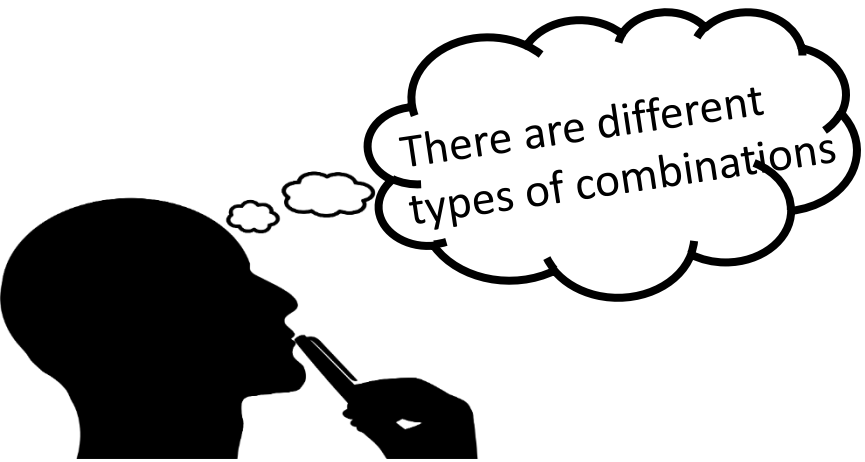
Hybrid Metaheuristics

Over the last years a large number of algorithms were reported that do not purely follow the concepts of one single traditional metaheuristic, but they combine various algorithmic ideas, often originating from other branches of optimization and soft-computing. These approaches are commonly referred to as ***metaheuristic hybrids*** or ***hybrid metaheuristics***.

The best results found for many real-life or classical optimization problems are obtained by hybrid algorithms.

The main motivation for the hybridization of different algorithmic concepts has been to obtain better performing systems that exploit and combine advantages of the individual pure strategies, that is, hybrids are believed to benefit from synergy.



1	Combining metaheuristics with (complementary) metaheuristics.
2	Combining metaheuristics with exact methods.
3	Combining metaheuristics with machine learning and data mining techniques.

Raidl, Günther & Puchinger, Jakob & Blum, Christian. (2010). Metaheuristic Hybrids. 10.1007/978-1-4419-1665-5_16.
Blum, C. & A. Roli 2003. Metaheuristics in combinatorial optimization: Overview and conceptual comparison. ACM Computing Surveys (CSUR) 35(3): 268-308.
Hybrid Metaheuristics, May 2010, BIOMA 2010, Ljubljana, Slovenia, "*file:///C:/Users/dell/Downloads/Hybrid_Metaheuristics.pdf*"

Hybrid Metaheuristics

No Free Lunch Theorem

There cannot exist a general optimization strategy which is always better than any other.

Solving a specific problem most effectively almost always requires a particularly tuned algorithm that is compiled of an adequate combination of sometimes very problem specific parts often originating from different metaheuristics and other algorithmic techniques.

Picking the right algorithm components, and combining them in the most appropriate way are key ingredients for leading optimization algorithms

We primarily distinguish hybrid metaheuristics according to four criteria:

the kinds of algorithms that are hybridized

Combine (parts of) different metaheuristic strategies, which is probably the most common approach

the level of hybridization

- High-level combinations
- Low-level combinations

Combine according to the level (or strength) at which the individual algorithms are couple.

the order of execution

- The individual algorithms are performed in a sequential way.
- The individual algorithms in an intertwined or even parallel way.

the control strategy

- one algorithm is the subordinate, embedded component of another.
- The individual algorithms exchange information but are not part of each other.

Hybrid according to their control strategy, which can be either integrative (coercive) or collaborative (cooperative).

THANK YOU