

Practical No: 069

Aim: - Implement radial basis functions using surrogate modeling

SurrogateModelOptim

SurrogateModelOptim is a Julia package for the optimisation of expensive functions. The surrogate model is based on an ensemble of Radial Basis Function interpolants with adaptive axis scaling.

Installation

Run this code only once to install dependencies.

```
using Pkg
Pkg.add("SurrogateModelOptim")
```

This package is intended to be used for functions which are expensive. We consider an expensive function `rosenbrock_2D` that evaluates in several minutes to days.

A julia function can be optimized with

SurrogateModelOptim.smoptimize — *Function.*

```
smoptimize(f::Function, search_range::Array{Tuple{Float64,Float64},1}; options=Option
```

Optimize the function `f` in the range `search_range` using a Radial Basis Function based surrogate model.

The goal is to minimize the function output

Step 1: Creating a generic function

```
julia> using SurrogateModelOptim

julia>

julia> rosenbrock_2D(x) = (1.0 - x[1])^2 + 100.0 * (x[2] - x[1]^2)^2
rosenbrock_2D (generic function with 1 method)

julia> |
```

Step 2: Creating search range

```
julia> search_range = [(-5.0, 5.0), (-5.0, 5.0)]
2-element Vector{Tuple{Float64, Float64}}:
 (-5.0, 5.0)
 (-5.0, 5.0)

julia> |
```

Step 3: Optimizing the function with the given search range

```
julia> smoptimize(rosenbrock_2D, search_range)
Iteration      Function value      Improvement
1 out of 5      168.5              N/A
2 out of 5      168.5              N/A
3 out of 5      168.5              N/A
4 out of 5      168.5              N/A
5 out of 5      168.5              N/A
Surrogate Model Optim Result
Best fitness:    168.5, (worst 90036)
Best candidate:  [-2.5; 5.0;;]
Function calls:  10
Iterations:      5
LHC sampling points: 5
Infill criteria: [:std, :median, :wstdmed03, :wstdmed06]
Mean axis scaling: [1.0, 0.3112141897719874] (relative to first dimension)
Smooth:          single (set to :single if noise is expected)
Returned surrogate contains all samples: false

julia> |
```