Deep Rock: Igneous Rock Image Classification
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Motivation
- State-of-the-art rock identification suffers from three major issues:
  1. Time-consuming
  2. Expensive
  3. Subject to human bias
- Geologists do not reliably identify rocks during field trips, and rather send samples to the laboratory
- After all, we all would love to have an app to classify rocks during outdoor activities

Methodology
- Grad-CAM is used to further filter out the dataset and interpret the deep learning model predictions
- Greyscale data augmentation dramatically lowers performance, indicating that color is important

Results
- Deep Learning is capable of automating rock classification
- Validation results show over 91% F1 score using pretrained DenseNet121
- Adding attention module can ensure that the rock is not confused with background objects

Dataset
No open-source rock image dataset exists, so we scraped the web!

<table>
<thead>
<tr>
<th>Class</th>
<th>Rock</th>
<th>Examples</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Andesite</td>
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<tr>
<td>2</td>
<td>Basalt</td>
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<tr>
<td>3</td>
<td>Diorite</td>
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<td>4</td>
<td>Gabro</td>
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<tr>
<td>5</td>
<td>Granite</td>
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<tr>
<td>6</td>
<td>Peridotite</td>
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<tr>
<td>7</td>
<td>Rhyolite</td>
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Evaluation Metrics
- Precision: 0.911
- Recall: 0.927
- F1 Score: 0.912

References