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How to Use Machine-learning and Computer Vision (LithoSearch) to Find Similar Lithology in Core-photo Library and Mapping The Results into 3D Space

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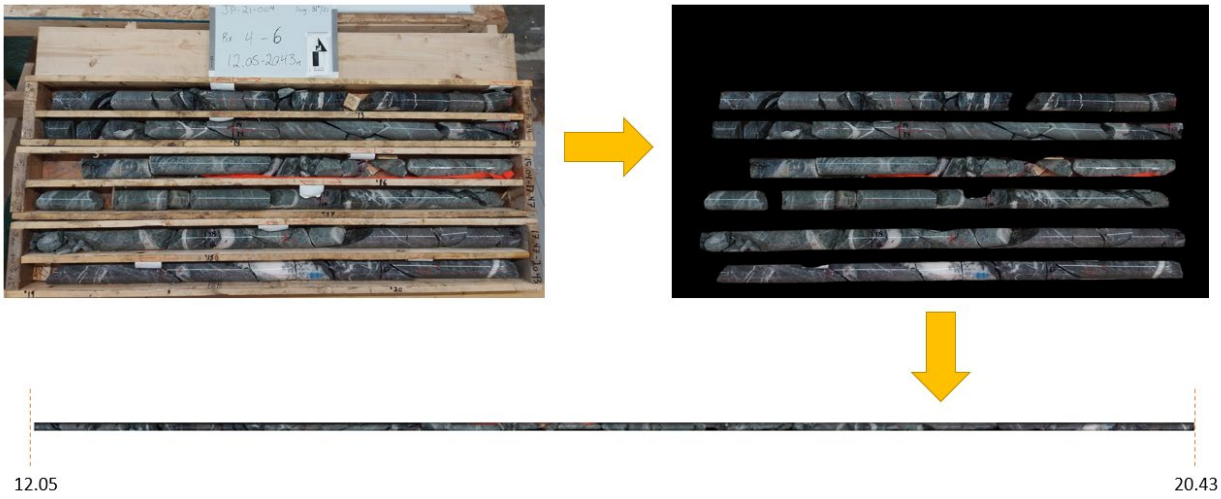
Summary

In mineral exploration, core photos ranging from several hundred to thousands of metres in length are brought up to surface and used by geologists for profiling the mineral composition at different depths. With LithoSearch, we leverage the images of these drill holes to find depths that have similar patterns, structures, and textures. The application scans through thousands of metres of drill holes and return areas of the drill holes that have some similarity giving the user the ability to filter the results through visual inspection and retain the good matches.

Workflow

The application is structured into multiple stages

1. Data Preparation
    a. Stitching the cores from boxes together to represent its structure under the earth



    b. Splitting the stitched images into chunks of equal size (from here on, referred to as segments)

2. Feature Extraction: Using different deep learning models, extract features from the segments and store them for later use

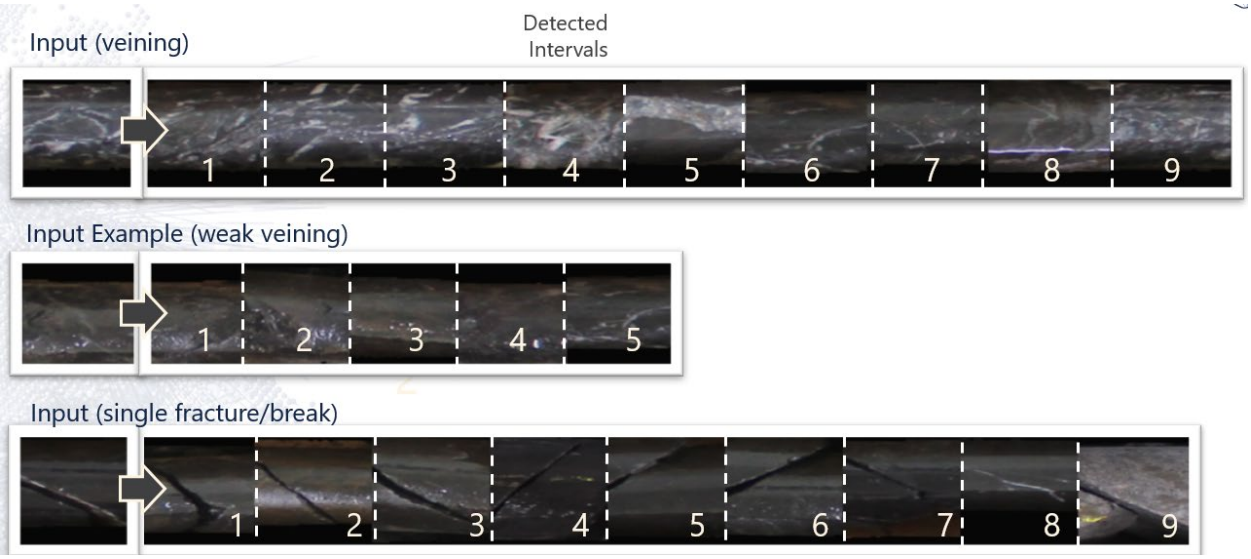
3. Indexing of features for faster retrieval: The features generated from the previous step are indexed and stored as static files to be used in the search stage

4. Search: Features from the target image are extracted and using the indexes, nearest neighbour segments are fetched.

5. Cluster: The results are further clustered for easy visual inspection

Results

Here we have 3 examples of different inputs that LithoSearch tested on:



References

[1] Azad, S, G., and Bourgeois, V, D., 2019, Using Deep Learning Approaches to Determine and Map the Spatial Extent of Core Trays, Geoconvention 2019