Exercise objective:

We can predict missing logs using the log-log prediction tool, which is part of the machine learning plugin. In this exercise, we want to predict the Density log.

Well data Preparation

Well(s) used as input data need to be available in the survey. If they are not: **import** wells (track, logs, markers, optionally time-depth curve or checkshot).

Wo	orkflow:	📆 - 🗢 🏊 🏽 🕂 🚔 🥰 📑 🍣 Yh 🎵						
				Machine Learning Control	Center	- 🗆 X		
1.	Open the Machine Learning Control Center with the	🦕 i	con.		-Surveys/E3 Demo 2023 Train	ning		
2.	Click on Wells.			Wells	Workflows Log-Log prediction Lithology classification			
3.	Select Log-Log prediction, and Hit Go.			Seismic				
				Seismic + Wells				
				Pre-trained Models				
				Neural Networks	Go			
						🔉 Close 🕜 🖻		
				Using Custom Python 3.9.13	3 environment odmlpython-cuda	5113		

Worl	kflow	con	ťd:									Log-Log Prediction ② Extract 🛛 🔐 🕄	rain 🛛 🛩 App	ly			_	_ ×
In th	e Ext	ract	Data	tab								Wells			Target(s)			
4.	 Press Select - <select data="" well=""></select> 																	
5. I	5. New window will pop up <select data="" extraction<="" for="" logs="" th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th></select>																	
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Well name	UWI	Well Type	X (m)	Y (m)	TDMD (m)	TDSS (m)	KB (m)	GL (m)	DT	GR	IMP	LITHO	OTH	PHI	RHOB	VEL	Seasurface	MFS11
1 F02-1		O Unknown	606554.00	6080126.00	1695.00	1665.00	30.00										3 0	553.6
2 F03-2		O Unknown	619101.00	6089491.00	2140.00	2110.00	30.00										= 30	486.14
3 F03-4		O Unknown	623255.98	6082586.87	2048.00	2013.71	34.10										3 0	479.74
4 F06-1		🗘 Unknown	607903.00	6077213.00	1701.00	1672.36	28.64										= 30	580

6. In the select logs for data extraction window, select the Input logs that will be used (GR and Sonic). The color of the selected logs cells will turn to blue

7. Select the target logs (RHOB), the color of the targeted log cells will turn to orange

8. Press on Ok

F02-1	well name	UWI	Well Type	X (m)	Y (m)	TDMD (m)	TDSS (m)	KB (m)	GL (m)	DT	GR	IMP	LITHO	OTH	PHI	RHOB	VEL	Seasurface	MFS1
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	02-1		O Unknown	606554.00	6080126.00	1695.00	1665.00	30.00										30	553.6
03-4 ♦ Unknown 63255.98 608256.87 204.00 201.71 34.10 Image: Construction of the construt	03-2		O Unknown	619101.00	6089491.00	2140.00	2110.00	30.00										3 0	486.14
00-1 0 0793.00 67721.3.00 170.00 170.3.00 17	03-4		O Unknown	623255.98	6082586.87	2048.00	2013.71	34.10										= 30	479.74
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3-2 \$ Unknown 61910.00 6089491.00 210.00 30.00 Image: Comparison of the	2-1		O Unknown	606554.00	6080126.00	1695.00	1665.00	30.00										3 0	553.6
3-4 \$\$\dot\$ Unknown 63255.98 608258.68 2048.00 2013.71 34.10 Image: Comparison of the compar	3-2		O Unknown	619101.00	6089491.00	2140.00	2110.00	30.00										3 0	486.14
6-1 🔷 Unknown 607903.00 6077213.00 1701.00 1672.36 28.64	3-4		O Unknown	623255.98	6082586.87	2048.00	2013.71	34.10										3 0	479.74
	6-1		O Unknown	607903.00	6077213.00	1701.00	1672.36	28.64										3 0	580
	06-1		🔷 Unknown	607903.00	6077213.00	1701.00	1672.36	28.64										30	

9. In the Log-Log prediction window,All wells, input logs, and Targets should belisted each at the appropriate column

- 10. Set the level of extraction
- 11. Give a name to the extracted example
- **12**. **Press** on Extract

🖀 Log-Log Prediction		- 🗆 ×
🖑 Extract 记 Train 🖌 Appl	У	
	Select Well Data	
Wells	Inputs	Target(s)
F02-1 F03-2	GR DT	RHOB
F03-4		
Log upscaling to (m) 0.	1524	
Extract between <	Start of data> v <end data="" of=""></end>	~
Extra Z above/below (m)		
Stepout from center log sample 10	T	
Edge/Gap Policy 🖲	Exclude incomplete 🔿 Add data	
Output Deep Learning Example Data	Well log Extraction	✓ 🤤 Select 🖌 🛩 Extract
		Proceed 😢 Close 👔

13. The *Train* tab get activated. Train the extracted examples data using suitable learning algorithm. **Select** Scikit-learn / XGBoost.

Different machine learning platforms and parameters can be tested. Keep the defaults parameters.

14. Specify a new *Output mode*l name (e.g. Model_to Predict RHOB_Scikit_XGBoost).

15. Press Run.

16. You should see "Training Successful "



Vorkflow cont'd:	📾 Log-Log Prediction	- 0
	😵 Extract 🛛 禄 Train 🗸 Apply	
	Survey F3_Demo_2023_Training V Select	
7. Select the "Apply" tab	Model 💮 AI_Prediction-model	Filter
8. Highlight the model name		Ē
The Survey and Training model can be modified in here.		
9 Pross Proceed		
	Name: Model to Predict RHOB_Scikit_XGBoost Type: Log-Log Prediction Number of inputs: 2 Output: RHOB Created by: hesham Created at: Wed 24 May 2023, 12:24:23 Last Modified: Wed 24 May 2023, 12:24:35 Object ID: 100060.57	

dol' wind 20. The "Apply" training mo up.

In this window we will Sele (GR and Sonic) for the blin which we will apply the trai predict the target log (RHO

21. Apply the trained mo well.

22. Type a new name for

23. Press Run to continu

1 F02-1 2 F03-2 3 F03-4 4 F06-1

		Select Well Data			
	App	y to	Wells		
ow we will Select the input logs nic) for the blind well F06-1, on Il apply the trained model and arget log (RHOB). Then Press OK.		F06-1			
	Output Z step	(m) 0.1524			
he trained model to a blind	Create betw	een <start data="" of=""></start>	End of data	> ~	
	Extra Z above/below	(m) 0 0			
	Log name for 'RH	IOB' B_Scikit_XGBoost	✓ g/cc (Gram/c	m3)	~
new name for the predicted log				🕑 Run 🛛 🔇	Close
Run to continue.				😪 Run 🛛 🔇	Close
Run to continue.				😪 Run 🛛 🔇	Close ?
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Run to continue. Select Logs for Data Extraction Well name UWI Domain MD Select Zone <start data="" of=""> < <end data<br="" of="">Well name F02-1 F03-2 F03-2 F03-4 F06-1</end></start>	ata> ✓ E LIT	Show None HO OTH	V Sele	Run	Close ?

We can QC prediction results by displaying the predicted log adjacent to the recorded input log:

- 24. Click on the Well Manager icon
- **25.** Select the well "F06-1" and the logs "Density" and "Density-Predicted".
- 26. Click on view logs icon **E** .





If the results are satisfactory, go back to the "Apply training" window, and apply the trained model to the rest of the wells where you want to predict density log.

27. **Select** all wells.

28. **Type** a new name and **Press** Run to continue.

🛞 Apply 'Model to Predict	RHOB_Scikit_XGBoost'		_		×
	Select Well Data				
Apply to		Wells			
	F02-1 F03-2				
	F03-4				
Output Z step (m)	0.1524)			
Create between	<start data="" of=""> ~</start>	<end data="" of=""> \sim</end>			
Extra Z above/below (m)	0 0)			
Log name for 'RHOB')B_Scikit_XGBoost ~	g/cc (Gram/cm3)			~
		Run	8	Close	?