ARS Documentation

Table of contents

1 Introduction of ARS(adaptive random subspace)

2 List of files

Main file:

ARS_main.py

Modules:

- **History_Manager.py** Record history information
- **Sample.py** Sample points
- **Collect_Direction.py** Collect the basis of subspace(including momentums, gradient(s), good direct search directions)
- **Construct_Model.py** Construct local model
- **Solve_TR.py** Solve TR problem

2.1 ARS_main.py

class ARS
- init: initialize parameters, history
- configure: fill in parameters
- Check_Stop_Criteria
- Update_Params: update parameters at the end of each iteration
- ARS_run: solver

2.1.1 init

init(self,x0, obj_fun, grad_fun=None, method:chr=None,options:dict=None,...)

2.1.2 configure(self)

2.1.3 Check_Stop_Criteria(self)

2.1.4 Update_Params(self)

还没来得及设定

2.1.5 ARS_run(self)

```
while not Check_Stop_Criteria do
  directions = Collect_Direction.Collect_Direction
  model = Construct_Model.Construct_Model
  tr_sol = Solve_TR.Solve_TR
  new_x = self.history.find_best_per_iter
  self.Update_Params()
  self.x = new_x
```

2.2 History_Manager.py

class History_Manager
- init
- evaluate
- find_best_per_iter
- evaluate_grad
- get_nfev
- get_ngrad

2.2.1 History_Manager.init(self, obj_fun, grad_fun=None)

$$\begin{cases} \text{self.obj\_fun} \\ \text{self.grad\_fun} \\ \text{self.total\_history=\{\}} \\ \text{self.iter\_obj\_history=\{\}} \\ \text{self.params=\{\}} \\ \text{self.ngrad=\{\}} \end{cases}$$

2.2.2 History_Manager.evaluate(self, x, iter, stage)

2.2.3 History_Manager.find_best_per_iter(self, iter)

2.2.4 History_Manager.evaluate_grad(self, x)

2.2.5 History_Manager.get_nfev(self)

2.2.6 History_Manager.get_ngrad(self)

2.3 Sample.py

$$\begin{cases} \text{Sample\_Direction} \\ \text{Sample\_Point} \end{cases}$$

2.3.1 Sample_Direction(x, stage, num_points, ds='uniform')

2.3.2 Sample_Point((x, iter, stage, num_points, history, ds='uniform'))

2.4 Collect_Direction.py

$$\begin{cases} \text{Collect\_Momentum} \\ \text{Collect\_Gradient} \\ \text{Collect\_DS} \\ \text{Collect\_Direction} \end{cases}$$

2.4.1 Collect_Momentum(iter, history)

number of momentums is recorded in history.params[...]

2.4.2 Collect_Gradient(x, iter, history)

number of total gradients, and number of sampling for each gradient are recorded in history.params[...]

2.4.3 Collect_DS(x, iter, history)

2.4.4 Collect_Direction(x, iter, mgs, history)

2.5 Construct_Model.py

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2.6 Solve_TR.py

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