Altair

HyperWorks

Altair HyperStudy 2019 Tutorials

HS-3005: Exporting Fit Models to Excel

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In this tutorials, you will learn how to:

- Run a Design of Experiments (DOE)
- Build a Fit to approximate the output responses
- Export the Fit model to an Excel report
- Use Excel to predict output response values

Before starting this tutorial, you must add the HstAddinFit add-in to Excel. For instructions on to install the HstAddinFit add-in, refer to Fit Excel Plug-In.

Step 1: Perform the Study Setup

1. Start HyperStudy.
2. To start a new study, click ***File*** > ***New*** from the menu bar, or click  on the toolbar.
3. In the **HyperStudy – Add** dialog, enter a study name, select a location for the study, and click ***OK***.
4. Go to the **Define models** step.
5. Add an Internal Math model.
   a. Click ***Add Model***.
   b. In the **Add - HyperStudy** dialog, add one **Internal Math** model.
6. Go to the **Define Input Variables** step.
7. Click ***Add Input Variable***.
8. In the **Add - HyperStudy** dialog, add two input variables.
9. Change the input variable's **Lower Bounds**, **Initial**, and **Upper Bounds** to the values indicated in the image below.

	Active	Label	Varname	Lower Bound	Initial	Upper Bound	Comment
1	☑	DV 1	dv_1	-6.2800000 ...	1.0000000 ...	6.2800000 ...	...
2	☑	DV 2	dv_2	-6.2800000 ...	1.0000000 ...	6.2800000 ...	...

10. Go to the **Specifications** step.

Step 2: Perform the Nominal Run

1. In the work area, set the **Mode** to ***Nominal Run***.
2. Click ***Apply***.
3. Go to the **Evaluate** step.

4. Click ***Evaluate Tasks***. An `approach/nom_1/` directory is created inside the study directory.
5. Go to the **Define Output Responses** step.

Step 3: Create and Define Output Responses

1. Click ***Add Output Response***.
2. In the **Add - HyperStudy** dialog, add one output response.
3. In the **Expression** column, enter `sin(dv_1)*cos(dv_2)`.

	Active	Label	Varname	Expression	Value	Comment
1	☑	Response 1	r_1	sin(dv_1)*cos(dv_2) ...	Not_Extracted	...

4. Click ***Evaluate***.

Step 4: Run a Hammersley DOE Study

1. In the **Explorer**, right-click and select ***Add*** from the context menu.
2. In the **Add - HyperStudy** dialog, select ***DOE*** and click ***OK***.
3. Go to the **Specifications** step.
4. In the work area, set the **Mode** to ***Hammersley***.
5. In the **Settings** tab, **Number of runs** field, enter `50`.

   Note: The large number of runs relative to the number of input variables is chosen to capture the highly non-linear nature of the output response function. This model is simple to evaluate, therefore the computational cost of the evaluation is not an important consideration in this example.
6. Click ***Apply***.
7. Go to the **Evaluate** step.
8. Click ***Evaluate Tasks***.

Step 5: Run a Radial Basis Function Fit

1. In the **Explorer**, right-click and select ***Add*** from the context menu.
2. In the **Add - HyperStudy** dialog, select ***Fit*** and click ***OK***.
3. Go to the **Select matrices** step.
4. Click ***Add Matrix***.

5. In the **Add - HyperStudy** dialog, add one matrix.
6. Define the matrix.
   a. Set **Type** to ***Input***.
   b. Set **Matrix Source** to ***Doe1 (doe_1)***.

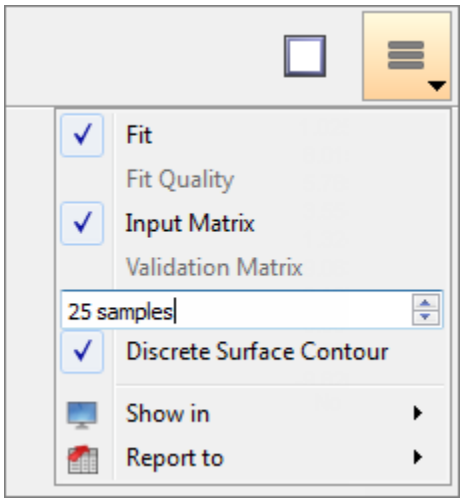
	Active	Label	Varname	Type	Matrix Source	Matrix Origin	Status
1	☑	FitMatrix 1	fitmatrix_1	Input	Doe 1 (doe_1)	DoeDoe 1	Import Pending

7. Click ***Import Matrix***.
8. Go to the **Specifications** step.
9. In the work area, set the **Mode** to ***Radial Basis Function***.
10. Click ***Apply***.
11. Go to the **Evaluate** step.
12. Click ***Evaluate Tasks*** to evaluate the designs.
13. Go to the **Post-Processing** step.
14. Click the ***Trade-Off*** tab to visualize the response surface as a function of two input variables.
    a. In the **Inputs** pane, select the ***X Axis*** checkbox for **DV 1** and the ***Y Axis*** checkbox for **DV 2**.

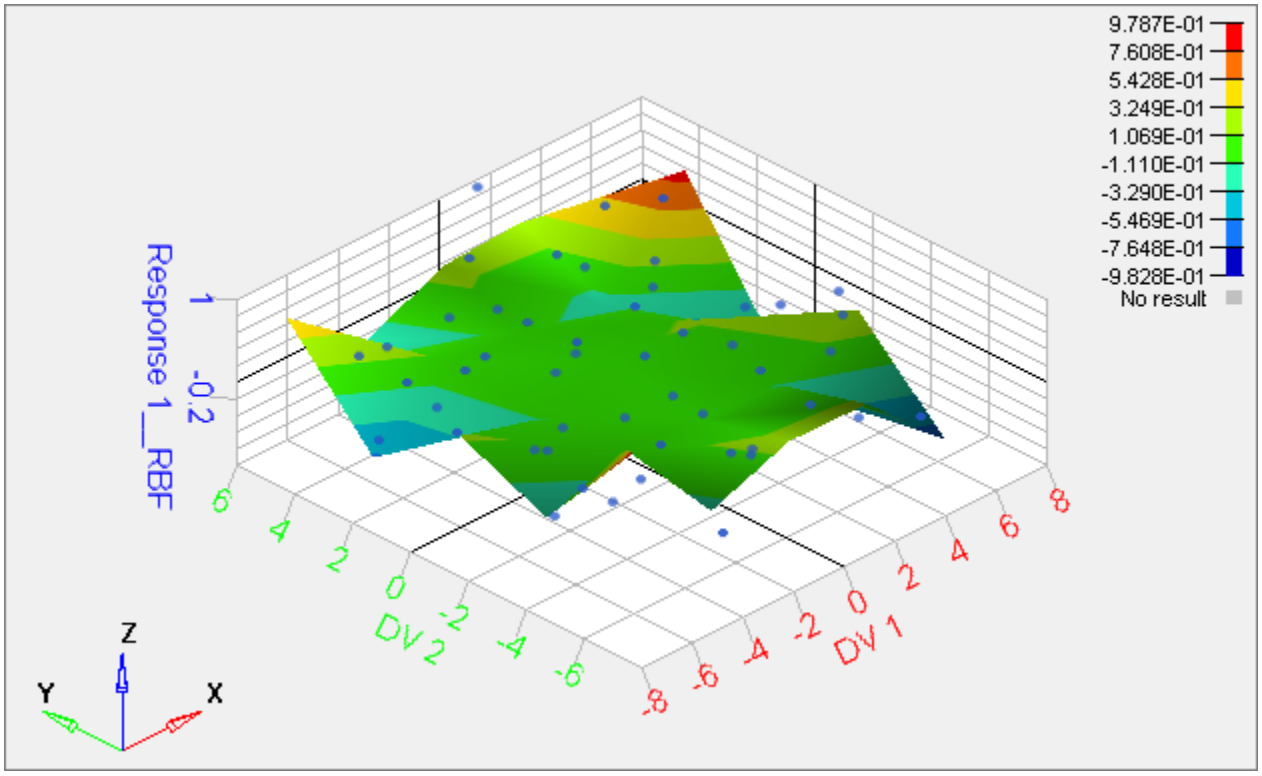
Inputs

	Label	Value	Value	X Axis	Y Axis
1	DV 1		6.1544000	☑	☐
2	DV 2		-6.0837500	☐	☑

    b. In the **Outputs** pane, click and adjust the plotting resolution of the display to include 25 samples.



c. Visually examine the plotted response surface to inspect the quality of the approximation to the original sinusoidal function.



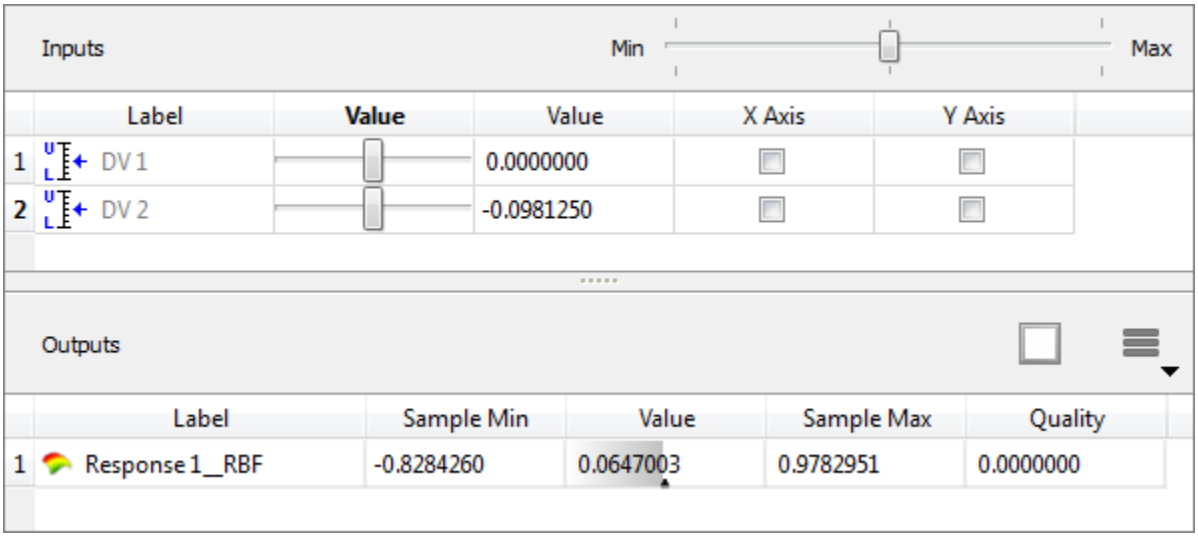
15. In the **Trade-Off** tab, interactively predict output response values as a function of the input variables.

    a. In the **Inputs** pane, clear the **X Axis** and **Y Axis** checkboxes.

    b. In the **Inputs** pane, modify the values of each input variable by moving the slider in the first **Value** column, or by entering values in the second **Value** column. The predicted output response value in the **Value** column of the **Outputs** table is adjusted.

    Note: The shaded spark lines in the **Value** cell indicate the relative value of the predicted

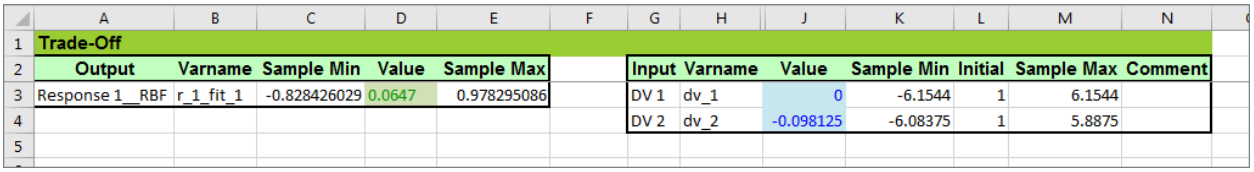
output response with respect to the minimum and maximum of the sample. The marker at the bottom of the cell references the value of the predicted output response at the nominal values of the input variables.



Step 6: Export an Excel Report for the Fit

1. Go to the **Report** step.
2. Select the ***HyperStudy Spreadsheet*** checkbox.
3. Click ***Create Report***. An Excel report is generated and opened in Excel.
4. In the Excel report, click the ***Trade-Off*** tab.

   Note: The structure and functionality of this tab is a reflection of the corresponding **Trade-Off** ta values on the right-hand side, and the predicted output response values are updated and d



	A	B	C	D	E	F	G	H	J	K	L	M	N
1	Trade-Off												
2	Output	Varname	Sample Min	Value	Sample Max		Input	Varname	Value	Sample Min	Initial	Sample Max	Comment
3	Response 1__RBF	r_1_fit_1	-0.828426029	0.0647	0.978295086		DV 1	dv_1	0	-6.1544	1	6.1544	
4							DV 2	dv_2	-0.098125	-6.08375	1	5.8875	
5													

5. To verify that the same values occur in the output response prediction columns for the same set of HyperStudy and the Excel report.

See Also:;

HyperStudy Tutorials