New AASPI Algorithms: November 2020

Application Name	Application Description	Location	Software Documentation	AASPI References
horizon_tracking	Algorithm that allows semiautomatic picking of horizons internal to formations whose boundaries have been manually picked	Stand alone algorithm that requires Matlab run--time libraries	http://mcee.ou.edu/aaspi/documentation/Interactive_tools-horizon_tracking.pdf	http://mcee.ou.edu/aaspi/publications/2020/Lou_et_al_2020-Seismic_horizon_picking_by_integrating_reflector_dip_and_instantaneous_phase_attributes.pdf
agc	A simple program that applies automatic gain control	under aaspi_util/agc		
nonparallelism	Algorithm that computes the standard deviation of vector dip, amplitude gradients, or both within an analysis window - useful for facies classification	under aaspi_util/Geometric Attributes	http://mcee.ou.edu/aaspi/documentation/Geometric_Attributes-nonparallelism.pdf	http://mcee.ou.edu/aaspi/publications/2019/Qi_and_Marfurt_2019-Nonparallelism_attributes_and_data_adaptive_Kuwahara_image_processing.pdf
som_waveform_classification	Replaces previous program som2d. New capabilities that allow mapping of "stacking patterns" measured by Poisson's ratio, Impedance, and other inversion products	under aaspi_util/Formation Attribute Analysis	http://mcee.ou.edu/aaspi/documentation/Formation_Attributes-som_waveform_classification.pdf	
similarity_multiple_input	A generalization of multispectral, multiazimuth, and multioffset coherence that allows greater flexibility on the input data volumes used	under aaspi_util/Geometric Attributes	http://mcee.ou.edu/aaspi/documentation/Geometric_Attributes-similarity_multiple_input.pdf	http://mcee.ou.edu/aaspi/publications/2017/Qi_et_al_2017_Multiazimuth_coherence_Geophysics.pdf

transformation analysis	Analyze data before and after transformation (i.e. normalization), supporting different normalization schemes, including z-score, robust scaling, and logarithmic scaling, as well as user defined shifting, stretching, and logarithmic scaling.	under aaspi_util > Machine learning toolbox > analyze input	http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-analyze_input-transformation_analysis.pdf	http://mcee.ou.edu/aaspi/AASPI_software_demos.html
pca	Now incorporated to the new machine learning workflow to show histograms and crossplots of projections.	under aaspi_util > Machine learning toolbox > analyze input, create model, and perform classification	http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-analyze_input-pca.pdf, http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-create_model-pca.pdf, http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-perform_classification-pca_facies.pdf	http://mcee.ou.edu/aaspi/AASPI_software_demos.html
ica	Now incorporated to the new machine learning workflow to show histograms and crossplots of projections. ICA analyze_input and create_model computation are now parallelized.	under aaspi_util > Machine learning toolbox > analyze input, create model, and perform classification	http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-analyze_input-ica.pdf, http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-create_model-ica.pdf,http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-perform_classification-ica.pdf	http://mcee.ou.edu/aaspi/AASPI_software_demos.html

kmeans	Incorporated to the new machine learning workflow. Kmeans code is reworked from scratch, now using kmeans++ algorithm and no longer output cluster ID, but instead project the cluster centers onto N number of output principal components to show the proximity of the clusters. Fully parallelized	under aaspi_util > Machine learning toolbox > analyze input, create model, and perform classification	http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-analyze_input-kmeans.pdf, http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-create_model-kmeans.pdf, http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-perform_classification-kmeans.pdf	
data analysis	Separate module of machine learning workflow analyze_input, capable of showing histograms, crossplots, and 3D distributions of normalized input data.	under aaspi_util > Machine learning toolbox > analyze input		
CNN_fault_prediction	Train Deep learning 3D Unet model and predict fault based on input fault surfaces in EarthVision format and an amplitude volume	under aaspi_util > Machine learning toolbox > CNN Fault, Surface Tools	http://mcee.ou.edu/aaspi/documentation/Machine_Learning_Toolbox-cnn_fault_prediction.pdf	http://mcee.ou.edu/aaspi/recorded_presentations/2020/Qi_et_al_2020-Comparing_convolutional_neural_network_and_image_processing_seismic_fault_detection_methods.mp4