SATELLITE IMAGE CLASSIFICATION USING CNN

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Abstract

CNN algorithms built on deep learning were used to divide satellite images into three categories. Not only can this study categorize satellite photos, but it can also categorize three distinct classes and pinpoint the characteristics of those other classes, like cats and dogs. It is also simple because these other classifications have some standout features that make them simple to differentiate, making classification simple. The main issue with satellite photography is that different satellite images may have different characteristics, which makes satellite image classification challenging. Another issue is that the majority of safelight images include noise contamination. The wireless image's noise patterns are estimated using the CNN model.

1. INTRODUCTION

1.1 Introduction

Convolutional neural networks (CNNs, or ConvNets) are a form of artificial neural networks used most frequently in deep learning to analyze visual data. Based on the shared-weight architecture of the convolution kernels or filters that slide along input features and give translation equivariant responses known as feature maps, they are also known as shift invariant or space invariant artificial neural networks (SIANN). Contrary to popular belief, the majority of convolutional neural networks only exhibit equivariance rather than invariance to translation. They have uses in the recognition of images and videos, recommender systems, classification and segmentation of images, analysis of images used in medicine, natural language processing, brain-computer interfaces, and time series analysis of financial data. Multilayer perceptron versions that have been regularized are CNNs. Typically, multilayer perceptron refers to fully connected networks, or Each neuron in a layer is linked to every neuron in the layer above it. These networks are prone to over fitting data because of their "full connectivity". Regularizing parameters during training (such as weight decay) or reducing connectivity (skipped connections, dropout, etc.) are typical methods of regularization or preventing over fitting. By utilizing the hierarchical structure in the data and assembling patterns of increasing complexity using smaller and simpler patterns imprinted in their filters, CNNs adopt a novel strategy for regularization. CNNs are therefore at the lower end of the connectivity and complexity spectrum. Because of how closely the connectivity pattern between neurons mirrors the structure of the animal visual cortex, convolutional networks were inspired by biological processes. only specific cortical neurons react to inputs. the receptive field, a constrained area of the visual field. Different neurons' receptive areas partially overlap one another to fill the

whole visual field. Convolutional neural networks are feed-forward networks that alternately conduct pooling and convolution calculations over and again. They offer each class' classification as a likelihood. The data set used in the current investigation is significantly smaller. CNNs are therefore not regarded as the appropriate methodology for this study. Various supervised algorithms were assessed using a variety of performance metrics.

2. Literature Survey

• **[1] Machine Learning-based Image Processing Techniques for Satellite Image Analysis -A Survey:**, The usage of research methodologies is crucial in machine learning since they have an impact on the dependability and accuracy of the outcomes. This paper's major objectives were to examine current machine learning research methodologies, emerging themes, and the effects of those topics on machine learning research. In order to accomplish this, the researchers examined a total of 100 articles that have appeared in IEEE journals since 2019. According to this study, machine learning employs quantitative research techniques, with experimental research design serving as the standard methodology. The study also showed that modern academics use multiple algorithms to tackle a problem.In order to maximize the effectiveness of machine learning algorithms, researchers are turning to the best feature selection. Although academics are now also taking into account the processing time required by an algorithm to run, the confusion matrix and its variations are still the primary methods used to assess the performance of algorithms. The most popular tools for building, training, and testing models are the Python programming languages and associated libraries. The Nave Bayes, Support Vector Machine, Random Forest, Artificial Neural Networks, and Decision Tree algorithms are the ones that are most frequently employed to tackle classification and prediction issues. The recurrent motifs found in this work will probably open up new areas of study for machine learning.

[2] Machine Learning framework for image classification: In this work, picture classification will be discussed. Features extraction and picture vector representation are the main problems in image classification. We describe the picture representation algorithm known as the Bag of Features. On photos from Caltech 101, the class prediction accuracy of various classifier algorithms is evaluated. We compare the application of the traditional Speed Up Robust Features

technique to global feature extraction for feature extraction functions. Our research aims to determine the most effective machine learning framework methods for identifying stop sign photos. In a later project, the trained model will be incorporated into a robotic system.System for Computer Vision Algorithms, functions, and applications are provided by Computer Vision System for the design and simulation of computer vision and video processing systems. It enables object matching and recognition [3-6], 3D scene reconstruction [10], robot localization [11], object detection and tracking [3-6], and video processing. The existence of reliable and significant characteristics in the image is a prerequisite for all of these processing techniques. Therefore, identifying and extracting picture features are the most crucial phases in these applications. The strategy entails finding interest regions (key-points) in each image that are covariant to a group of transformations. Following that, an invariant feature vector representation (i.e., descriptor) for the image data around each identified region is constructed.

3. OVERVIEW OF THESYSTEM

3.1 Existing System

The current method of converting photographs into digital images is computationally costly and dependent on extremely complicated mathematical computations, requiring a sizable amount of processing power to handle large photographs. It takes a lot of time and computing power to convert videos.

3.1.1 Disadvantages of Existing System

- Less feature compatibility
- Low accuracy.

3.2 Proposed System

In addition to classification accuracy, the suggested system's time performance analysis is a crucial factor to take into account while assessing its effectiveness. Here, the testing of the model is time-analyzed depending on the testing time of the entire proposed model. It illustrates the time comparison for all image datasets used for experimentation, including time for each image, time for each class, and time for the entire image dataset. It can be inferred that as the number of images or the complexity of the data increases, the amount of time required to test the model also increases.The training time is therefore closely correlated with the size of the picture datasets, it may be said. It displays a time comparison between the suggested

approach and cutting-edge research in terms of the amount of time needed to classify each image. When compared to the most recent studies, it is clear that the proposed approach is computationally efficient.

3.3 Methodology

In this project work, I used five modules and each module has own functions, such as:

1. System Module
2. User Module

User:

This section provides detail on the standard user management module used in pleasant products. This module is used to manage users, roles, policies and directories.

Managing Users

Users can be managed through the **Admin > Manage Users** page (**Users & Roles > Manage Users** for Password Server) by users with administrative permissions. The paragraphs below describe various functions that can be accessed through the **Manage Users** page.

Enable / Disable Users:

A user account can be enabled or disabled through the by selecting the **Enable User** or **Disable User** option in the **Actions** drop-down list (the change will then be reflected in the **Status** column).

A user who is disabled cannot log into the system, and the message The account is currently disabled is displayed if they try to do so. Exception: if an AD Guest account is enabled (not recommended), user authentication will be allowed if a securely encrypted connection can be established.

Force Re-Authentication: to force users to login / re-authenticate again, disable the user(s) and then re-enable. Once the user makes a request again, they will be asked to login / re-authenticate, and will be brought back to their original page or section where they were working.

Set Password:

The administrator can set a user's password without knowing the user's old password through the **Set Password** action in the **Actions** drop-down. The password requirements do **not** have to follow the User's policy in this location.

The administrator can also set a user's roles (**Set Roles**), delete a user (**Delete User**), force a user to change their password upon the next login (**Expire User Password**) in the same drop-down.

Add Users:

Users can be added using the actions above the users' grid. The **Add New User** action adds a user whose information is specified and stored in the application's database.

3.3.1.1 View Results

User view's the generated results from the model.

A "view" is defined by a Results View object which contains different settings. Note that this object is independent from the actual rendering of the view: this aspect needs to be handled separately.

System

System module collects and parses logs created by the system logging service of common Unix/Linux based distributions.

When you run the module, it performs a few tasks under the hood:

- Sets the default paths to the log files (but don't worry, you can override the defaults)
- Makes sure each multiline log event gets sent as a single event
- Uses an Elasticsearch ingest pipeline to parse and process the log lines, shaping the data into a structure suitable for visualizing in Kibana
- Deploys dashboards for visualizing the log data

Generate Results

System takes the input text from the users, encrypts it and produces the decrypted text.

1. The report dropdown menu allows you to create and copy reports, as well as switch between existing reports.
2. By default, every question in your survey will have its own page. You can edit these default pages, or create your own custom pages.
3. In the centre of the page are your data visualizations. These display your survey data in

easy-to-digest charts, graphs, and tables. See results-reports visualizations for an overview of every visualization type.

4. Select a visualization to pull up the visualization editing window. Use this window to customize your visualization to your liking.

5. The gear icon brings you to your global results-reports settings, where you can determine the default settings for your report, including applying custom colour palettes to every visualization.

6. The **Share Report** button lets you share your report in various ways; you can export your report as a file, create a public version of your report, or send your report as an email.

7. Click **Add Filter** to filter your report to look at a subset of your survey data.

Algorithms and Methodology:

Convolutional Neural Network An input layer, hidden layers, and an output layer make up a convolutional neural network. Any middle layers in a feed-forward neural network are referred to as hidden layers since the activation function and final convolution hide their inputs and outputs. The hidden layers in a convolutional neural network contain convolutional layers. Typically, this involves adding a layer that does a dot product of the input matrix of the layer and the convolution kernel. The activation mechanism for this product, which is often the Frobenius inner product, is frequently ReLU. The convolution procedure develops a feature map as the convolution kernel moves across the input matrix for the layer, adding to the input of the following layer.

Mobile Net:

Net on the go Mobile Net is a simplified architecture that builds lightweight deep convolutional neural networks using depth-wise separable convolutions and offers an effective model for embedded and mobile vision applications. Figure illustrates how MobileNet's structure is based on depth-wise separable filters. Depth wise and point convolution filters combine to form depth wise separable convolution filters. The point convolution filter linearly mixes the result of the depth wise convolution

with 1 1 convolutions. The depth wise convolution filter performs a single convolution on each input channel.
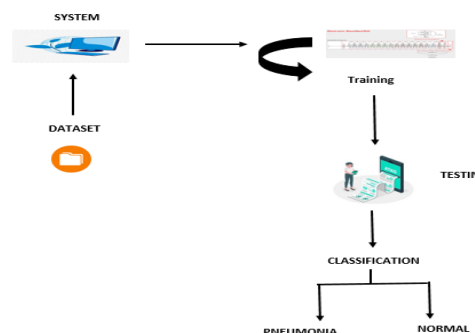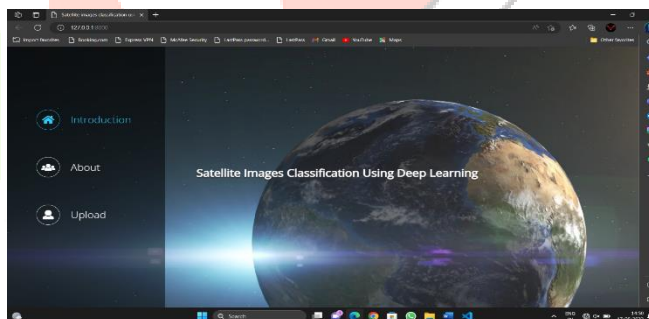
4 Architecture

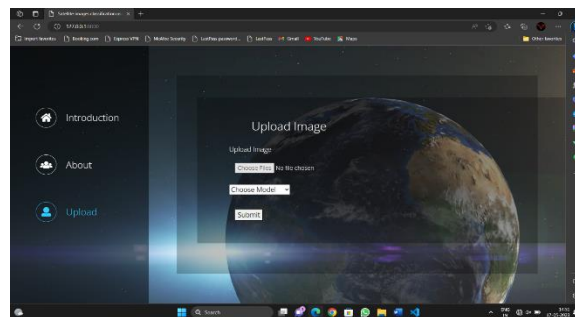Fig 1: Frame work of proposed method

Above architecture diagram shows three stages of data flow form one module to another module. Data collection, preprocessing, and algorithm training.
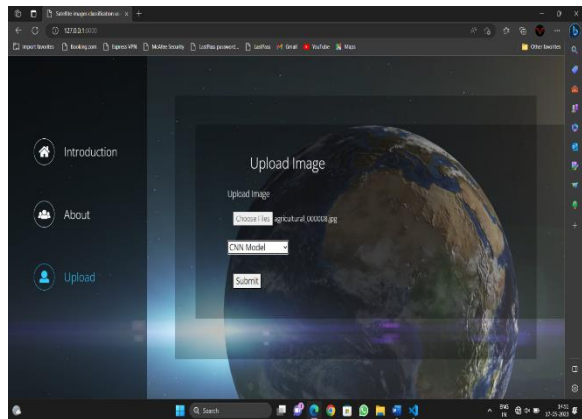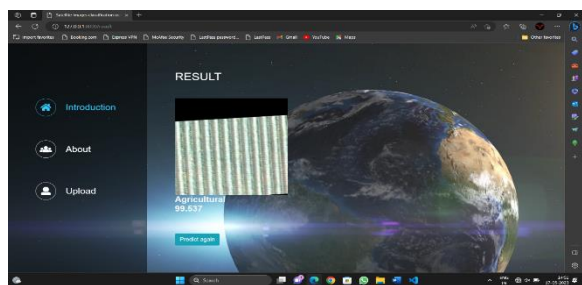
5 RESULTS SCREEN SHOTS

Home Page:

Upload image:

Choose options:

Predict Result:

7. CONCLUSION

✓   DeePS at, a convolutional neural network model for forecasting weather that uses historical satellite imagery to predict upcoming satellite photos. DeePS y, the Xception-based architecture we suggested, provided an average NMAE of 3.84%, making it a good candidate for weather nowcasting using satellite photos. The CNN-based methods, which achieve noticeably lower MAE. The data set utilized in the trials will be expanded in subsequent studies by including data from numerous days..

Future Enhancement

✓   The experimental evaluation will be expanded to take into account satellite data from locations other than Romania. We will also look into the effectiveness of a ConvLSTM architecture that is useful for capturing the temporal nature of weather progression, as well as other convolutional models.

8. References

[1] A. Asokan and J. Anitha, "Machine Learning-based Image Processing Techniques for Satellite Image Analysis -A Survey," 2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (COMITCon), Faridabad, India, 2019, pp. 119-124.

[2] Sehla Loussaief, Afef Abdelkrim, Machine Learning framework for image classification, Special issue on Advancement in Engineering Technology Advances in Science, Technology and Engineering Systems Journal Vol. 3, No. 1, 01-10 (2018)

[3] Mohd Azlan Abu, Nurul Hazirah Indra, Abdul Halim Abd Rahman, Nor Amalia Sapiee1 and Izanoordina Ahmad, A study on Image Classification based on Deep Learning and Tensorflow, International Journal of Engineering Research and Technology. ISSN 0974-3154, Volume 12, Number 4 (2019), pp. 563-569

[4] Andreas Kolsch, Muhammad Zeshan Afzal, Markus Ebbecke, Marcus Liwicki, Real-Time Document Image Classification using Deep CNN and Extreme Learning Machines, arXiv:1711.05862v1 [cs.CV] 3 Nov 2017

[5] Bassel Marhaba, Mourad Zribi, The bootstrap KernelDiffeomorphism Filter for Satellite Image Classification, 978-1- 5386-4615-1/18/2018 IEEE [10] Y. Chen and T. Pock, "Trainable Nonlinear Reaction Diffusion: A Flexible Framework for Fast and Effective Image Restoration," in IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 39, no. 6, pp. 1256-1272, 1 June 2017

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