INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Extracting dispersion curves by Deep Learning to study underground structure

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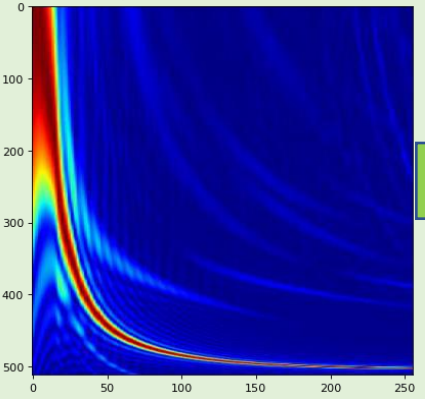
During my internship at l'OMP, I build up a data-base by simulating different programs in geophysics. From there, I build and train a model to extract dispersion curves from dispersion images. Based on these dispersion curves, researchers can reconstruct the underground structure by the process of dispersion curve inversion. Therefore, extracting correct dispersion curves is extremely important.

The process of extracting dispersion curves is divided into two steps:

- Finding the energy-zones: image segmentation by DCNet which is a deep neural network with convolutional layers.
- Post-processing to fit dispersion curves: Clustering by DBSCAN. Rectifying curves by Gaussian filter. In each energy zone that we found, we can fit the dispersion curve by finding for each frequency the phase velocity at which the dispersion energy attains local maximum peak

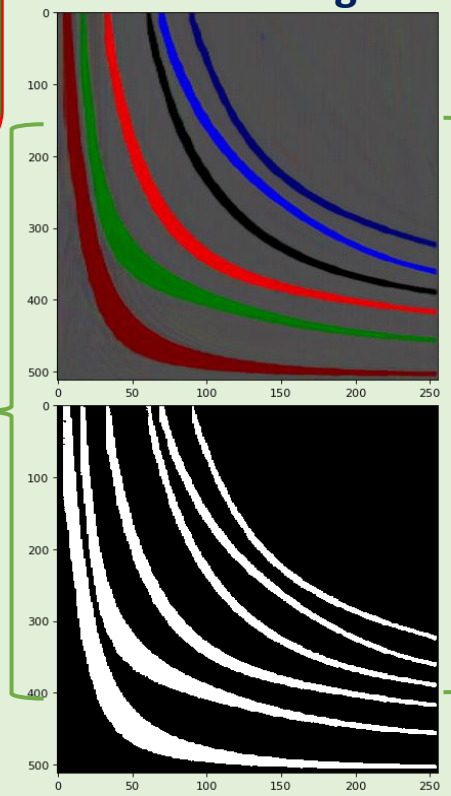
Dispersion image



Deep Neural Net

Input → DCNet → Output

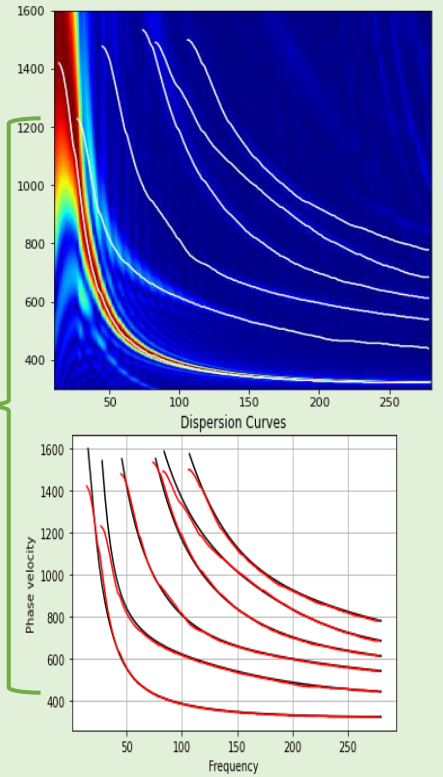
Embedding



Segmentation

Post-processing → Output

Extracted Dispersion Curves



Comparing with theoretical curves by CPS

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