A

MINI PROJECT REPORT

ON

Image Classification using deep learning

SUBMITTED BY :-

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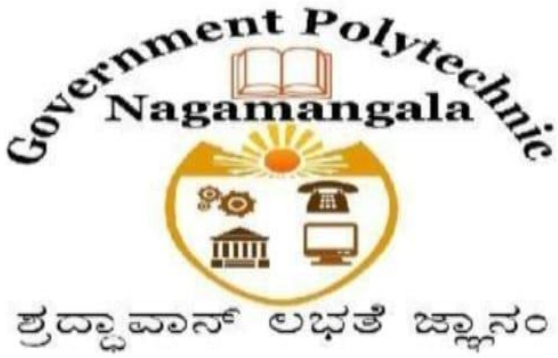

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Abstract:

The rapid growth of digital imagery has necessitated the development of robust image classification systems capable of accurately categorizing diverse visual data. This project focuses on leveraging Convolutional Neural Networks (CNNs) for image classification, a deep learning approach that has demonstrated exceptional performance in computer vision tasks. The objective is to design and implement a CNN-based model capable of efficiently categorizing images into multiple classes. The methodology involves the use of a carefully curated dataset with labelled images, encompassing various classes relevant to the specific application domain. The dataset is preprocessed to normalize pixel values and ensure uniform dimensions. A CNN architecture is constructed, comprising convolutional layers for feature extraction, max-pooling layers for spatial down-sampling, and fully connected layers for classification.

Acknowledgment:

I would like to express my sincere gratitude to all those who contributed to the successful completion of this image classification project.First and foremost, I extend my deepest appreciation to my supervisor, whose guidance and expertise were invaluable throughout the entire research process. insightful feedback and continuous support played a crucial role in shaping the direction of this project.I am thankful to the for providing the necessary resources and infrastructure essential for conducting the experiments and analyses.The access to computational resources and the dataset significantly contributed to the robustness and validity of the results.I would also like to acknowledge the efforts of whose collaboration and constructive discussions greatly enriched the project. Their diverse perspectives and technical contributions enhanced the overall quality of the research.Additionally, I appreciate the open-source community for developing and sharing tools and frameworks, particularly the contributors .These resources formed the backbone of the implementation, enabling the realization of the proposed image classification system.

Table Content:

(1) Introduction to Image Classification:

A systematic arrangement in groups and categories based on its features. Image classification came into existence for decreasing the gap between the computer vision and human vision by training the computer with the data. The image classification is achieved by differentiating the image into the prescribed category based on the content of the vision. Motivation by , in this paper, we explore the study of image classification using deep learning.The conventional methods used for image classifying is part and piece of the field of artificial intelligence (AI) formally called as machine learning.

The machine learning consists of feature extrac-tion module that extracts the important features such as edges, tex-tures etc and a classification module that classify based on the fea-tures extracted. The main limitation of machine learning is, while separating, it can only extract certain set of features on images and unable to extract differentiating features from the training set of data. This disadvantage is rectified by using the deep learning [2].Deep learning (DL) is a sub field to the machine learning, capable of learning through its own method of computing. A deep learning model is introduced to persistently break down information with a homogeneous structure like how a human would make determina-tions. To accomplish this, deep learning utilizes a layered structure of several algorithms expressed as an artificial neural system (ANN).

The architecture of an ANN is simulated with the help of the biological neural network of the human brain. This makes the deep learning most capable than the standard machine learning models [3, 4]. In deep learning, we consider the neural networks that identify the image based on its features. This is accomplished for the building of a complete feature extraction model which is capable of solving the difficulties faced due to the conventional methods. The extrac-tor of the integrated model should be able to learn extracting the differentiating features from the training set of images accurately. Many methods like GIST, histogram of gradient oriented and Local Binary Patterns, SIFT are used to classify the feature.

(2) Problem Analysis:

1. Convolutional neural networks

Several pre-trained models used in transfer learning are based on large convolutional neural networks (CNN) (Voulodimos et al. 2018).In general, CNN was shown to excel in a wide range of computer vision tasks (Bengio 2009). Its high performance and its easiness in training are two of the main factors driving the popularity of CNN over the last years.

A typical CNN has two parts:

Convolutional base, which is composed by a stack of convolutional and pooling layers. The main goal of the convolutional base is to generate features from the image. For an intuitive explanation of convolutional and pooling layers, please refer to Chollet (2017). Classifier, which is usually composed by fully connected layers. The main goal of the classifier is to classify the image based on the detected features.

Figure 1 shows the architecture of a model based on CNN. Note that this is simplified version, which fits the purposes of this text. In fact, the architecture of this type of model is more complex than what we suggest here.

Architecture of a model based on CNN:

One important aspect of these deep learning models is that they can automatically learn hierarchical feature representations. According to Yosinski et al. (2014), 'if first-layer features are general and last-layer features are specific, then there must be a transition from general to specific somewhere in the network'. As a result, the convolutional base of our CNN—especially its lower layers (those who are closer to the inputs)—refer to general features, whereas the classifier part, and some of the higher layers of the convolutional base, refer to specialised features.

dataset describe()

Dataset: - `df = pd.read_csv("/content/WILDCATS[1].CSV")`

Univariate

count

mean4

std2

min

max

(3) Software and hardware requirements:

The software and hardware requirements for image classification can vary depending on the specific framework, library, or tool you choose to use. However, I can provide you with a general overview of the common requirements.

Software Requirements:

I. Deep Learning Frameworks:

TensorFlow
PyTorch
Keras
MXNet
Caffe

II. Image Processing Libraries:

OpenCV
Pillow (PIL)

III. Python:

Most deep learning frameworks and libranes are Python-based, so a Python installation is necessary

IV. CUDA and CUDNN (Optional but recommended for GPU acceleration):

If you plan to use GPU acceleration, you'll need to install NVIDIA CUDA and CUDNN for your GPU. Many deep learning frameworks support GPU acceleration.

Hardware Requirements:

I. 1.CPU

For smaller-scale image classification tasks, a modern multi-core CPU.

Sufficient.For larger datasets datasets or more complex model, a CPU.

II. 2.GPU(Optional but recommended for fater training):

Deep learning learning models, especially large convolutional neural networks.

III. 3.Memory(RAM):

The amount of RAM needed depends on the size of your dataset and the
Complexity of your models. Deep learning tasks, especially with large datasets, may require a significantAmount of Ram.

(4) Conclusion of Image Classification:

Conclusion Four test images sea anemone, barometer, stethoscope and radio interferometer are chosen. The AlexNet database for testing and validation of image classification using deep learning. The convolutional neural network is used in AlexNet architecture for classify-cation purpose. From the experiments, it is observed that the images are classified correctly even for the portion. The test images and shows the effectiveness of deep learning algorithm.

(5) References:

- ✓ **(PDF) Image classification using Deep learning (researchgate.net).**
- ✓ **(PDF) Image classification based deep learning: A Review (researchgate.net).**
- ✓ **Image Classification using deep learning | PPT (slideshare.net).**