Test Cases for FOQUS UQ/OUU

5/2015

OUU: Test 1

Load ouu_optdriver.in

Select first 4 parameters as Z1, next 4 as Z2, last 4 as Z3

Sample for Z3 in x3sample.txt (a random sample)

Select objective function option 1

User provides inner optimization solver

Result should be:

X 1 = -3.18312466e-02

X 2 = -3.60003473e-01

X 3 = 2.80095861e-01

X 4 = 8.25463572e-01

Ymin = 3.37718307e+01

OUU: Test 2

Load ouu_optdriver.in

Select first 4 parameters as Z1, next 4 as Z2, last 4 as Z4

Select objective function option 1

Select LHS with 200 points

Do not select response surface for Z4

User provides inner optimization solver

Result should be:

X 1 = 1.86036289e-10

X 2 = -3.03887157e-01

X 3 = -2.85241220e-02

X 4 = 6.85709429e-01

Ymin = 2.96778292e+01

OUU: Test 3

Load ouu_optdriver.in

Select first 4 parameters as Z1, next 4 as Z2, last 4 as Z4

Select objective function option 1

Select LHS with 200 points

Select response surface for Z4

User provides inner optimization solver

Result should be:

X 1 = -8.42127663e-03

X 2 = -3.07361498e-01

X 3 = 1.40207429e-02

X 4 = 6.93277367e-01

Ymin = 2.78042757e+01

OUU: Test 4

Load ouu_optdriver.in
Select Z1 – first 4, Z2 – next 4, Z3 – next, Z4 – last 3
Select objective function option 1
Use x3sample4.txt for Z3
Use LHS, n=100 for X4, no response surface
User provides inner optimization solver
Result should be:

X 1 = -4.18641332e-11

X 2 = -3.02572752e-01

X 3 = 1.85462313e-01

X 4 = 6.76104594e-01

Ymin = 4.63915567e+01

OUU: Test 5

Load ouu_optdriver.in
Select Z1 – first 4, Z2 – next 4, Z3 – next, Z4 – last 3
Select objective function option 1
Use x3sample4.txt for Z3
Use LHS, n = 100 for Z4, use response surface
User provides inner optimization solver
Result should be:

X 1 = -1.11665888e-04

X 2 = -3.03818464e-01

X 3 = -2.49418350e-02

X 4 = 6.86762398e-01

Ymin = 4.50793019e+01

OUU: Test 6

Load ouu_optdriver.in

Select Z1 – first 4, Z2 – next 4, Z3 – next, Z4 – last 3

Select objective function option 1

Use x3sample4.txt for Z3

Use x4sample4.txt for Z4, use response surface (n=50)

User provides inner optimization solver

Result should be:

X 1 = -1.69078616e-02

X 2 = -3.58113535e-01

X 3 = -2.28399250e-02

X 4 = 6.88810100e-01

Ymin = 4.00722909e+01

OUU: Test 7

Load ouu_optdriver.in

Select Z1 – first 4, Z2 – next 4, Z4 – last 4

Select objective function option 1

Use x4sampleLarge.txt for Z4 (10000 sample points)

Select response surface for Z4

Choose a sample size=100 for Z4 response surface sample

Use x4sample.txt to be the response surface sample

Select user-provided inner optimization driver

Result should be: Not implemented/tested yet

UQ: Test 1

Load examples/UQ/test_suite/Branin/BraninSample.psuade

Go to 'Analyze' lower section ('Analysis')

In 'Ensemble Data' mode,

- **Select x1 and x2 in Step (3), then press visualize**
- **Run 'Uncertainty Analysis' at Step (4): click 'Analyze'**

Now switch to 'Response Surface' in Step (1):

- **Select Radial Basis Function in Step (3), click 'Validate'**
- **Select x1 and x2 in Step (5), then click 'Visualize'**
- **Select 'Uncertainty Analysis' at Step (7), click 'Analyze'**
- **Select 'Sensitivity Analysis' at Step (7), click 'Analyze'**
- **Sect other response surfaces in Step (3), and repeat these steps**

UQ: Test 2

Load examples/UQ/test_suite/Morris20/MorrisSample.psuade

Go to ‘Analyze’ upper section (‘Qualitative Analysis’)

- **Click ‘Compute input importance’**
- **Load examples/UQ/test_suite/Morris20/LHSample.psuade**
- **Go to ‘Analyze’ upper section (‘Qualitative Analysis’)**
- **Click ‘Compute input importance’ (‘MARS Ranking’)**
- **Change Step (2) to ‘Sum of Trees’**
- **Click ‘Compute input importance’**
- **Change Step (2) to ‘Delta Test’, click ‘Compute input importance’**

Go to ‘Analyze’ lower section (‘Analysis’)

- **Select X1 and X3 in Step (3), click ‘Visualize’**
- **Select ‘Uncertainty Analysis’ in Step (4), click ‘Analyze’**
- **Switch Step (1) to ‘Response Surface’**
- **Choose ‘MARS’ in Step (3), click ‘Validate’**
- **Select ‘Uncertainty Analysis’ in Step (7), click ‘Analyze’**
- **Select ‘Sensitivity Analysis’ in Step (7), click ‘Analyze’**

UQ: Test 3

Load examples/UQ/test_suite/MCMCTest/Sample.psuade

Go to 'Analyze' lower section ('Analysis')

- **Select 'Response Surface' in Step (1)**
- **Select Y1 in Step (2)**
- **Select 'Radial Basis Function' in Step (3), click 'Validate'**
- **Repeat the previous 3 steps for Y2, Y3, and Y4**
- **Select X1 and X2 in Step (5), click 'Visualize'**

Go to Step (8) and click 'Infer'

- **On 'Output Settings', check all 4 outputs**
- **Select 'Radial Basis Function' for all outputs**
- **On 'Observations,' select number of experiments = 1**
- **Set all output means = 0, and all output Std Dev = 0.005**
- **Click 'Infer' in Step (9)**
- **Close the posterior plot window, then click 'Replot' in Step (9)**

UQ: Test 4

Load examples/UQ/test_suite/MCMCDisc/Sample.psuade
Click ‘Analyze’
Switch to ‘Expert’ Mode in ‘Analysis’ (top of page)
Under ‘Response Surface Analysis’, select Quadratic
Click ‘Validate’. Close CV error plot.
Go to bottom of page and click ‘Infer’

- **On ‘Output Settings’, check ‘Observed’ for Output Y**
- **Select ‘Polynomial/Quadratic’ for Output Y**
- **In ‘Input Settings’, select X1 to be of type ‘Design’**
- **On ‘Observations,’ load observation file: MCMCDisc/expdata**
- **Check ‘Use Discrepancy’ and specify ‘Save’ destination**
- **Check ‘Save Posterior’**
- **Click ‘Infer’**

Go back to the ‘Uncertainty’ page, load the discrepancy file

- **Go to ‘Analyze’ and visualize response surface with ‘linear’**

UQ: Test 5

Load examples/UQ/test_suite/Ishigami/Sample.psuade

Click ‘Analyze’

Switch to ‘Expert’ Mode in ‘Analysis’ (top of page)

Under ‘Response Surface Analysis’, select RBF

Click ‘Validate’. Close CV error plot.

In ‘Visualize Response Surface,’ pick X1, X2, click ‘Visualize’

Go to ‘Choose UQ Analysis’

- **Select ‘Uncertainty Analysis’ and ‘Epistemic-Aleatory’**
- **Select ‘Epistemic’ for X1 and ‘Aleatory’ for X2 and X3**
- **For X1, choose min = -0.1 and max = 0.1**
- **Click ‘Analyze’ (in ‘Choose UQ Analysis’) – take some time**
- **Use the slide bar to examine probability ranges**
- **Select other ranges for X1, re-run and observe plots**