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DUPLICATE SIGNATURE VERIFICATION USING CNN ALGORITHM

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Abstract: Many different security programs use biometric technology. These systems try to identify people based on physical or behavioral characteristics. In the first case, identification is based on the measurement of biological features such as fingerprints, faces, and irises. The second scenario includes behavioral features such as speech and handwriting. Authentication and identification are two basic applications of biometric technology. In the first scenario, a system user provides a biometric sample while claiming who he is. The function of an authentication system is to determine whether the user really is who they say they are. When a user provides a biometric sample, the goal of the identification scenario is to find that user's biometric sample among other users registered in the system. This project introduces an innovative approach for duplicate signature verification using Convolutional Neural Networks (CNN). Signature verification is an important aspect of document authentication and fraud prevention. The proposed system uses CNN, a powerful class of deep learning algorithms suitable for image-based tasks, to analyze and distinguish between real and duplicate signatures. The system starts by capturing high-resolution images of signatures that incorporate different writing styles and conditions. These images serve as input to a CNN architecture, which is trained to learn complex features and patterns that represent valid signatures. The trained model is used for real-time verification to effectively distinguish between genuine and duplicate signatures. Extensive experiments and validation demonstrate the robustness and accuracy of the CNN-based approach in detecting duplicate signatures. Keywords: convolutional neural network;

Introduction : For legal transactions, authorization is by signature. This increases the need for signature verification. Handwritten signatures are unique to each person and impossible to duplicate. This technology is easy to explain and reliable. Identifying and verifying handwritten signatures from images is a big problem. This is very difficult because even the human eye does not have the visual ability to detect all internal details. handwritten. Since the signature changes every time, it is difficult for humans to distinguish between genuine and fake products. Deep learning using a highly digital replica of the human brain can be used to identify fake signatures.

Higher accuracy. The main advantage of signature verification systems over other types of technology is that signatures are already accepted as a common method of identity verification. There are two types of handwritten signature verification: online and offline. Online methods use electronic techniques and computers to extract signature information and obtain dynamic information such as pressure, speed, and writing speed for verification purposes. Offline signature verification uses fewer electronic controls and a signature image captured with a scanner or camera. Offline signature verification systems use features extracted from scanned signature images. The function used for offline signature verification is very simple. Here only pixel images should be evaluated. However, offline systems are difficult to design because many desirable features such as stroke order, velocity, and other dynamic information are not available offline. The verification process should be based entirely on the features that can be extracted from the static signature trace.

Problem Statement : Handwritten signatures are unique to each person and impossible to duplicate. This technology is easy to explain and reliable. Identifying and verifying handwritten signatures from images is a big problem. This is very difficult because the human eye does not have the visual ability to recognize all the details of handwriting. It is difficult for humans to sign because the signature changes every time Verification of handwritten signatures There are two types: online and offline. Online methods use electronic devices. Technology and computers to extract information about signatures and photographs Dynamic information such as pressure, speed and writing speed for targets Offline signature verification requires fewer electronic controls

Use a signature image taken with a scanner or camera. Offline signature The verification system uses features extracted from the scanned signature image. From The function used for offline signature verification is very simple. only this, I need to evaluate pixel images. However, offline systems are difficult to design Provide as many desirable features as possible, such as stroke order, speed, and impact. In offline mode, no other dynamic information is available. Confirmation This process should be based entirely on features that can be extracted from the trace. Static signature image

Working :

Our project prepares the most important steps in verifying and identifying signatures that exist for image manipulation and modification. Successful implementation of this will lead to better results and higher accuracy. Threshold method is used to extract signature from signature background. All the pixels of the signature are converted to "1" and the remaining pixels belonging to the background of the signature are converted to "0". To do this, a noise reduction filter is applied to the binary signature. Remove a black pixel on a white background. Eliminate defects, improve images and improve quality.

Convolution neural network Traceability :

CNN (Convolutional Neural Network) algorithms are a type of deep learning algorithm commonly used in image classification tasks, such as identifying plants from images of leaves. This algorithm is designed to learn and automatically extract features from input images without the need for manual feature extraction. The CNN algorithm consists of multiple neural layers organized into three types of layers: convolutional layers, combinational layers, and fully connected layers. Convolutional layers perform feature extraction by applying a set of filters to the input image. Each filter detects specific features such as edges, lines and textures. The output of each convolution layer is a set of feature maps that show the presence of detected features in different spatial locations in the image. Fusion layers are used to reduce the dimensionality of feature maps by downsampling them. The most common type of integration is maximum integration, which takes the maximum value of the local region of the feature map. This helps to extract the most salient features and reduce the computational complexity. The fully connected layer uses the extracted features to perform the final classification task and predict the class labels of the input image. The output of the final fully connected layer is passed through a softmax function that transforms the output into a probability distribution over possible class labels. CNN algorithms are trained using large datasets of labeled images. During training, the algorithm adjusts the neuron weights to minimize the difference between the predicted class label and the actual class label. This is done using a loss function such as stratified cross-entropy. CNN algorithms have been shown to be very effective in image classification tasks such as plant identification from leaf images. By automatically extracting relevant features from input images, this algorithm can achieve high accuracy and robustness in identifying different plant species. Connected device technologies include radio frequency identification (RFID) and blockchain. Specifically, RFID is a technology that helps collect data on connected devices, and blockchain is a decentralized technology that can provide secure and reliable data storage.

Search by CNN:

The CNN algorithm has been shown to be highly effective in image classification tasks, including plant identification from leaf images. By automatically extracting relevant features from input images, the algorithm can achieve high accuracy and robustness in identifying different plant species. The CNN algorithm for identifying plants from leaf images involves a series of mathematical operations that learn and classify the images. The algorithm can be divided into the following steps: • Convolutional layers: The input sheet image passes through a series of convolutional layers. Each layer consists of a set of filters that interpolate with the input image and extract features. Filters detect edges, lines and patterns in an image. • Activation function: The output of each convolutional layer is passed through an activation function such as ReLU (Rectified Linear Unit) to introduce non-linearity into the model. 42 • Pooling layers: When the function is activated, the output is passed through a pooling layer that reduces the dimensionality of feature maps by taking the maximum or average value in each window. • Fully connected layers: The output of the last pooling layer is combined and passed through a series of fully connected layers. These layers perform the classification task by learning the relationship between the extracted features and the corresponding class labels. • Softmax function: The last layer of the CNN algorithm applies a softmax function to the output of fully connected layers.This function converts the output to a probability distribution over possible class labels. • Loss function: The loss function measures the difference between the predicted class label and the actual class label. The goal is to minimize performance loss during training. Optimization: CNN algorithms use optimization techniques such as stochastic gradient descent (SGD) to update model parameters and improve accuracy during training. Handwritten signatures are a proven means of obtaining a personal signature.

Identification information whose use is strictly permitted for administrative and financial purposes. institution Currently, digital signature devices are specifically designed for the following purposes:For this purpose, it is increasingly used in the commercial and banking sectors.It facilitates payments and transactions in many other sectors including government, healthcare, education and courier services. Acquisition device produces an electronic signal called raw data that represents the signature, Recorded during the writing process. In the preprocessing stage, Improving input data usually involves filtering, noise reduction, Signature smoothing and normalization. Function function or parameter function Because it is extracted in the feature extraction phase, You can write your signature. Validation is used to evaluate the authenticity of a file.

Test signature attributes against attributes stored in your knowledge base.and was developed in the training phase. Allin-one standard program includes the following:These three phases run on a single device, resulting in a self-

consistent system. Cloud scenarios require three basic steps to take further. It is decomposed and placed on a distributed architecture. To verify the signature, It has attracted a lot of attention in the last 40 years. Current industrial scenario It mainly includes banking and business transactions. Of course these Transactions are performed in a distributed cloud scenario. Interoperability. In addition, each of us owns a mobile device and the number is increasing. We often use mobile devices to conduct transactions.

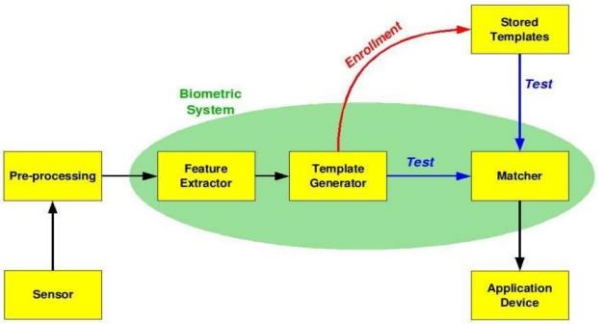
System Model :

System implementation is a critical stage in the development life cycle that represents the transition from design and development to commercialization of a new or upgraded information system. This process includes physically installing hardware and software components, configuring network settings, and adjusting system parameters to ensure seamless operation. Data migration (if applicable) is an important step in transferring data from existing systems to new systems using a thorough validation process to ensure accuracy and completeness. Detailed tests including unit testing, integration testing, system testing, and user acceptance testing are performed to identify and fix any issues before full implementation. User training is an essential part of implementation and ensures that end users and support staff are familiar with the new system. It is also supplemented with comprehensive documentation and supporting materials. Finally, parallel execution can be done to allow the new system to work temporarily alongside the old system and provide a safety net against unforeseen problems before the migration is complete. This comprehensive approach to systems implementation is intended to ensure a smooth and effective transition to new or upgraded information systems. Python is a widely used high-level, interpreted programming language. It is used in various fields such as web development, scientific computing and data. The first publication on analytics, artificial intelligence, machine learning and more It was introduced in 1991 by Guido Van Rossum and has since become one of the most popular. Its simplicity, readability and versatility make it a popular programming language. one of The main feature of Python is that its syntax is easy to learn and accessible. For beginners and experienced programmers alike. Has a large standard library, It offers a wide range of modules for tasks such as file I/O, network and general tasks. Python also has a large and active community. Developers who help develop open source libraries and packages Python works as an interpreted language, that is, a language that is executed. line by line to the translator, Libraries like NumPy and Pandas, machine learning libraries, etc. TensorFlow and PyTorch. It is also commonly used for scripting and automation Its ease of use and readability make it ideal for this task. Overall, Python is powerful and A versatile programming language that is widely used in various fields We appreciate its simplicity, ease of use and active community.

Life Cycle:

Life cycle. It represents the transition from design and development to commercialization of new or upgraded information systems. This process includes physically installing hardware and software components, configuring network settings, and adjusting system parameters to ensure seamless operation. Data migration (if applicable) is an important step in transferring data from existing systems to new systems using a thorough validation process to ensure accuracy and completeness. Detailed tests including unit testing, integration testing, system testing, and user acceptance testing are performed to identify and fix any issues before full implementation. User training is an essential part of implementation and ensures that end users and support staff are proficient in implementing the new system. Comprehensive documentation and support materials. Finally, By Parallel execution allows the new system to temporarily run alongside the old system, providing a safety net against unexpected events. Different aspects of human physiology, chemistry and behavior Used for biometric authentication. Select the specific biometric to use Certain programs require weighting of several factors. and was identified Seven factors used in evaluating the suitability of some traits for an application biometric. Universality means that everyone who uses the system must have this feature. Uniqueness means that the characteristics must be sufficiently different from one person to another. Allows related groups to be distinguished from each other. Continuity refers to how a property changes over time. More In particular, properties with "good" durability are reasonably stable over long periods of time. Time for a specific matching algorithm. Measurable (collectibility) refers to the ease of acquisition or measurement. In addition, the characteristics of the obtained data

Subsequent processing and extraction of relevant feature sets. Performance is related to the accuracy, speed and robustness of the technology used. Acceptability is related to the degree of acceptance of the individual in the relevant group. Technology they wish to capture their biological characteristics and was evaluated. The correct use of biometrics is very application dependent. Some are biometrics Some are better than others based on the level of convenience and security you need. No A single biometric meets all the requirements for every imaginable application.



Existing Model :

One of the main challenges of signature verification tasks is the high intra-class variability. Compared to physical biometric features such as fingerprints or irises, a user's handwritten signatures often show large variations between samples. Signature identification is the problem of identifying the author or creator of the desired document according to his writing style and has been studied for different characters. Although scale-invariant features are likely to be required for signature detection, scale-dependent features may also be appropriate. Gaussian models and hidden Markov models (HMM) are widely used in various fields due to their versatile features. In image processing, Gaussian models, often implemented through Gaussian filters, play a vital role in tasks such as noise reduction and blurring, and help improve image quality by smoothing pixel-level noise. In the field of machine learning, Gaussian mixture models (GMMs), a type of Gaussian model, are used for clustering and density estimation and have been effective in capturing complex data distributions. On the other hand, HMMs are widely used in speech recognition systems to model the continuous nature of speech signals. HMMs are good at capturing temporal dependencies, making them suitable for applications where sequential analysis of data is important, such as gesture recognition, handwriting recognition, and bioinformatics. Its probabilistic framework allows it to represent systems with hidden states and observe sequences, which makes it especially valuable in dynamic and evolving scenarios. These existing systems demonstrate the versatility of Gaussian and HMM models in multiple domains, paving the way for continued advancements and applications in areas such as signal processing, machine learning, and more.

Disadvantages :

- Irrelevant and redundant features are extracted from a large number of low classification accuracy computations

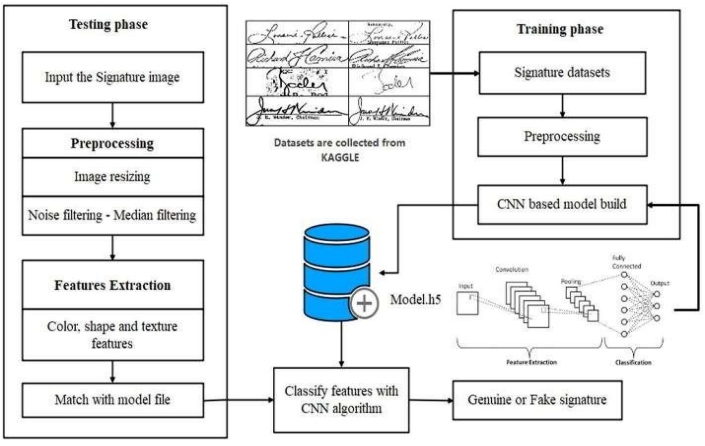
Proposed Model :

As signatures are the primary mechanism for authentication and authorization in legal transactions, there is a growing need for efficient automated signature verification solutions. In this project, a signature verification system based on deep learning is proposed. First, the local features of the image are calculated and with the help of a predefined codebook, an event histogram is created. Compare this histogram to determine author identity or similarity to other handwritten documents. Currently, signature detection methods can be divided into two approaches. The first approach analyzes the letters themselves and the second method uses the textural features of the handwriting. Forensic science identifies authors by analyzing their writing style. This analysis requires separating the foreground of the image from the background, so the author identification result depends on the binarization algorithm. CNN counts the occurrence of gradient orientations in local parts of the image. The main idea behind CNN descriptors is that the appearance and shape of local objects in an image can be described by the intensity gradient distribution or edge direction. This technique divides the image into small square cells and calculates a gradient-oriented or edge-oriented histogram based on the central difference. CNN features are calculated by obtaining histograms of edge intensity direction and shape features of local regions.

Advantages :

- Of high accuracy of division and classification
- The system is user friendly.
- We provide customers with peace of mind by providing them with factual information

System Architecture:



Application:

The purpose of this system is to identify duplicate signatures using convolutional neural networks.

Software components:

Operating System: Windows OS
Frontend: Python

Backend: my SQL
Application: web application
Tool: PYCHARM.

Hardware components:

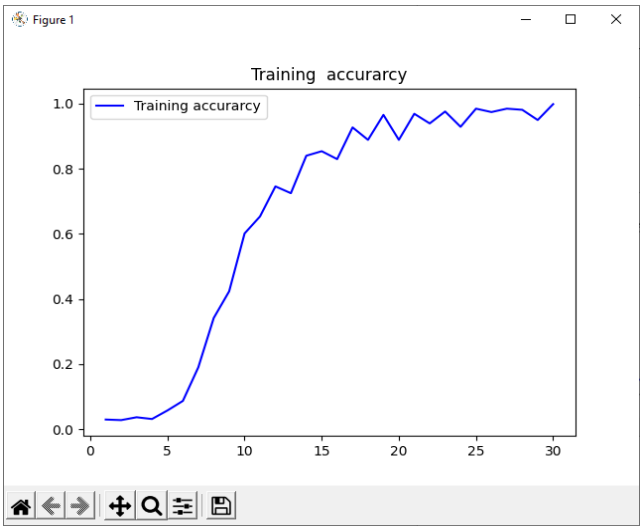
Processor: Intel 2.60 GHz processor
RAM: 1 GB
Hard disk: 160 GB
Compact disk: 650 MB
Keyboard: Standard keyboard
Monitor: 15 inch color monitor

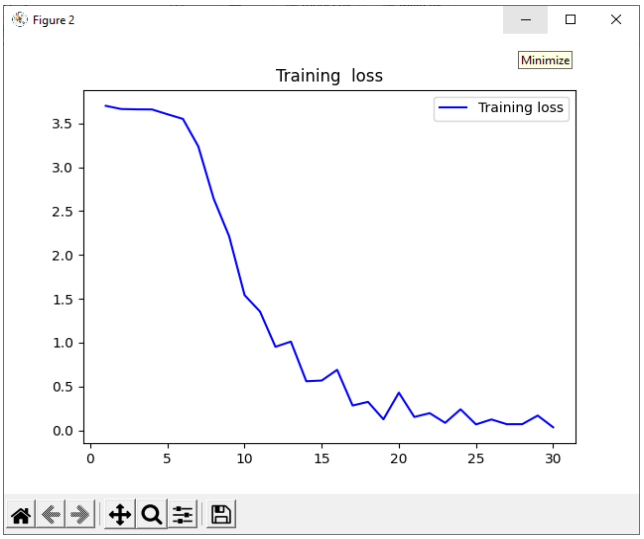
CONCLUSION:

Biometric technology is used in a variety of security applications. The purpose of such systems is to identify individuals on a physiological or physiological basis. Behavioral characteristics in the first case, the diagnosis is based on the following measurements: Biological features such as fingerprint, face and iris. The second case is related. It has behavioral features such as voice and handwritten signatures. Biometric authentication This system is primarily used in two scenarios: authentication and identification. Handwritten signature is one of the most important types of biometric features.

Mainly because it is widely used to verify a person's identity for legal and financial purposes. And in administrative areas, handwritten signature verification is the easiest way. The most non-invasive biometric authentication method. Signatures can be identified by their content. Geometric shapes. Modeled verification systems are tolerant of intra-individual signature variation, but insensitive to inter-individual signature variation. One, it is a counterfeit product. The CNN feature enhances signature verification itself for the following reasons: Fixed scaling and rotation properties. This function describes the shape In combination with geometric features such as circle and aspect ratio, Better Accuracy A project that introduces handwritten signature techniques Validation using the neural network approach of this method uses the extracted features from the preprocessed signature image. The extracted features are used for training. Neural network using back propagation training algorithm.

OUTPUT:





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