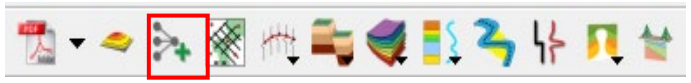
Exercise objective:

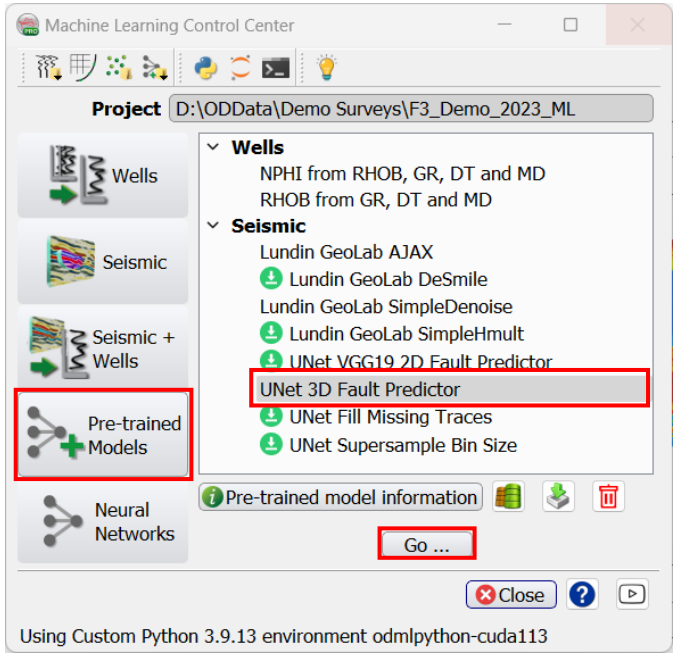
To predict fault's location using the ''*Seismic – Pre-trained models - Unet 3D Fault Predictor"* tool which is part of the machine learning plugin. In this exercise, we want to predict faults location.

Seismic data Preparation
Seismic need to be available in the survey. If not, **import** seismic, and interpret some "key fault'' locations or use an existing trained model.



Workflow:

1. **Open** the Machine Learning Control Center with the  icon.
2. **Click** on "Pre-trained Models".
3. **Select** the ''Unet 3D Fault Predictor'' and **Press** Go.



Workflow cont'd:

4. The *"Apply Unet 3D Fault Predictor"* window pops up.

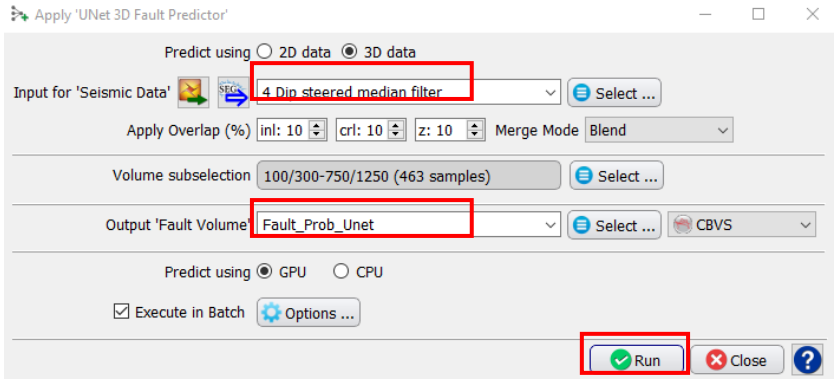
5. **Select** *Input Cube (e.g. 4 Dip steered median filter).*

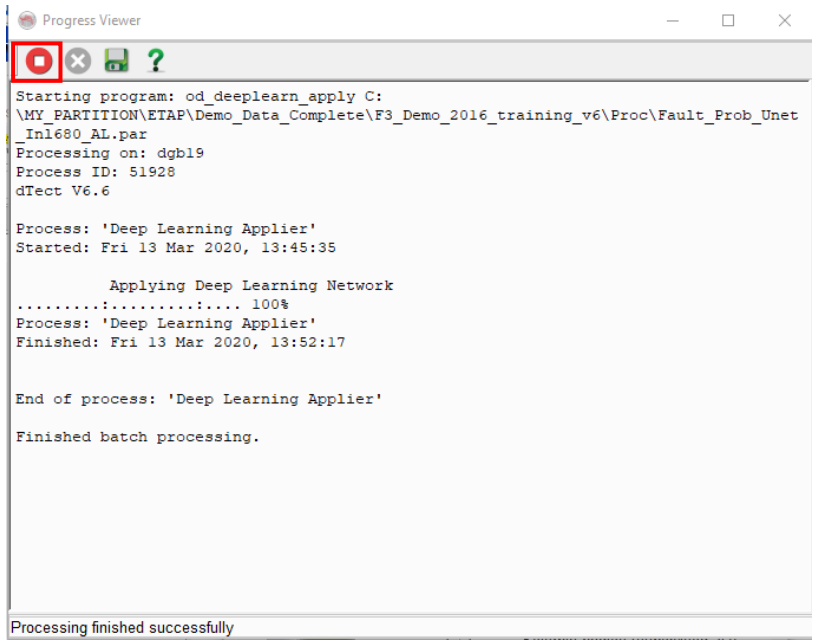
6. ***Specify*** *a new name for the "Output Fault Volume to Cube" (e.g. 'Fault_Prob_Unet).*

If not enough GPU memory, use CPU or crop the Volume in subselection.

7. **Press** Run.

8. When the processing finish, **Press** button  to close the Progress Viewer window.





Workflow cont'd:

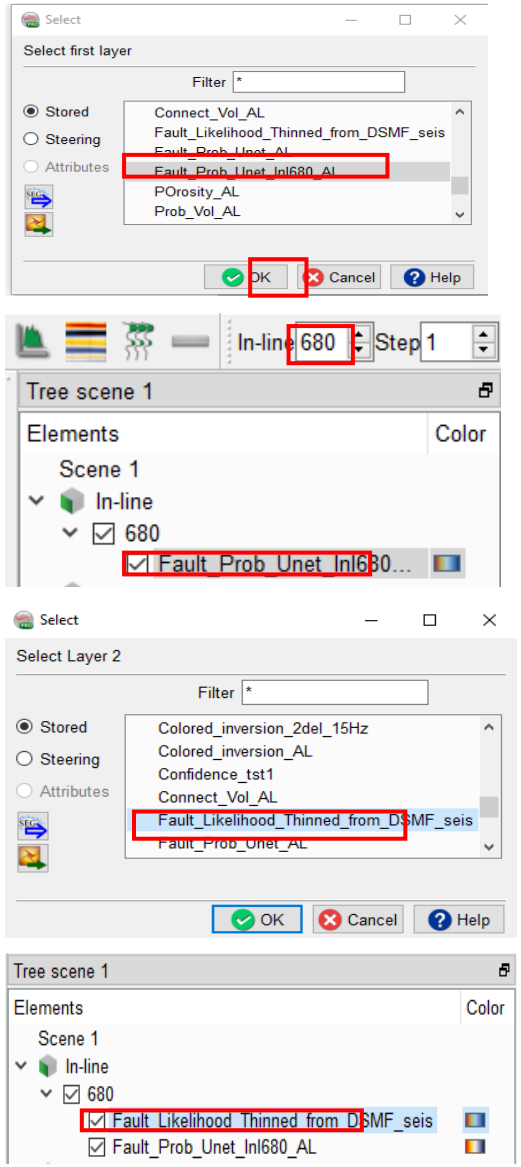
QC the output fault probability results on the In-line 680.

9. ***Right Mouse click*** *on In-line > Add and select Data > Store.* ***Select*** *the created Fault Probability cube (e.g. Fault_Prob_Unet_In680), and then* **Press** OK.

10. ***Type*** *in the Inline field: 680, and then* **Press** Enter.

The same way, add to the display, the existing Thinned likelihood probability display.

11. **Right-Click** *on Inline 680 > Add > Attribute >Stored.* ***Select*** *the existing thinned fault likelihood (e.g. Fault_Likelihood_Thinned_from_DSMF_seis), and* **Press** **OK**.



Workflow cont'd:

12. **Display** the predicted fault probability, and **Compare** with the thinned fault likelihood.

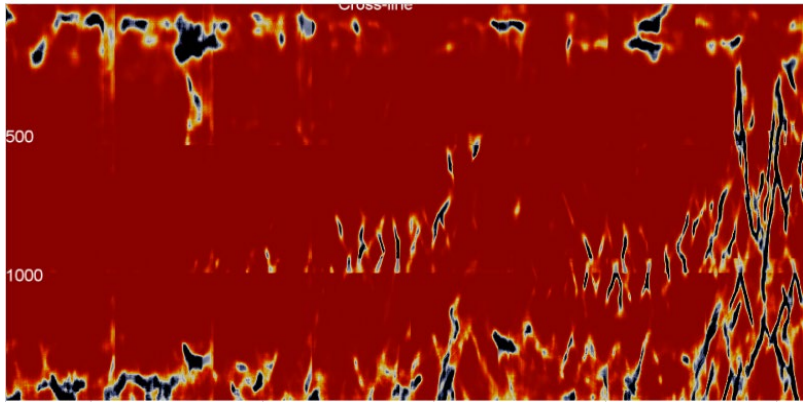
Note:

The thinned fault likelihood, contains more small faults and noise. Whereas the predicted fault probability, contains more faults information and less noise.

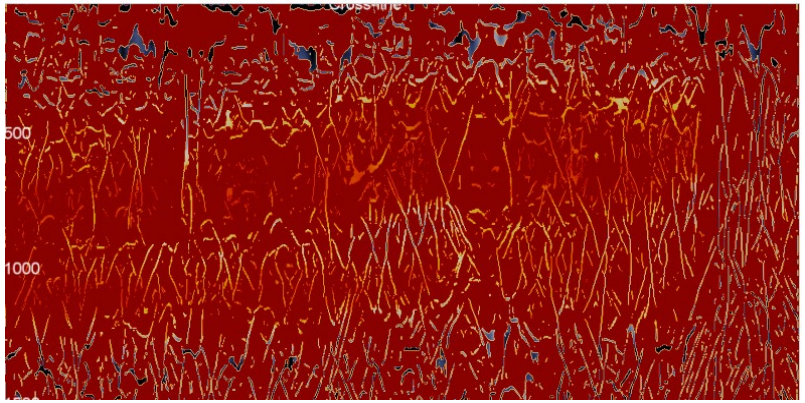
The predicted fault probability is un-thinned. To be able to make a fair comparison with the thinned fault likelihood, a thinning needs to be applied to the predicted fault probability.

In the next steps we will apply the thinning.

Predicted fault probability (un-thinned)



Thinned fault likelihood



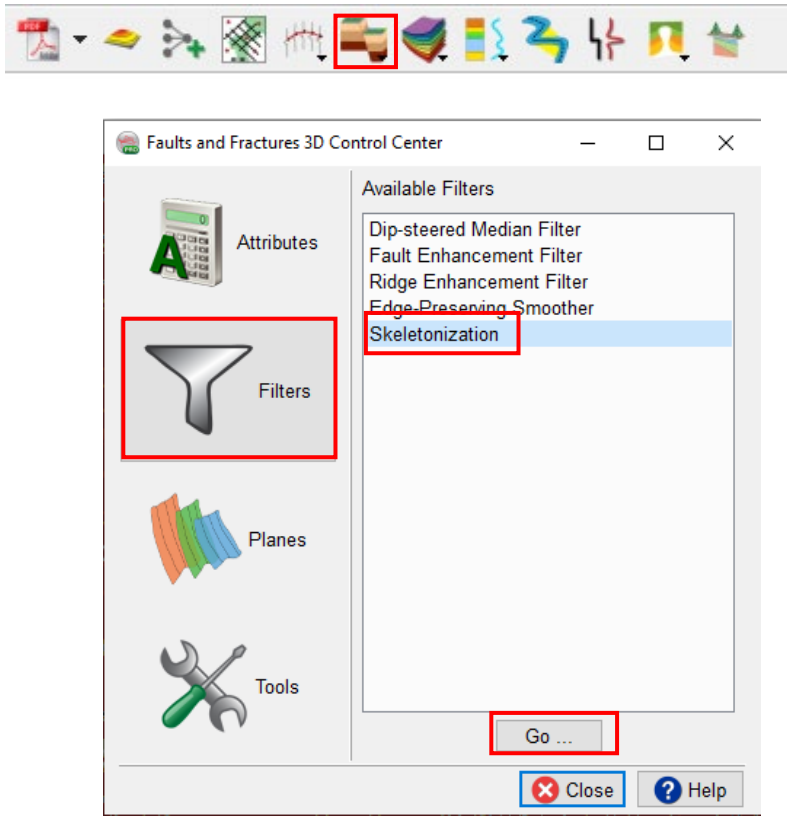
Workflow cont'd:

The next step, is to apply a thinning to the predicted fault probability.

13. **Select**: faults and fractures > 3D icon 

14. The Faults and Fractures 3D Control Center window pops up. **Select** Filters > Skeletonization.

15. **Press** Go.



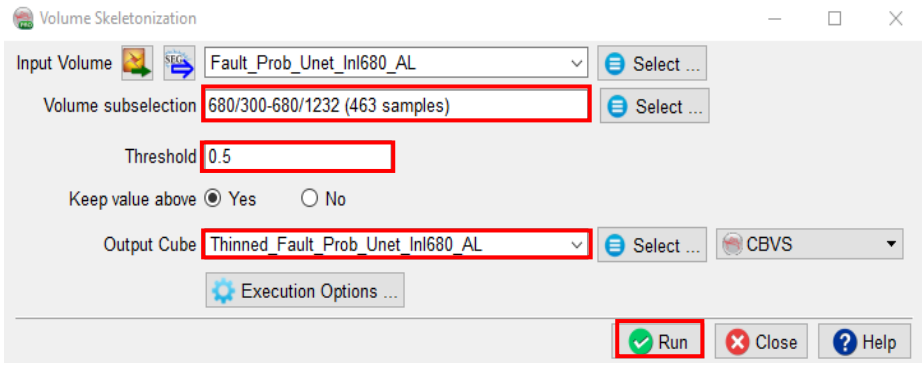
Workflow cont'd:

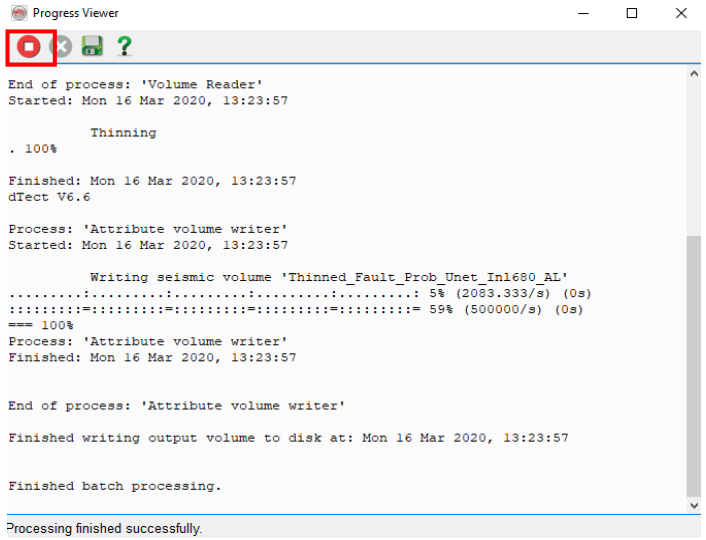
16. The Volume Skeletonization window pops up.

17. **Set** the parameters as specified in the window:
    a. Volume subselection: Inline range = 680
    b. Threshold: 0.5
    c. Type a new name for the ''Output Cube'' e.g. Thinned_ft_prob_Unet_I680_threshold.5

18. **Press Run**.

19. The Progress Viewer window pops up. Once the computation is done, **Press** Close icon.





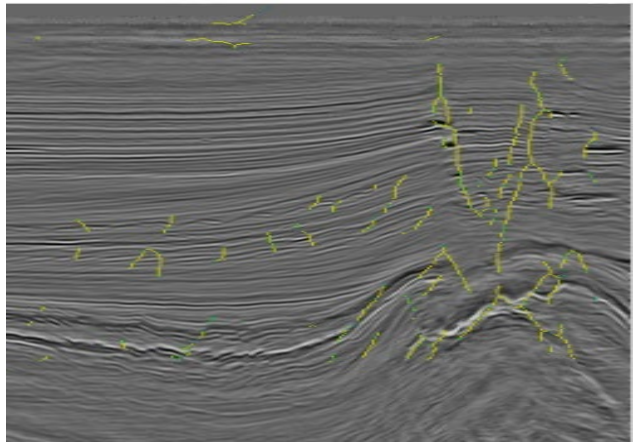
Workflow cont'd:

20. **Display**: the new thinned predicted fault probability. **Right mouse click** on the Inline 680 > Add > Attributes. **Select** the new thinned predicted fault probability (e.g Thinned_ft_prob_Unet_l680_threshold.5).

21. **Compare** with the existing thinned fault likelihood.

Note that the thinned fault likelihood contains small-scale faults and noise, whereas the thinned predicted fault probability outputs more continuous faults information and less noise.

Thinned predicted fault probability



Thinned fault likelihood