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CNN-LSTM: Development of Offline Signature Authentication

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Abstract:
Offline Signature Authentication is a critical task in the field of document authentication, and its accuracy is essential for ensuring security while transactions. This research proposes two approaches: Initially Pre-trained CNN models are used to extract features from signature images, which are then combined with handcrafted features such as HOG and some other geometric features of signature. Such combined features are passed to bidirectional LSTM model in which drop out layer undergoes classification which differentiate real and forgery signature. The proposed system has potential applications in document authentication and security, subsequently combination of CNN models and additional features provides more comprehensive representation of signature images resulting in improved accuracy. Three signature datasets are utilized namely GDPS, CEDAR, and BHSig-Bengali each with varying signature styles and image quality. Our experimental outcomes reveal that Bidirectional Convolutional LSTM along with handcraft features attained maximum accuracy in offline signature verification system.

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I. Introduction

An individual's signature is a commonly used biomarker for identification because of its unique traits of behavior. In most cases, a handwritten signature is a valid form of authentication. In order to minimize processing time and failure risks, automation systems have substituted human authentication of signatures techniques. Specifically, researchers fine-tune CNN models such as VGG16, VGG-19 model by Shayekh et al. [1] signature image datasets for extract high-level features from input images Zhang et al. [2]. These extracted features are pass into a Bidirectional LSTM network for signature verification, improving the accuracy and reliability of the authentication process. Moreover Jahandad et al [3] applied to Siamese RNN model along with GoogleNet approach reaches accuracy as 83% Inception V1 and Inception V3 attained accuracy as 75%. This work aims to enhance accuracy in offline signature authentication by exploring the effectiveness of different feature extraction methods. In addition, two pre- trained models such as Inception v3 and VGG16 are applied for training the features on images to verify real or forgery signature. Various analysis has done Ali Fathel et al. [4] for predicting the performance of offline signature detection using key point descriptors namely BRISK etc and Neha Sharma et al. [5] for enhancing the performance of predicting fake signature based on accuracy.

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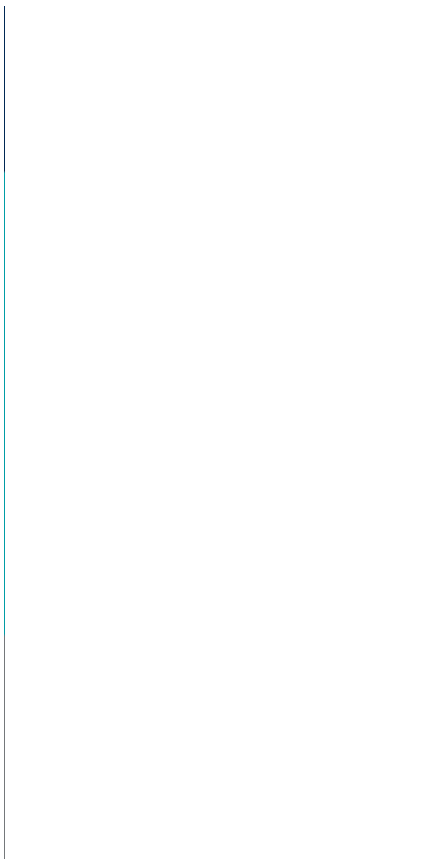Published: 2024

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