

# mcMST: Multi-criteria minimum spanning tree

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## Summary

The single-objective minimum spanning tree (MST) problem is a combinatorial optimization problem known to be polynomial-time solvable, e.g., with the algorithm of Prim (Prim 1957). However, in real-world applications one is frequently faced with multiple objectives which need to be minimized simultaneously. Since the objectives are usually conflicting, there is no single optimal solution. Instead the goal is the approximate the so-called Pareto-front, i.e., the set of nondominated solutions (see Deb and Kalyanmoy (2001)).

The R (R Core Team 2017) package `mcMST` provides algorithms to approximate the Pareto-front of mcMST problems. Beside a multi-objective version of Prim's algorithm (see, e.g., Knowles and Corne (2001)) the package offers two evolutionary multi-objective algorithms (EMOAs). The first is based on the Prüfer-encoding (Prüfer 1918) and is very similar to the genetic algorithm proposed by Zhou and Gen (1999). The second EMOA operates on the edge list directly. Moreover, a simple and generic enumeration algorithm is included which is useful to compute the exact front of graph problems for small instance sizes by exhaustive enumeration. This is particularly useful to investigate similarity of Pareto-optimal solutions.

Additionally, a modular toolbox to generate multi-objective benchmark graph problems is included in the `mcMST` package. This allows for easy generation of a diverse benchmark set.

## References

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