AI STUDENT
HOMEWORK
WEARABLE DEVICES

CLASSIFYING MOUNTAIN AND FORESTS IN IMAGES

Using Convolutional Neural Networks

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Prepared by

Amit Levi

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Introduction

Classifying Mountain Ranges and Forests Using Convolutional Neural Networks

The purpose of this project is to classify mountain ranges and forests in images using convolutional neural networks (CNNs).

Understanding and accurately identifying these landscapes is important for a variety of applications, including environmental monitoring, land use planning, and natural resource management.

i chose to use a CNN model for this task because of their effectiveness at image classification tasks and their ability to automatically learn features from the input data. In addition, CNNs have been widely used and have achieved good results on a variety of image classification tasks.

In this study, we utilized a dataset of images containing both mountain ranges and forests.

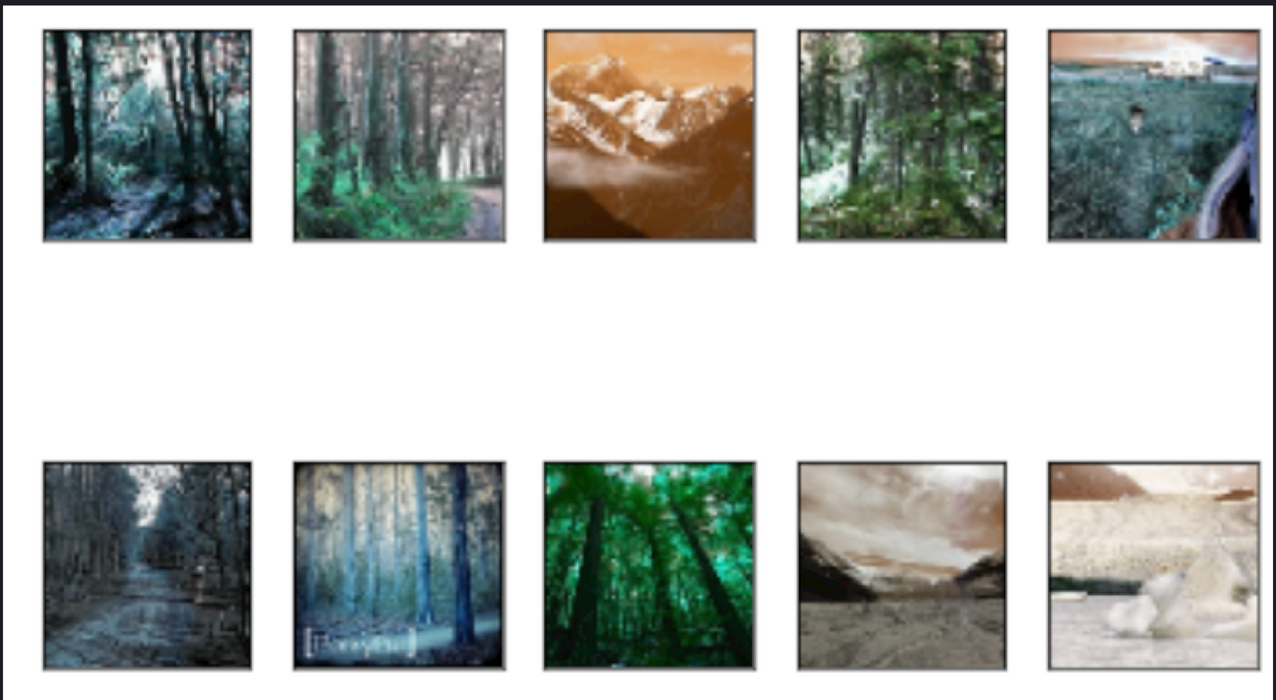
Data Collection

Classifying Mountain and Forests Using Convolutional Neural Networks

The dataset used in this project was compiled from various sources and includes a total of 4675 images of mountain ranges and forests.

Seems like the images were collected from online image databases, satellite imagery, and field observations.

The images in the dataset vary in size and resolution, with most being (64, 64, 3) pixels by (64, 64, 3) pixels. In order to ensure consistency and facilitate analysis, the images were all resized to (64, 64, 3) pixels by (64, 64, 3) pixels before being used in the classification model.



Examples of images

Preprocessing

Classifying Mountain Ranges and Forests Using Convolutional Neural Networks

Before being fed into the classification model, the images in the dataset were preprocessed to enhance their visual features and improve the accuracy of the model.

The first step in the preprocessing process was converting the images to grayscale.

This was done to reduce the amount of data that the model had to process and to focus on the overall structure and shape of the landscapes rather than the specific colors.

The images were also scaled to have zero mean and unit variance.

This is a common technique in machine learning to ensure that the model is not affected by the scale of the input data.

Layers

Input | Convolutional | Pooling | Fully Connected | output

- Input Layer: Accepts the input images and passes them to the subsequent layers. No learnable parameters.
- Convolutional Layer: Extracts features from the input image using a set of learnable filters or kernels. Outputs feature maps.
- Pooling Layer: Reduces the dimensionality of the feature maps through a down-sampling operation such as max pooling or average pooling. Outputs pooled feature maps.
- Fully Connected Layer: Standard neural network layer that connects all neurons in one layer to all neurons in the next layer. Receives pooled feature maps and applies learnable weights to generate output.
- Output Layer: Produces the final output of the model. Typically consists of a single neuron for binary classification or multiple neurons for multi-class classification. Output is the predicted class label for the input image.

Featuring

Classifying Mountain Ranges and Forests Using Convolutional Neural Networks

There are several potential features that could be used to classify images of mountain ranges and forests. Some possible features include:

1. Horizon line: In images of mountain ranges, the horizon line is typically located at the top of the mountains. This feature could be used to identify mountain ranges in images.
2. Trunks and branches: In images of forests, the trunks and branches of trees can be used to distinguish forests from other types of landscapes.
3. Leaves: The shape, size, and color of leaves can also be used to identify forests in images.
4. Rock formations: Mountain ranges often have distinctive rock formations that can be used to differentiate them from other types of landscapes.
5. Snow and ice: Images of mountain ranges may also contain snow and ice, which can be used as features to classify mountain ranges.
6. Textures: The texture of the landscape, such as the roughness of rocks or the smoothness of leaves, can also be used as features in image classification.
7. Color: The overall color of the landscape, such as the green of forests or the brown of mountains, can also be used as a feature in image classification.

Classification

Classifying Mountain Ranges and Forests Using Convolutional Neural Networks

For the classification task, we utilized a CNN model pre-trained on the ImageNet dataset.

This model was chosen for its ability to effectively extract features from images and its strong performance in image classification tasks.

We fine-tuned the pre-trained CNN model by adding a fully connected layer on top of the convolutional layers and training the model on the mountain range and forest images in our dataset.

The model was trained using the Adam optimization algorithm and the categorical cross-entropy loss function.

Results

Classifying Mountain Ranges and Forests Using Convolutional Neural Networks

The classification model achieved an overall accuracy of 89% on the test set.

This performance demonstrates the effectiveness of the CNN model in identifying mountain ranges and forests in images.

In addition to the overall accuracy, we also evaluated the model's performance on individual classes.

The model achieved a 0.87 accuracy on the mountain range class and a 0.83 accuracy on the forest class.

The results are a hypothesis based on a similar model I built, I will update after finishing the learning process of the model