DEoptim:

optimization for the tough stuff

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R has lots of optimizers

- Smooth, convex, and linear solvers are readily available
- Base R has optim, and optimX is maintained by optim's author
- Additional continuous solvers exist in Rglpk, quadprog, ROI and others
- For problems requiring numerical or global solutions, you get your choice of particle swarms (pso, hydroPSO), simulated annealing (GenSA), and genetic algos (genalg, rgenoud, DEoptim, and the new GA)
- See the Optimization Task View for a more complete list: http://cran.r-project.org/web/views/Optimization.html

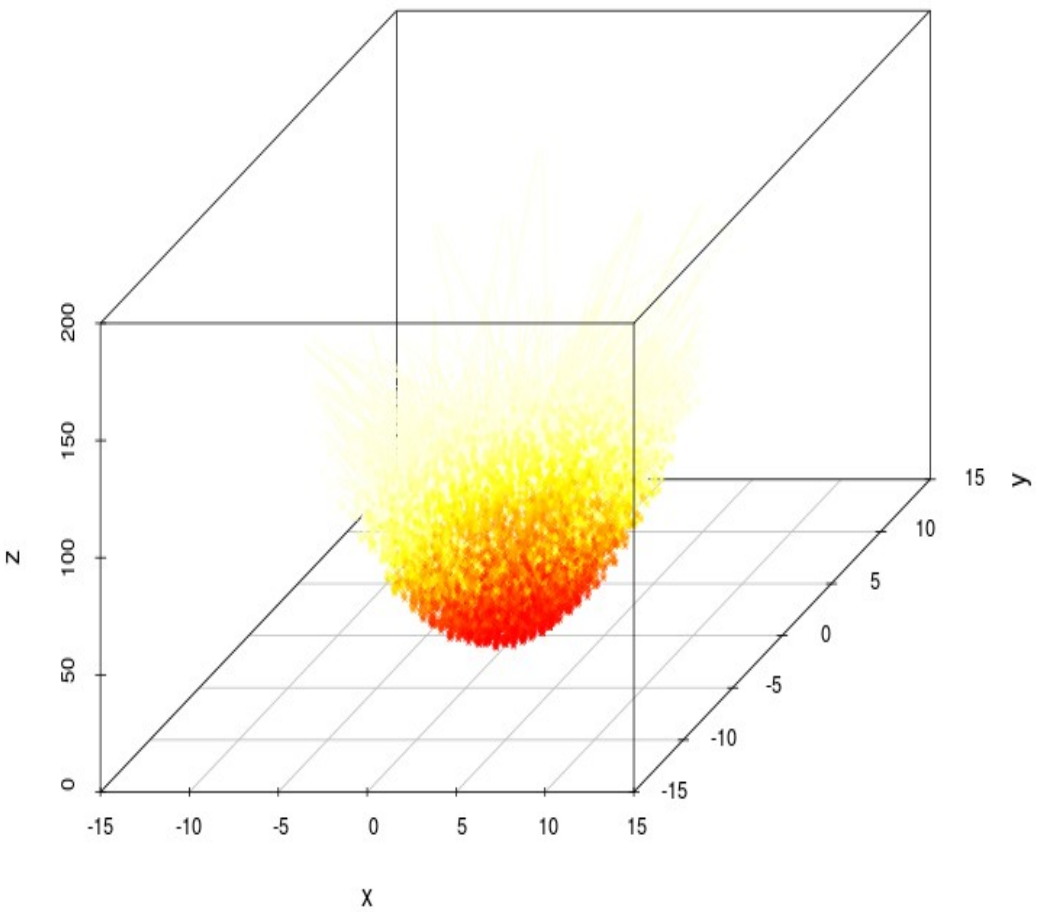
First Pick a Tough Objective

```
Rastrigin<- function(x,y) {
    z = 20 + (x^2 - 10 * cos(2 * pi * x)) +
    (y^2 - 10 * cos(2 * pi * y))
}


set.seed(1234) #you likely don't want to do this
x<-rnorm(10000,0,3)
y<-rnorm(10000,0,3)
z<-Rastrigin(x,y)


require(scatterplot3d)


scatterplot3d(x,y,z,color=heat.colors(length(z))
[rank(z)])
```



See package 'soobench' for other tortuous optimization objectives.

Next: Find the global optim

```
Rastrigin_w<- function(w) { #take a vector of parameters
  x=w[1]
  y=w[2]
  20 + (x^2 - 10 * cos(2 * pi * x)) + (y^2 - 10 * cos(2 * pi * y))
}

require(DEoptim)
opt.out <- DEoptim(Rastrigin_w, upper=rep(15,2), lower=rep(-15,2),
                   control=list(storepopfrom=1, trace=FALSE))
summary(opt.out)
```

```
***** summary of DEoptim object *****
best member   :  0 0
best value    :  0
after         :  200 generations
fn evaluated  :  402 times
************************************
```

Thank You for Your Attention

- Global numerical solvers don't require a smooth or continuous function space
- They will find optima to the limits of numerical precision and the computing time allocated
- DEoptim is very useful in fields ranging from portfolio optimization to spectroscopy
- DEoptim is joint work with Joshua Ulrich, Katherine Mullen, and David Ardia