Seismic fault interpretation is a significant part of modeling of the subsurface processes of any scale. Currently, seismic interpreters utilize manual faults detection. It is entirely guided by domain experts and often looks "geologically correct”, but is biased, extremely time-consuming and not repeatable. In this work, we employed faults classification and detection by means of Convolutional Neural Networks (CNN), which have been extensively utilized in identifying faces, objects, and classifying images.

**Models**

Each dense layer had L1 norm regularization applied.

**Discussion**

1. Synthetic set accuracy (F1=0.95) is close to domain expert level.
2. A lack of real reverse and strike slip data did not allow to test real data accuracy for these classes.
3. Strike slip accuracy metric is characterized by low recall, i.e. by abundance of false negatives.
4. Neural Style Transfer can be utilized for faking reverse or strike slip seismic sections.
5. Fault detection using activation maps demonstrates good performance in identification of faults on seismic sections.

**Future Work**

1. Gather more real reverse fault and strike slip data to validate model over those classes.
2. Form an implementation on full 3D seismic sections to exploit 3D locality.

**References**


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**Introduction**

- **Dataset**
  - 4 image classes: No Fault, Normal Fault, Reverse Fault and Strike Slip Fault.
  - Synthetic simulation of 50K images (256 x 256).
  - Manual collecting 3K images from real seismic datasets (New Zealand and Norway).
  - Data augmented using Kerias ImageDataGenerator.
  - Train/Validation/Test -> 90/5/5.
  - Real data: No Fault and Normal Fault only.

**Neural Style Transfer for Faking Reverse Faulted Seismic Images**

**Class Activation Maps**

**Accuracy and Misclassification**

<table>
<thead>
<tr>
<th>Metrics</th>
<th>No Fault</th>
<th>Normal</th>
<th>Reverse</th>
<th>Strike Slip</th>
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<tr>
<td>Precision</td>
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<td>0.960</td>
<td>0.879</td>
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<tr>
<td>Recall</td>
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<td>0.900</td>
<td>0.910</td>
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<tr>
<td>F1</td>
<td>1.00</td>
<td>0.960</td>
<td>0.940</td>
<td>0.940</td>
</tr>
</tbody>
</table>

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