

## 1 Extending the `optimr()` function in package `optimz`

“**optimz**” is a package intended to provide improved and extended function minimization tools for *R*. Such facilities are commonly referred to as “optimization”, but the original `optim()` function and its replacement in this package, that is, `optimr()`, only allow for the minimization or maximization of nonlinear functions of multiple parameters subject to at most bounds constraints. Some methods also permit fixed (masked) parameters. In general, we wish to find the vector of parameters `bestpar` that minimize an objective function specified by an *R* function `fn(par, ...)` where `par` is the general vector of parameters, initially provided as the vector `start`, and the dot arguments are additional information needed to compute the function. Function minimization methods may require information on the gradient or Hessian of the function, which we will identify as `gr(par, ...)` and `hess(par, ...)`.

## 2 How `optimr()` works

`optimr()` is an aggregation of wrappers for a number of individual function minimization (“optimization”) tools available for *R*. The individual wrappers are selected by a sequence of `if()` statements using the argument ‘`method`’ in the call to `optimr()`.

To add a new optimizer, we need in general terms to carry out the following:

- Ensure the new function is available, that is, the package containing it is installed;
- Add an appropriate `if()` statement to select the new “method”;
- Translate the control list (“`control`”) elements of `optimr()` into the corresponding control arguments (possibly not in a list of that name) for the new “method”;
- If necessary, redefine the *R* function or functions to compute the value of the function, gradient and possibly Hessian of the objective function so that the output is suited to the method at hand.
- When derivative information is required by a method, we may also need to incorporate the possibility of numerical approximations to the derivative information.