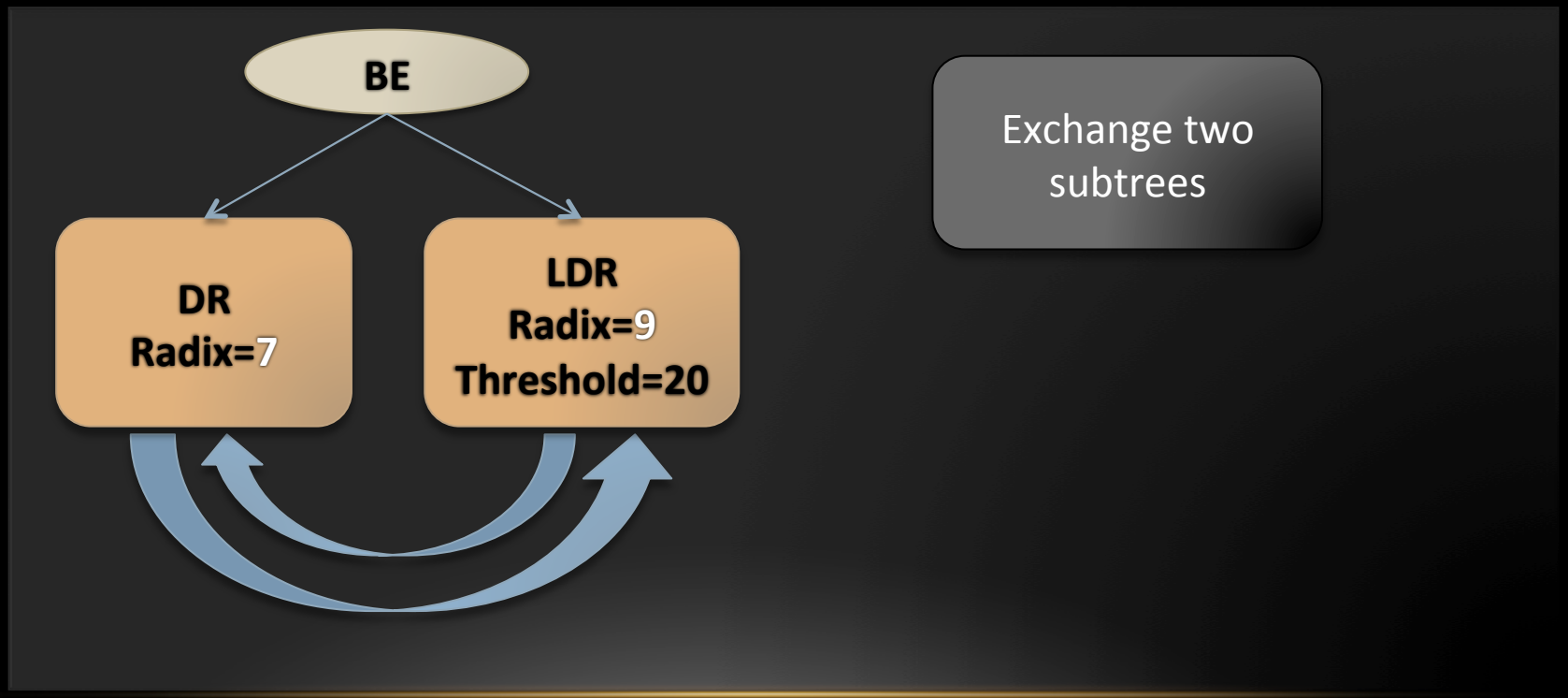
Mutation



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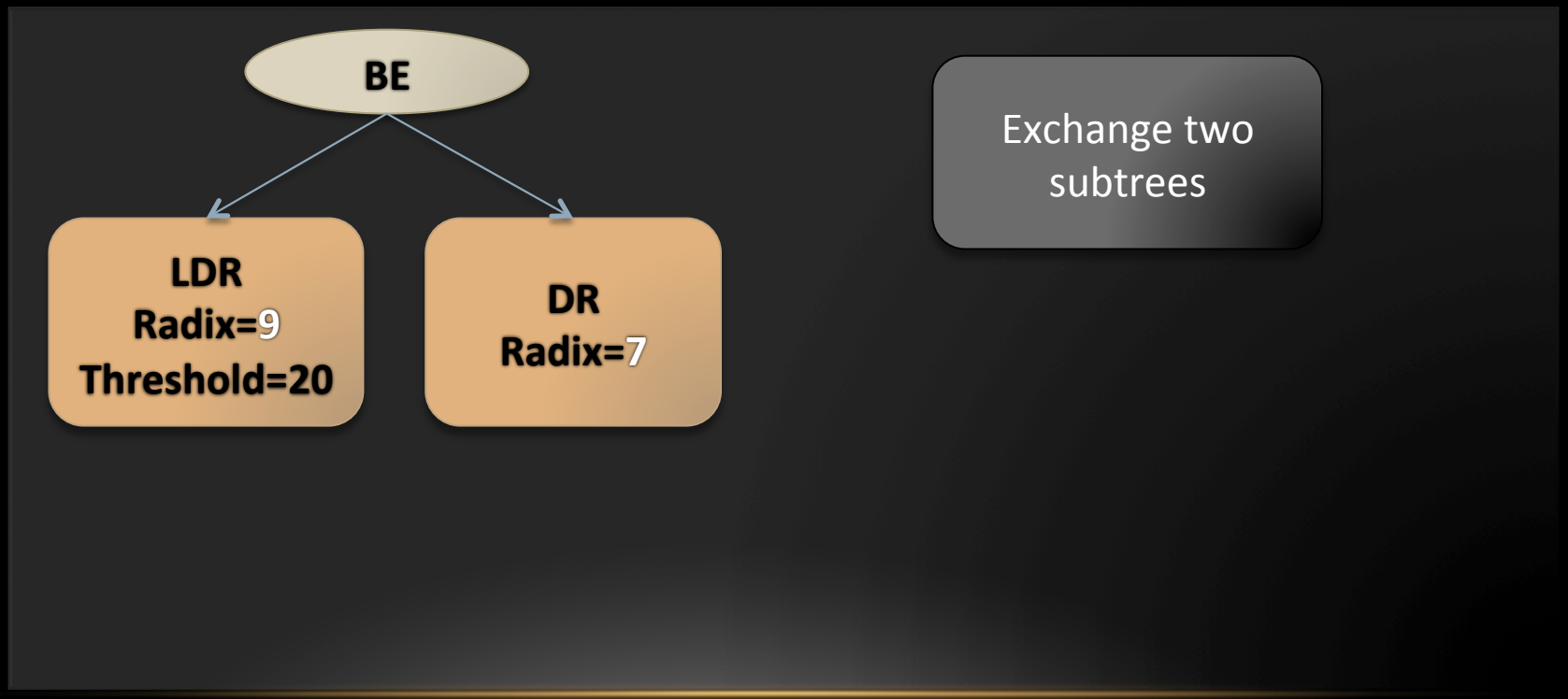

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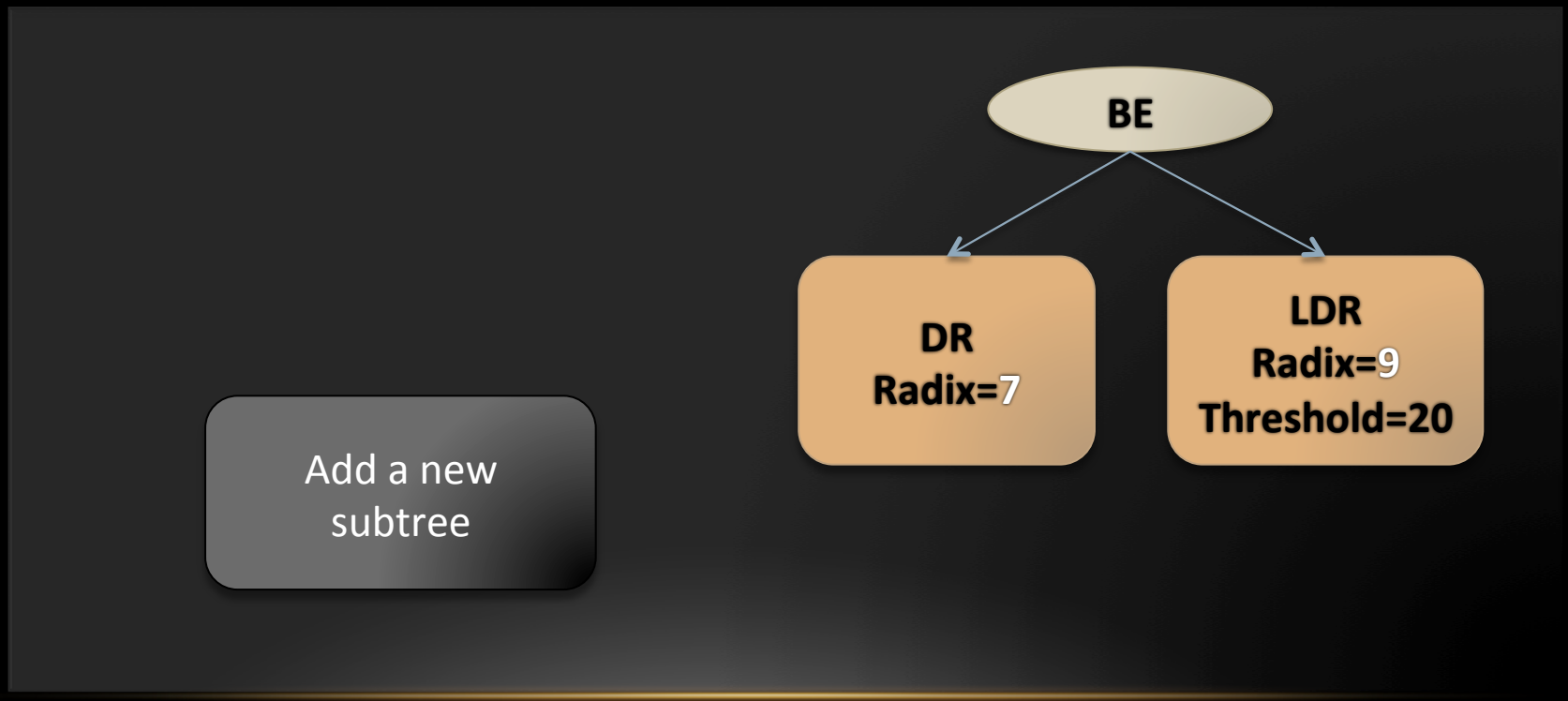

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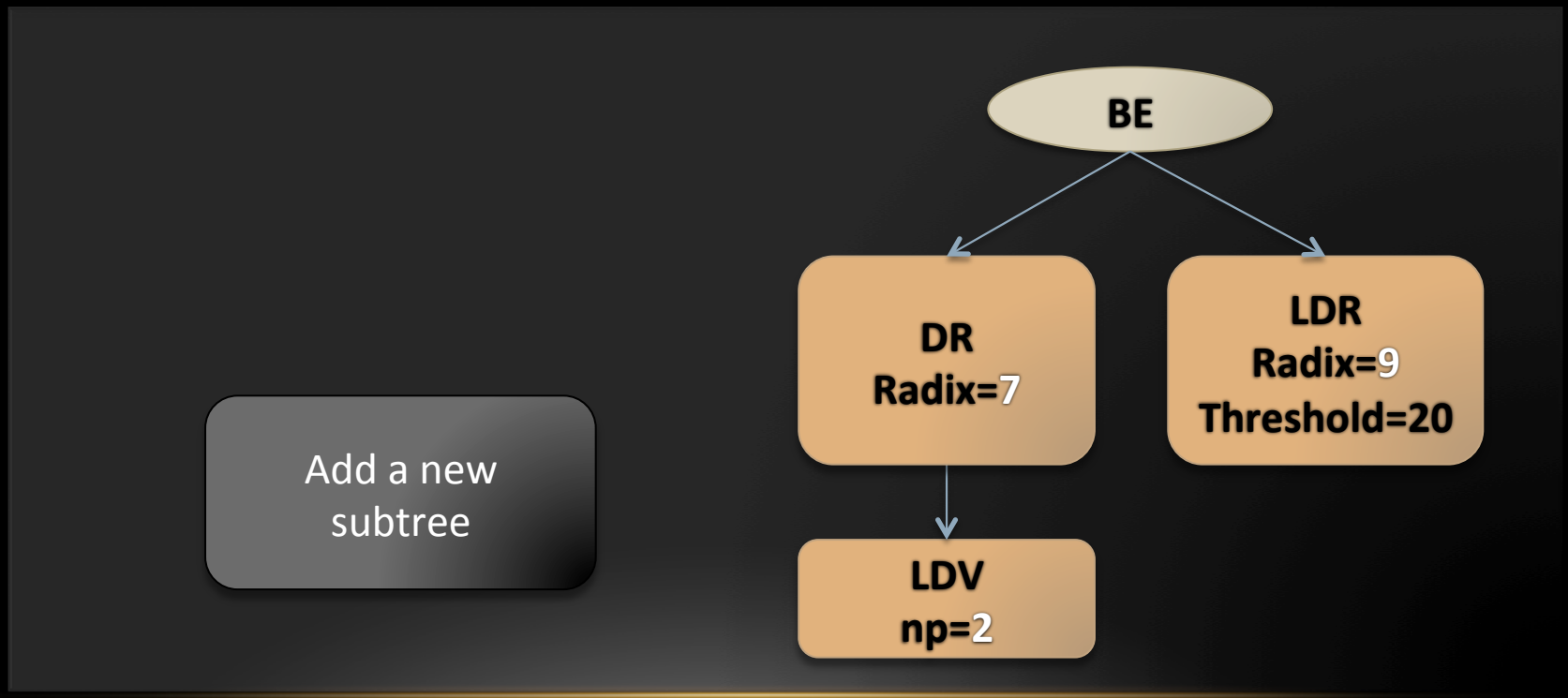

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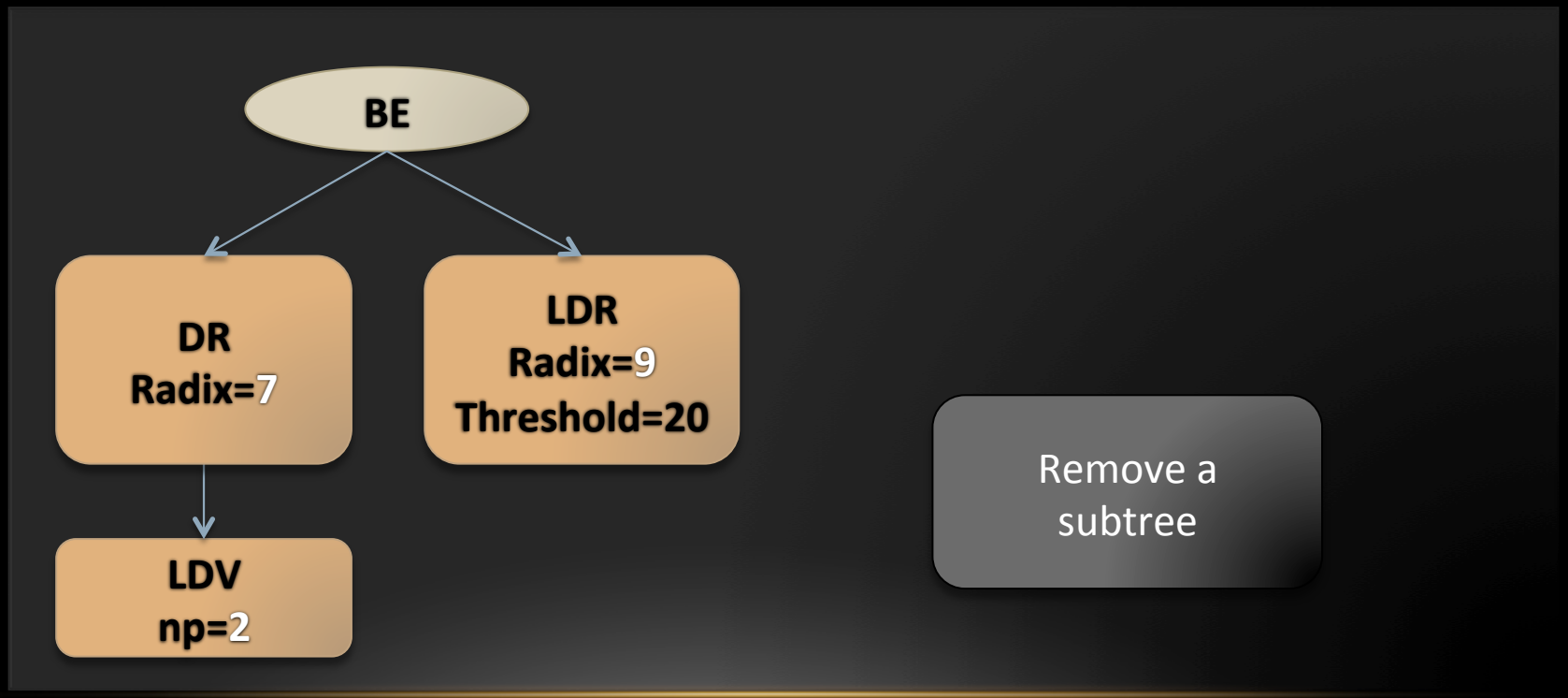

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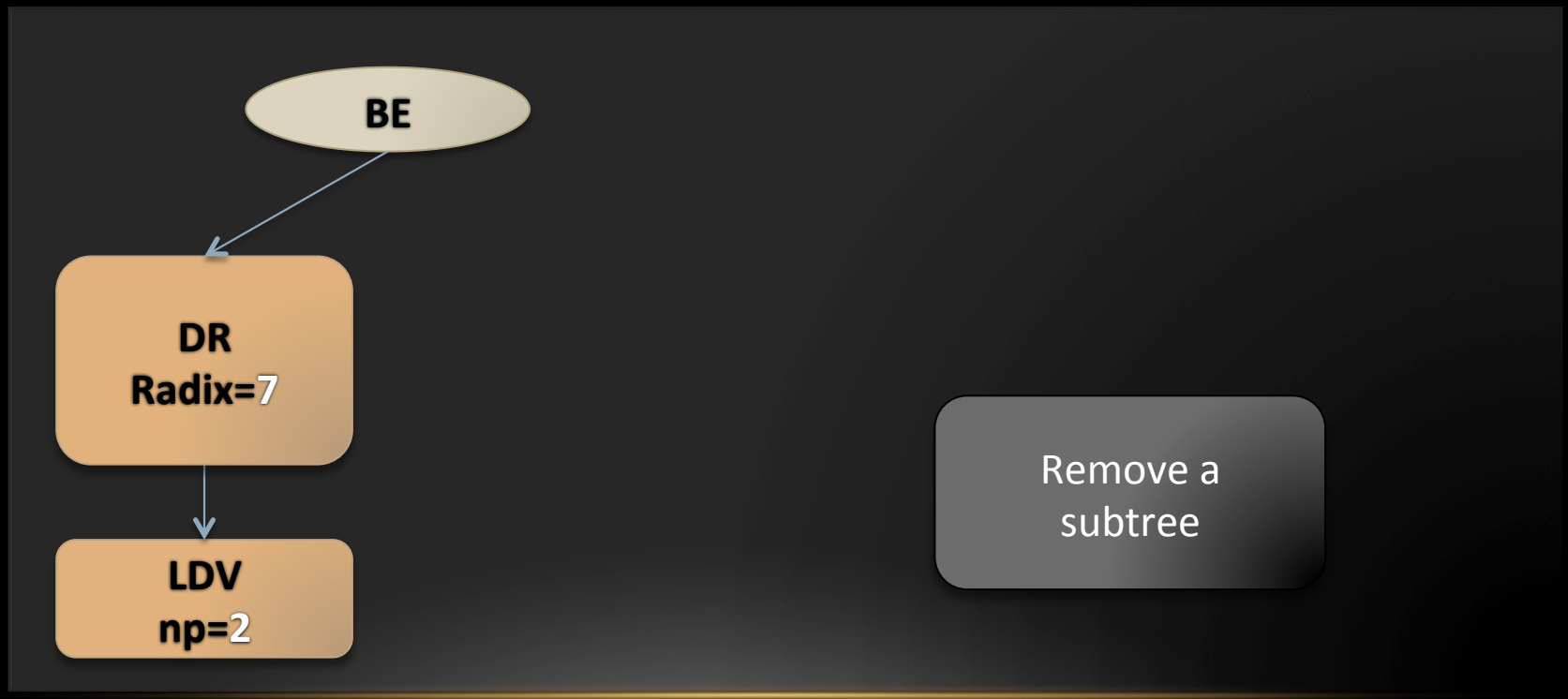
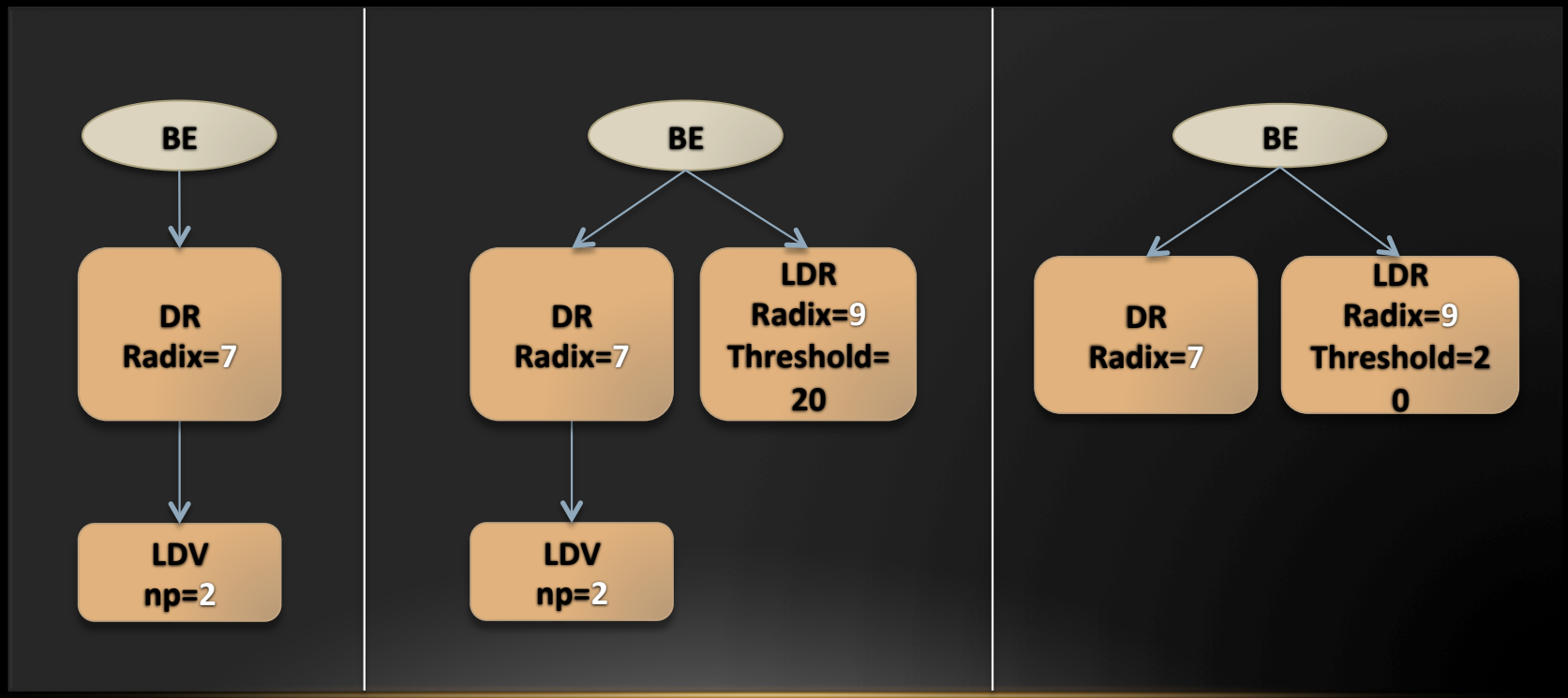


GENE SORT

Fitness Function

GENE SORT

Fitness Function



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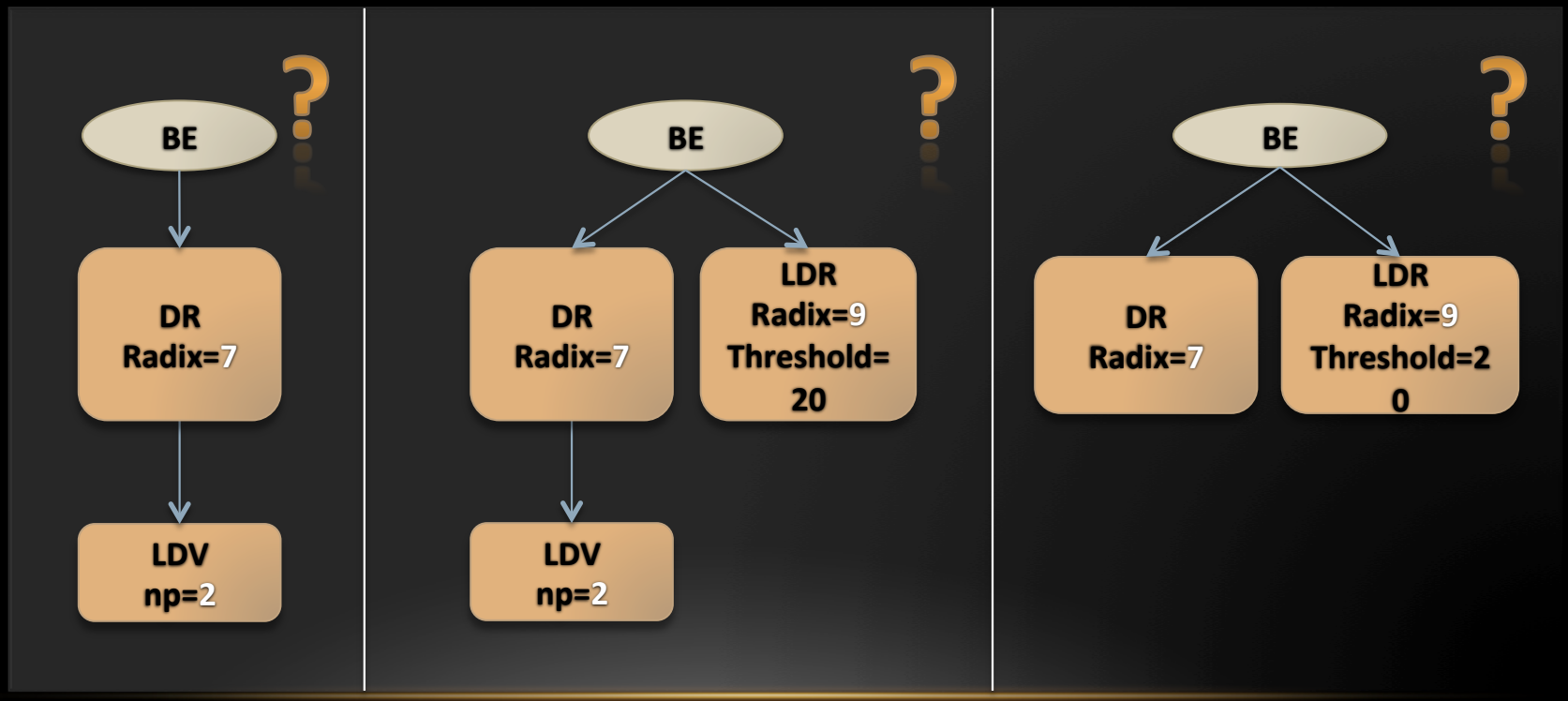
Fitness Function



GENE SORT

Performance as Fitness Function

GENE SORT

Genetic Algorithm

GENE SORT

Genetic Algorithm {

P = Initial Population

While (stopping criteria is false) do {

Apply mutation and crossover and generate set M of k individuals
P = P ∪ M
S = Input sets with different sizes and different standard deviations
Use each genome of P to sort each element of S
Apply fitness function to remove the k least fit individuals from P.

}}

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EVALUATION OF GENE SORT

- Tested on seven different platforms

Settings	
Population Size	50
# Generations	100
# Generated offsprings	30
Mutation Rate Possibilty	6%
# Training input sets	12

EVALUATION OF GENE SORT

9h on the Intel Xeon
(3.0 GHz)

80h on the SGI R12000
(300 MHz)

EVALUATION OF GENE SORT

Gene Sort : 7% worse than other algorithm ONLY in three platforms.

- AMD Athlon (having low values of std. Deviation)
- SGI R12000 and Intel Itanium (having high values of std. Deviaton)

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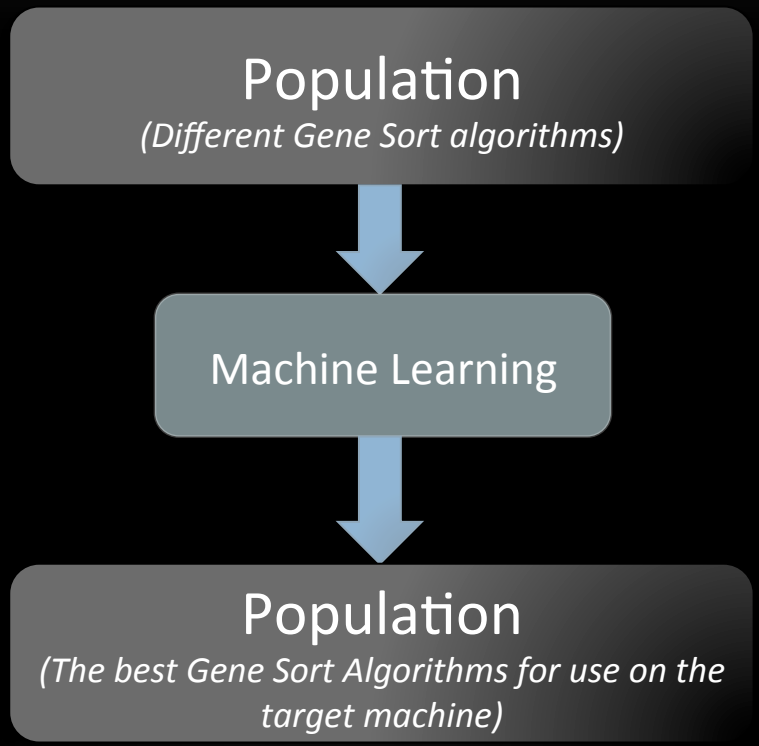
CLASSIFIER SORTING



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CONCLUSION

- Best sorting routines using Genetic Algorithms to generate Classifier Sorting (Xsort).
- 36% Faster than “Pure” sorting algorithms
- Faster than comercial libreries like IBM ESSL, INTEL MKL, STL (C++),etc.

THAT'S ALL

THANK YOU VERY MUCH FOR YOUR ATTENTION