A Hybrid Model for Fingerprint Recognition via LSTM and CNN

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Abstract:
This paper proposes a Convolutional Neural Network (CNN) and Long Short-Term Memory (LSTM) based hybrid model for enhancement of fingerprint recognition and matching from collective datasets. A CNN model is deployed for feature extraction learning from the source image data and Long Short-Term Memory for prediction in sequence at even time series which obtains optimized results against prevailing techniques with the base of specific metrics. The outputs of the hybrid approach demonstrate good recognition of fingerprint with accuracy of 98%. The proposed approach can potentially reduce the false acceptance and false rejection rates in fingerprint recognition systems, thereby enhancing their overall security and usability. The implication of using LSTM and CNN for fingerprint recognition is a significant advancement in biometric authentication technology with the potential for wide-ranging applications inclusive of law enforcement, border security, and access control systems.

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Identifying individuals based on their fingerprint patterns is a unique and widely used method. Fingerprint patterns are individual and the best way to obtain someone's identity. Fingerprint identification has the advantage of being a safe and constant method, making it an infallible technique for human recognition due to its unique nature [1]. Fingerprint biometrics remains highly relevant and in demand [2] despite newer developments in other areas. Fingerprint authentication is both convenient and affordable when compared to other touchless biometric technologies that are predicted to decrease in usage in the future. However, concerns have been raised regarding the security of this widely used authentication technology. Nevertheless, significant progress has been made in this field, indicating a contrasting view. When biometric authentication first emerged at the beginning of this millennium, it shattered the limitations of people's perceptions, dispelling the notion that such technology only existed in science fiction movies. This opened up a world of possibilities for tech manufacturers and companies, and everyone wants a piece of this pie [3] [4]. The proposed method includes a pre-verification filter designed to remove bad or malicious fingerprints. By using deep learning, the system can repeatedly train itself with test samples, resulting in increased accuracy in detecting and reducing false identification. As a result, the proposed method greatly improves security and accuracy compared to traditional methods. [5] The general architecture is effective for preventing spoofing attempts by utilizing the LSTM units' ability to detect long-term relationships within input sequences, as well as extracting local and dense features through convolution operations. Thence, fingerprint detection is through and get categorized through the proposed hybrid learning approach of combined convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM).

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