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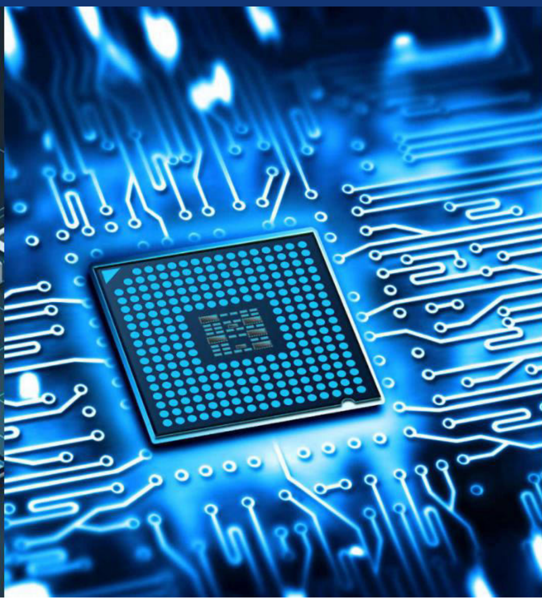


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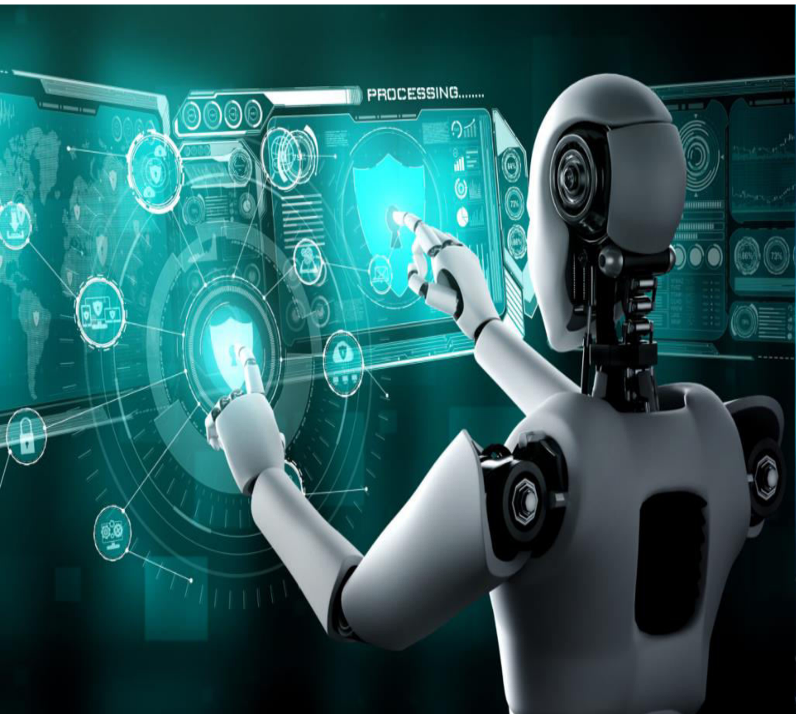

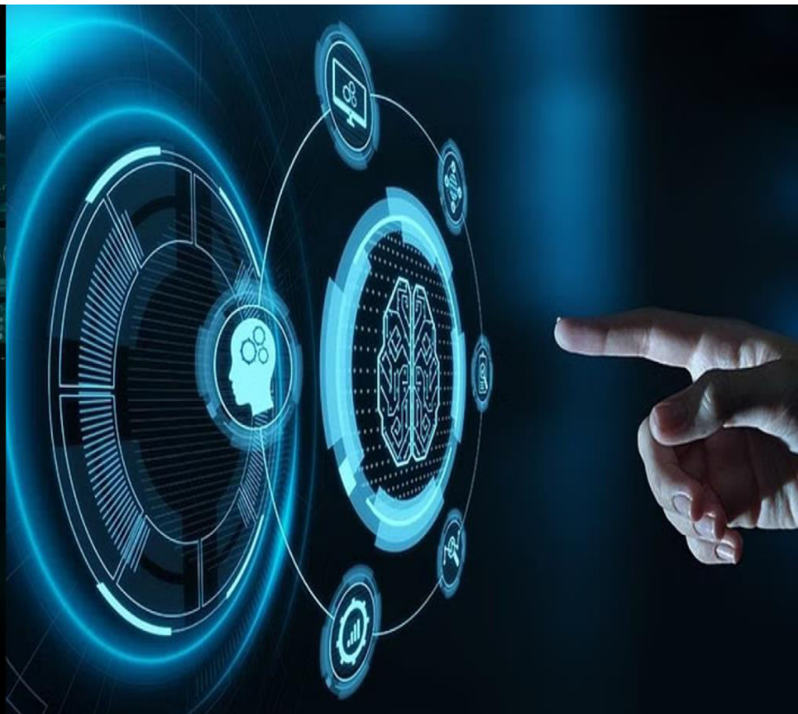

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Fake Logo Detection Using CNN

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ABSTRACT: The fake logo by matching and recognizing it with the original logo. This is done by dividing the image of logo into rows and columns and thus each cell has its index value .Taking the index value of each cell which belongs to the image of logo to be verified check it with the original image index value of the corresponding cell. From the relation between index values of both the original logo and the one being considered we could decide whether it is fake logo or original logo. If the index values of all the cells are exactly matching with the actual logo, then it is considered to be original logo, otherwise it is the fake logo. This process is achieved by using CNN logo detection and recognition algorithm. Traditional methods often rely on feature extraction and comparison techniques, such as SIFT (Scale-Invariant Feature Transform) and SURF (Speeded Up Robust Features), while deep learning approaches leverage convolutional neural networks (CNNs) and generative adversarial networks (GANs) for feature learning and discrimination.

KEYWORDS: CNN (Convolutional Neural Networks), SIFT (Scale-Invariant Feature Transform), SURF (Speeded Up Robust Features), GANs (Generative Adversarial Networks), Deep Learning, Feature Extraction, Logo Recognition.

I. INTRODUCTION

The large-scale and growing production of visual data by firms and institutions, along with the growing popularity of social media systems, has brought about an age where visual data is more abundant and significant than ever. Amongst the countless ways in which visual data has emerged, graphic logos are particularly unique. These logos are not simple visual objects; they are central to defining and accessing the identity of companies, products, and institutions. Logos are graphic works that can refer to real-world objects, emphasize a name, or display abstract signs with high perceptual appeal.

In the current global and digital market, logos have become an essential part of brand identity and recognition. As a result, the area of trademark recognition has attracted much attention, and extensive research has been focused on content- based indexing and retrieval in logo databases. The ultimate aim is to make the trademark registration process easier and more efficient by ensuring that logos are recognized accurately and effectively. This is achieved through a carefully controlled image acquisition and processing chain, where the quality of images is paramount, and distortions are minimized. However, developing a generic system for logo detection and recognition in images captured in real-world environments presents a unique set of challenges. Unlike controlled environments, real-world conditions involveplethora of variables. Therefore, a robust system must exhibit invariance to a wide range of geometric and photometric transformations to accommodate the diverse conditions of image and video recordings. Logos in real-world images are rarely captured in isolation; they are often entangled with complex backgrounds and subject to various degrees of partial occlusions.
In addition, a system designed to detect and recognize logos must also be able to identify small differences in local structures, which is important for detecting malicious tampering or retrieving logos with slight local peculiarities.
These local descriptors have to be very discriminative, so that accurate recognition is made possible even under subtle variations. A generic system for logo detection and recognition has to address such contrasting requirements.

II. LITERATURE SURVEY

2.1 Content based image retrieval at the end of the early years:

Presents a review of 10 references in content-based image retrieval. The paper starts with discussing the working conditions of content-based retrieval: patterns of use, types of pictures, the role of semantics, and the sensory gap. Subsequent sections discuss computational steps for image retrieval systems. Step one of the review is image processing for retrieval sorted by color, texture, and local geometry. Features for retrieval are discussed next, sorted by accumulative and global features, salient points, object and shape features, signs, and structural combinations thereof. Similarity of pictures and objects in pictures is reviewed for each of the feature types, in close connection to the types and means of feedback the user of the systems is capable of giving by interaction. We briefly discuss aspects of system engineering: databases, system architecture, and evaluation.

2.2 Image retrieval: Ideas, influences, and trends of the new age:

We have witnessed great interest and a wealth of promise in content-based image retrieval as an emerging technology. While the last decade laid foundation to such promise, it also paved the way for a large number of new techniques and systems, got many new people involved, and triggered stronger association of weakly related fields. In this article, we survey almost 300 key theoretical and empirical contributions in the current decade related to image retrieval and automatic image annotation, and in the process discuss the spawning of related subfields. We also discuss significant challenges involved in the adaptation of existing image retrieval techniques to build systems that can be useful in the real world. In retrospect of what has been achieved so far, we also conjecture what the future may hold for image retrieval research.

2.3 Event detection and recognition for semantic annotation of video:

Research on methods for detection and recognition of events and actions in videos is receiving an increasing attention from the scientific community, because of its relevance for many applications, from semantic video indexing to intelligent video surveillance systems and advanced human computer interaction interfaces. Event detection and recognition requires to consider the temporal aspect of video, either at the low-level with appropriate features, or at a higher-level with models and classifiers that can represent time. In this paper we Techniques and knowledge management.

2.4 Page rank for product image search

In this paper, we cast the image-ranking problem into the task of identifying “authority” nodes on an inferred visual link structure that can be created among a group of images. Through an iterative procedure based on the Page Rank computation, a numerical weight is assigned to each image; this measures its relative importance to the other images being considered. The incorporation of visual signals in this process differs from the majority of large-scale commercial-search engines in use today. Commercial search-engines often solely rely on the text clues of the pages in which images are embedded to rank images, and often entirely ignore the content of the images themselves as a ranking signal. To quantify the performance of our approach in a real-world system, we conducted a series of experiments based on the task of retrieving images for 2000 of the most popular products queries. Our experimental results show significant improvement, in terms of user satisfaction and relevancy, in comparison to the most recent Google Image Search results.

III. SYSTEM ANALYSIS

3.1 Existing System

The previous work on “Shape matching and object recognition using shape contexts,” and “ANSIG— An analytic signature for permutation invariant two- dimensional shape representation,” have used different global descriptors of the full logo image either accounting for logo contours or exploiting shape descriptors such as shape context. A two-stage algorithm proposed in “Logo detection based on spatial spectral saliency and partial spatial context,” that accounts for local contexts of key points. They considered spatial-spectral saliency to avoid the impact of cluttered background and speed up the logo detection and localization.

Appropriate metrics is accomplished among available methods, using two publicly available fundus datasets. In addition, the paper proposed the comprehensive normalization method which recorded acceptable results when applied for color normalization. The drawback of this method is that it assumes that a logo picture is fully visible in the image, is not corrupted by noise and is not subjected to transformations. According to this, they cannot be applied to real world images. The major limitation of this approach is image resolution, and their solution has revealed to be very sensitive to occlusions.

3.2 Proposed System

In this project we have used CNN (convolution neural network) algorithm to classify logo as fake or original. To Train this algorithm we have used below logo images. CNN is a type of deep learning model for processing data that has a grid pattern, such as images, which is inspired by the organization of animal visual cortex and designed to automatically and adaptively learn spatial hierarchies of features from low-to high-level patterns.

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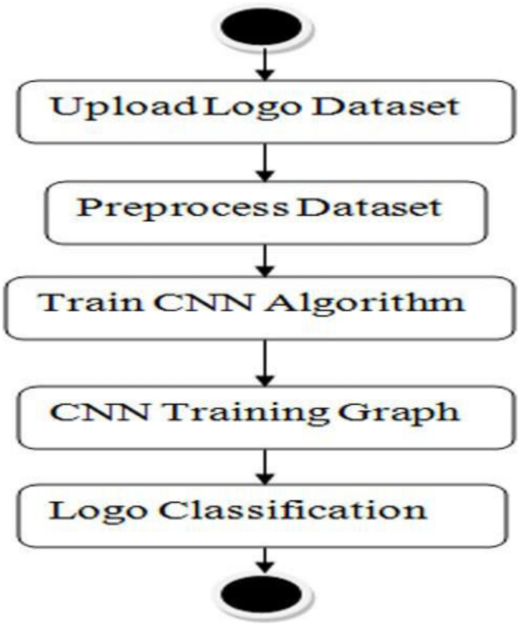
3.3 Modules Information

To implement this project, we have designed following modules

1. Upload Logo Dataset: using this module we will upload the dataset to the application.
2. Preprocess Dataset: using this module we will read each image and then resize all images to equal size and then normalize pixel values and then shuffle dataset. After processing we will split dataset into train and test where application using 80% dataset images for training and 20% for testing.
3. Train CNN Algorithm: using this module we will input 80% training images to CNN algorithm to train a model and this model will be applied on 20% test images to calculate prediction accuracy.
4. CNN Training Graph: using this module we will plot CNN training accuracy and loss graph.
5. Logo Classification: using this module we will upload test image and then CNN will classify those images as Fake or original.



IV. FUNCTIONAL REQUIREMENTS: SOFTWARE REQIREMENTS

System Attributes:

1. filename
2. classifier
3. labels, X, Y, X_train, y_train, X_test, y_test, classifier

USECASE: Use cases - Use cases describe the interaction between the system and external users that leads to achieving particular goals.

To implement this project, we have designed modules

- Upload Logo Dataset
- Preprocess Dataset
- Train CNN Algorithm
- CNN Training Graph
- Logo Classification

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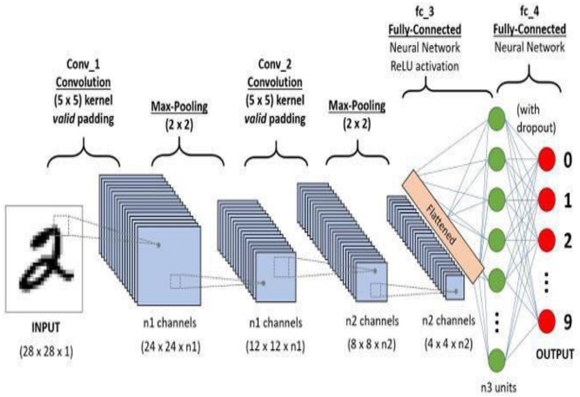
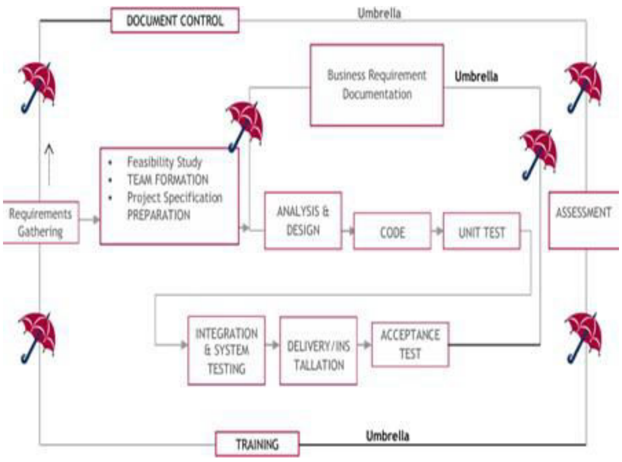
Work down Structure:(Architecture)



NON-FUNCTIONAL REQUIREMENT:
Usability: Usability is a quality attribute that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process.(how it was handling entire project easy)
Security: the quality or state of being secure: such as. a : freedom from danger : safety. b : freedom from fear or anxiety. c : freedom from the prospect of being laid off job security.
Readability: Readability is the ease with which a reader can understand a written text.
Availability: the quality or state of being available trying to improve the availability of affordable housing. 2 : an available person or thing.

PROCESS MODEL USED WITH JUSTIFICATION



SDLC is nothing but Software Development Life Cycle. It is a standard which is used by software industry to develop good software. Stages in SDLC:

- Requirement Gathering
- Analysis
- Designing
- Coding
- Testing
- Maintenance

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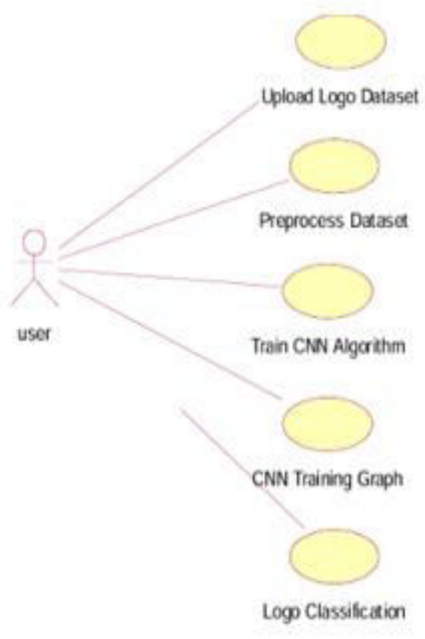
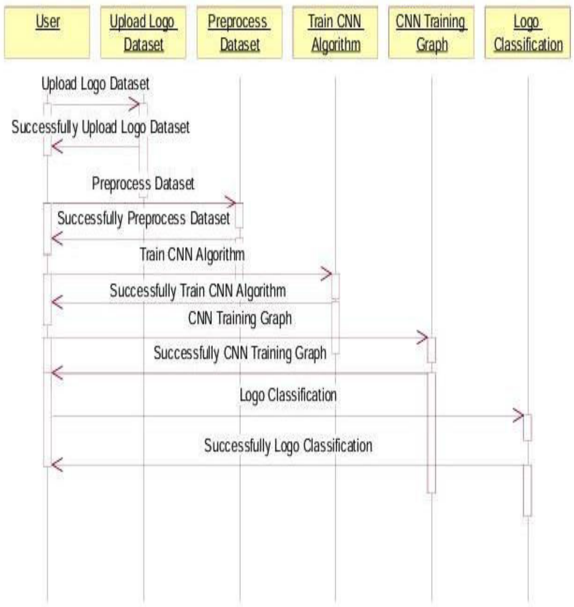
V. SYSTEM DESIGN

1. USECASE DIAGRAM:

A use case diagram at its simplest is a representation of a user's interaction with the system and depicting the specifications of a use case. A use case diagram can portray the different types of users of a system and the various ways that they interact with the system. This type of diagram is typically used in conjunction with the textual use case and will often be accompanied by other types of diagrams.



2. SEQUENCE DIAGRAM



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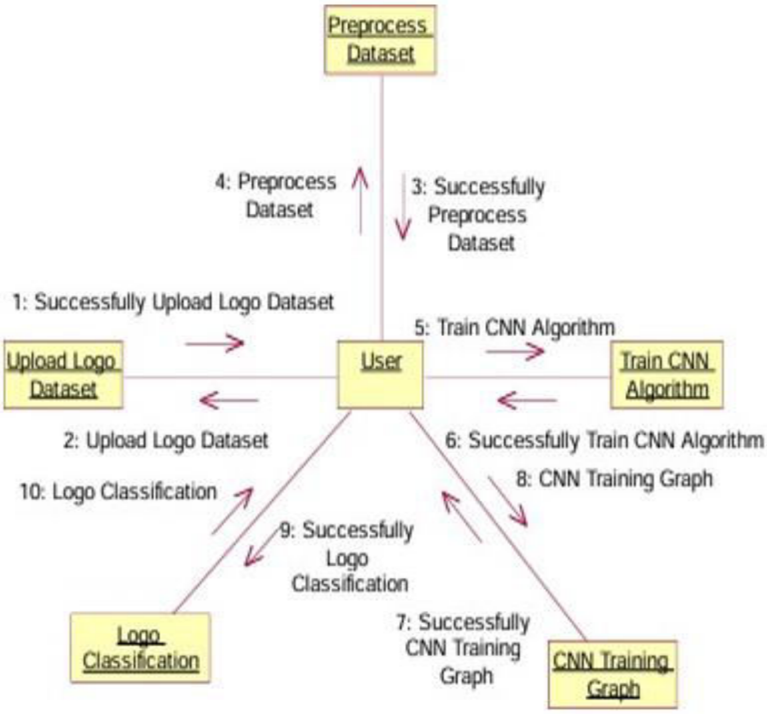
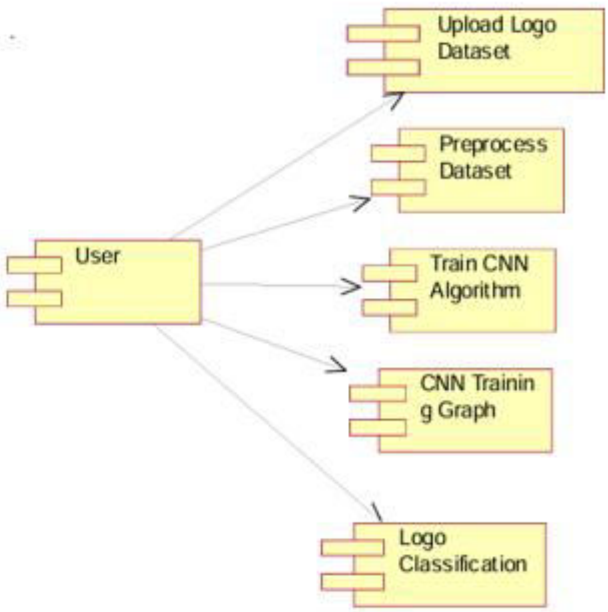
3. COLLABORATION DIAGRAM:

A collaboration diagram describes interactions among objects in terms of sequenced messages. Collaboration diagrams represent a combination of information taken from class, sequence, and use case diagrams describing both the static structure and dynamic behaviour of a system.



4. COMPONENT DIAGRAM:



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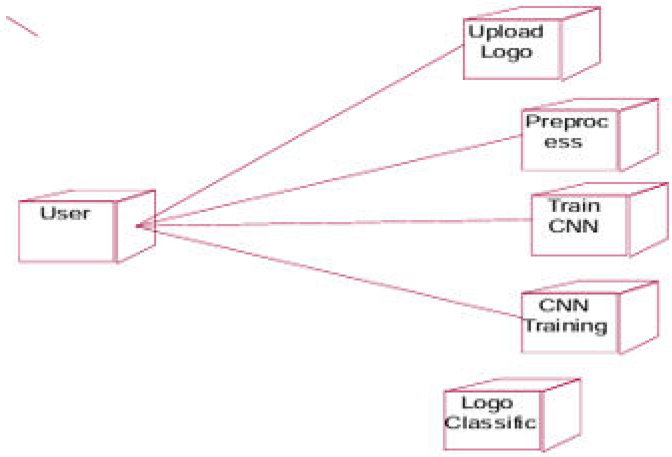
In the Unified Modelling Language, a component diagram depicts how components are wired together to form larger components and or software systems. They are used to illustrate the structure of arbitrarily complex systems. Components are wired together by using an assembly connector to connect the required interface of one component with the provided interface of another component. This illustrates the service consumer - service provider relationship between the two components.

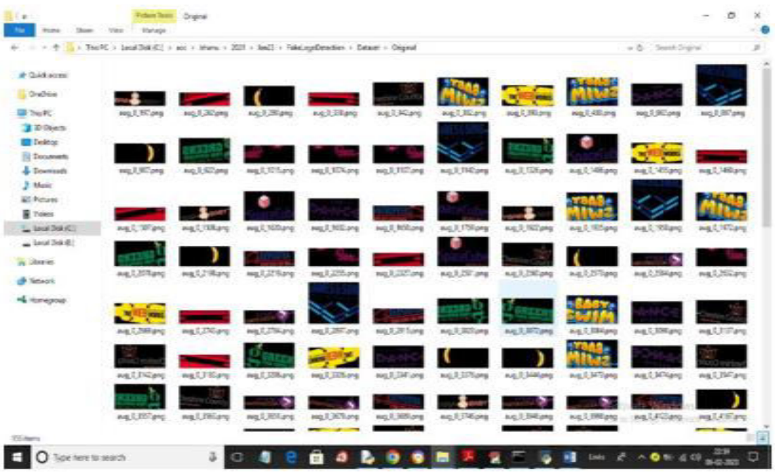
VI. DEPLOYMENT DIAGRAM

A deployment diagram in the Unified Modeling Language models the physical deployment of artifacts on nodes. To describe a web site, for example, a deployment diagram would show what hardware components ("nodes") exist (e.g., a web server, an application server, and a database server), what software components ("artifacts") run on each node (e.g., web application, database), and how the different pieces are connected (e.g. JDBC, REST, RMI). The nodes appear as boxes, and the artifacts allocated to each node appear as rectangles within the boxes. Nodes may have sub nodes, which appear as nested boxes. A single node in a deployment diagram may conceptually represent multiple physical nodes, such as a cluster of database servers.



VII. RESULTS AND DISCUSSION

In this project we have used CNN (convolution neural network) algorithm to classify logo as fake or original. To Train this algorithm we have used below logo images



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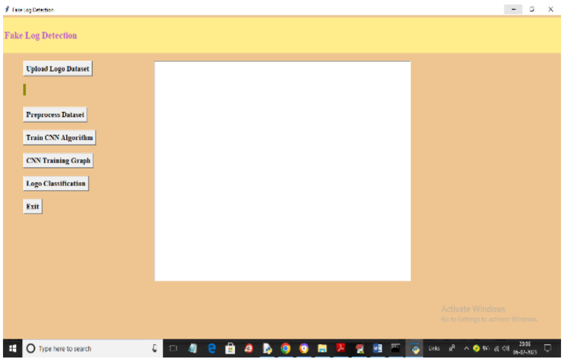
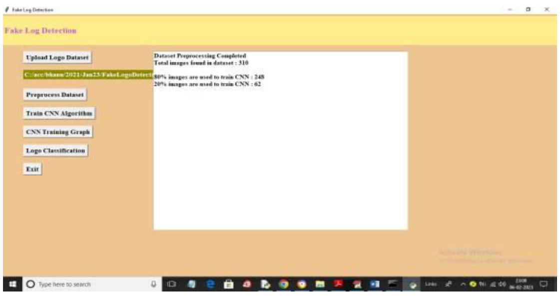
So, by using above images will train CNN algorithm for logo classification. To implement this project, we have designed following modules

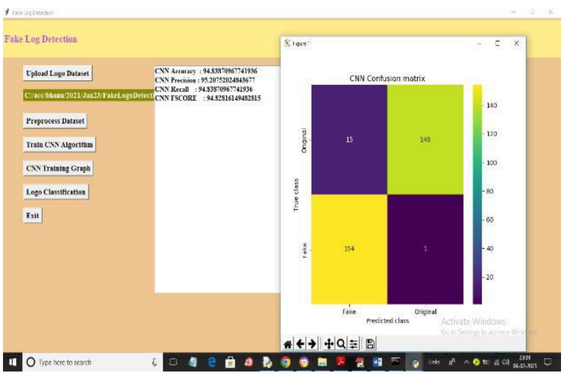
1. Upload Logo Dataset: using this module we will upload dataset to application
2. Preprocess Dataset: using this module we will read each image and then resize all images to equal size and then normalize pixel values and then shuffle dataset. After processing we will split dataset into train and test where application using 80% dataset images for training and 20% for testing
3. Train CNN Algorithm: using this module we will input 80% training images to CNN algorithm to train a model and this model will be applied on 20% test images to calculate prediction accuracy.
4. CNN Training Graph: using this module we will plot CNN training accuracy and loss graph
5. Logo Classification: using this module we will upload test image and then CNN will classify those images as Fake or original.



In above screen click on 'Upload Logo Dataset' button to upload dataset and get below output.



In above screen dataset processing completed and we can see dataset contains 310 images and application using 80% (248) images for training and 20% (62) images for testing and now click on 'Train CNN Algorithm' button train CNN with training images and get below output.



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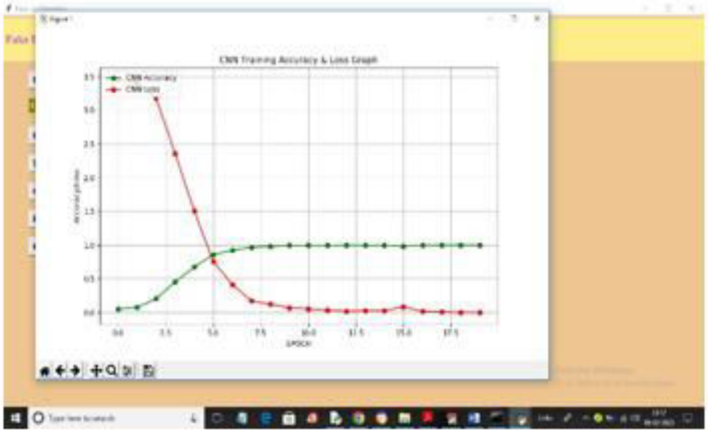
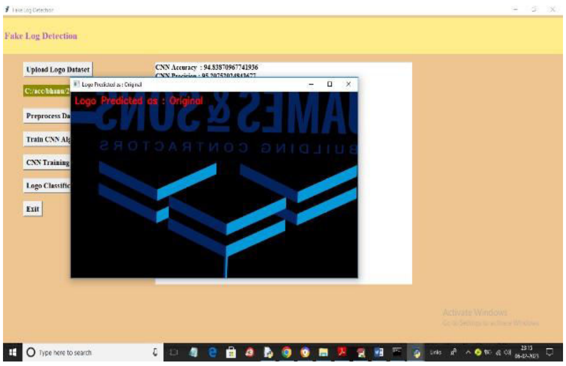


In above screen CNN training completed and we got its prediction accuracy as 94% and we can see other metric like precision, recall and FSCORE. In confusion matrix graph x-axis represents Predicted Labels and y-axis represents True Labels and blue colour boxes contains incorrect prediction count and different colour boxes contains correct prediction count and in above graph we can see wrong prediction counts are very few so we can say CNN predictions are more than 90% correct. Now click on 'CNN Training Graph´ button to get below graph.

In above graph x-axis represents training epoch and y-axis represents Accuracy and Loss values and green line represents accuracy and red line represents loss and in above graph we can see with each increasing epoch accuracy got increase and loss got decrease. Now close above graph and then click on 'Logo Classification' button to get below output.



In above screen in red colour text, we can see image logo classified as Original and similarly you can upload and test other images.

VIII. CONCLUSION

We introduced in this work a novel logo detection and localization approach-based similarities referred to as context dependent. The strength of the proposed method resides in several aspects: (i) the inclusion of the information about the spatial configuration in similarity design as well as visual features, (ii) the ability to control the influence of the context and the regularization of the solution via our energy function, (iii) the tolerance to different aspects including partial occlusion, makes it suitable to detect both near-duplicate logos as well as logos with some variability in their appearance, and (iv) the theoretical groundedness of the matching framework which shows that under the hypothesis of existence of a reference logo into a test image, the probability of success of matching and detection is high.

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