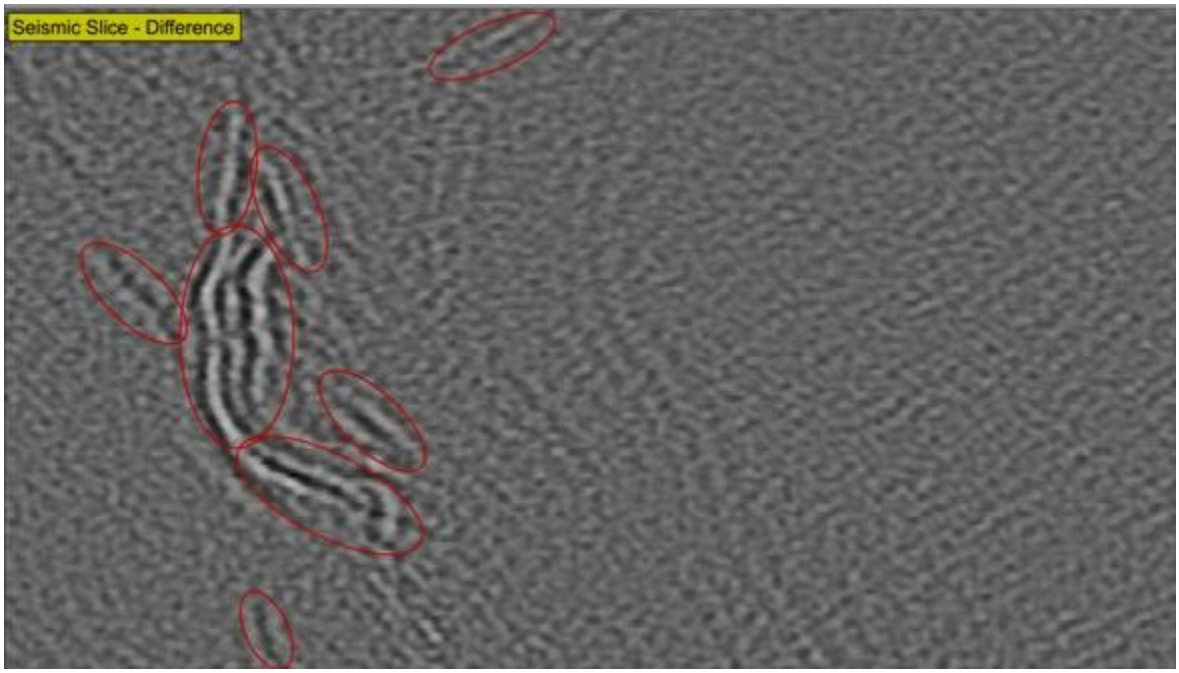
Detecting linear signal in noisy 2D images

In high-volume remote sensing applications (e.g. radar, astronomy, ultrasound, seismic) it is often very time-consuming to manually inspect and interpret all incoming data (in our seismic case, 2D images). The challenge is to look for genuine signals in predominantly noisy data, with very low signal-to-noise ratios. There has hence been many attempts at automating the signal/anomaly detection process through deterministic or statistical processes. Some deterministic methods may e.g. be based on frequency analysis or Hough transforms. Statistical methods are often based on unsupervised classification methods like K-means or DBSCAN. With the recent progress in Machine Learning and AI technologies there is some hope that such methods can be used to gain better signal detection performance than current methods. For this project the aim will be to detect the presence and location of rare linear features in noisy 2D images, where the noise has a random distribution.



I assume there will be three distinct tasks in this project (but I am open for other approaches as well):

- Build a light-weight frontend application for the creation of a corpus of labeled noisy 2D images, to be used for training
- As an alternative, generate a corpus of synthetic labeled training data
- Build (or reuse) an appropriate Deep Neural Network (DNN) architecture, and train it on the corpus of manual and/or synthetic training data
- Try to optimize the DNN architecture for detection accuracy and minimal compute cost

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