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Explain Cash AI: Interpretable Fake Currency Detection Using Deep Learning

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Abstract

Because they are made without the official approval of the government, counterfeit banknotes constitute a major risk to a country's economy. Preventing the widespread circulation of counterfeit currency notes requires the ability to identify and differentiate between genuine and counterfeit notes. The problem is that regular people have a hard time spotting counterfeit currency. There is currently no publicly accessible system that can identify counterfeit notes, but banks and other financial organizations do have such systems. In this study, we provide a method for distinguishing between genuine and counterfeit banknotes using deep learning techniques, most especially Convolutional Neural Networks (CNNs). By analyzing a photograph of the paper note, the system can assess its legitimacy in real-time. We test the suggested method on a dataset including both authentic and counterfeit banknotes, and it successfully detects counterfeit notes with a high degree of accuracy. Businesses that deal with cash transactions, banks, and other financial institutions are some of the potential users of our suggested system. Preventing the economy and the people from suffering financial losses may be achieved via the rapid detection and prevention of counterfeit cash notes.

Introduction

All around the globe, governments and financial institutions are still grappling with the problem of counterfeit currency notes. Produced by dishonest people and corporations, counterfeit notes cause substantial economic harm. Several technological improvements to identify counterfeit banknotes have been suggested as a solution to this issue. The efficacy of these solutions, however, depends on resolving their limits. A nation's financial stability and security may be severely compromised by the widespread circulation of counterfeit currency notes. Furthermore, the average individual typically has a hard time telling the difference between genuine and counterfeit banknotes. As a result, the detection of counterfeit currency notes has grown in importance for both law enforcement and financial organizations. Our proposed new model utilizes Convolutional Neural Networks (CNNs), a subset of Deep Learning algorithms, to differentiate between counterfeit and genuine banknotes, thereby overcoming these shortcomings. To train the convolutional neural network (CNN) model, the suggested system needs a big dataset that includes both genuine and counterfeit banknotes. Users will be able to verify the legitimacy of cash notes when the model has been trained and incorporated into an interface. What follows is an outline of the paper's structure, which will examine and critique relevant prior research while drawing attention to knowledge gaps. are going to detail the dataset that was used for the research. Here we will lay out the plan for solving the research challenge. The design of the study's convolutional neural network (CNN) is described in length in this section. must provide an analysis and report on the outcomes of the trial. will provide a brief overview of the study's results and talk about what those results mean. The paper's sources will be listed at the end.

Literature Survey

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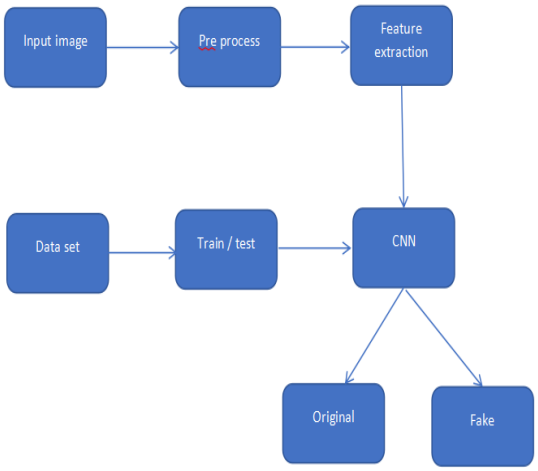
One promising new technique that could have significant uses in wireless security is radio frequency fingerprinting (RF fingerprinting), which was developed by Qingyang Wu, Carlos Feres, Daniel Kuzmenko, and Ding Zhi. The authors of this paper provide a novel deep neural network-based RFfingerprinting technique. Specifically, a recurrent neural network based on long short-term memory is suggested and used for the automated identification of hardware-specific characteristics and transmitter classification. The efficiency of the suggested approach was proved in experimental investigations that used identical RF emitters, which achieved extremely high detection accuracy even in the face of heavy noise.

Junqing Zhang, Aiqun Hu, Ming Liu, and Linning Peng Using a two-dimensional representation of the differential relationship of a single time series, this paper suggests a new deep learning-based radio frequency identification method for IoT terminal authentications. The method does not require synchronization and makes use of differential constellation traces to extract RFF features. Next, a CNN is built to recognize various devices by using DCTF capabilities. The suggested DCTF CNN has the advantages of minimal complexity, zero prior knowledge, and excellent identification accuracy when compared to current CNN based RFF identification approaches.

Methodology



Proposed system

The goal of the proposed AI-driven diet and exercise advice system is to provide a highly customized experience by using sophisticated data analytics and insights generated by AI. Several essential parts make up the system: Profile of the User and Data Gathering Important details such as users' ages, genders, heights, weights, fitness objectives, food preferences, and activity levels are input by users. Personalized suggestions are generated using this data. Meta-Recommendation Engine Driven by Artificial Intelligence Version 5.2 An AI-powered recommendation engine integrated into the system's core uses machine learning methods to: Create customized exercise regimens.The technology incorporates data from wearable devices like fitness trackers and smartwatches to improve the accuracy of meal choices depending on the user. This allows the system to take into account the user's current level of activity, heart rate, and sleep habits in order to provide suggestions based on those metrics in real-time.The first figure

Data collecting, model training, system design, and assessment are all parts of the organized method that the AI-powered diet and exercise advice system takes throughout development. 6.1. Gathering data and preparing it for analysis Registration forms and linked wearable gadgets gather user data. The nutrition information comes from trustworthy sources, and the exercise programs are hand-picked according to the advice of fitness experts. In data preparation, tasks such as encoding categorical data, normalizing continuous variables, and addressing missing values are performed. 6.2. Building Machine Learning Models In order to make predictions about food and exercise, the recommendation engine makes use of supervised learning techniques. Models are trained and developed using TensorFlow and scikit-learn. To ensure the model's correctness, it is trained using datasets that comprise a wide variety of user profiles. The model adjusts and improves according to user input using reinforcement learning methods to guarantee continual development. Model Frontend: React and Redux for an interactive user interface is evaluated using key metrics including prediction accuracy, recall, precision, and F1-score. The backend uses Flask and Node.js to handle APIs and business logic. MongoDB is used as a database for storing user data and recommendations. Data Security: Protocols for encryption and secure authentication methods to guarantee the safety of

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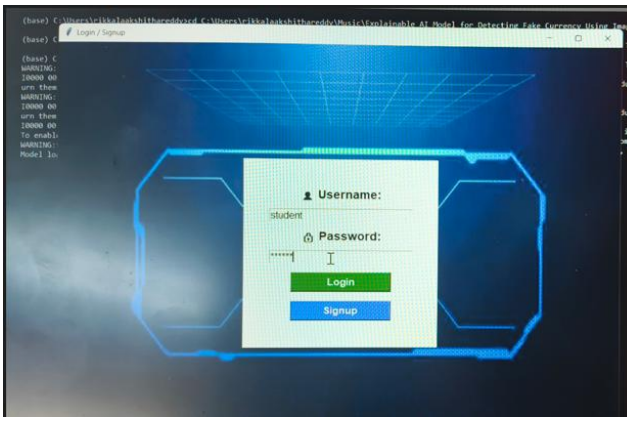
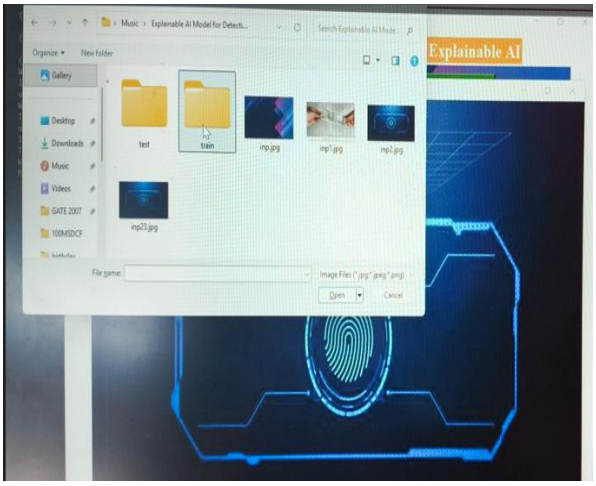
data. The use of third-party APIs allows for the continuous updating of health data from dietary databases and wearable devices in real-time [14]. (Refer to 2

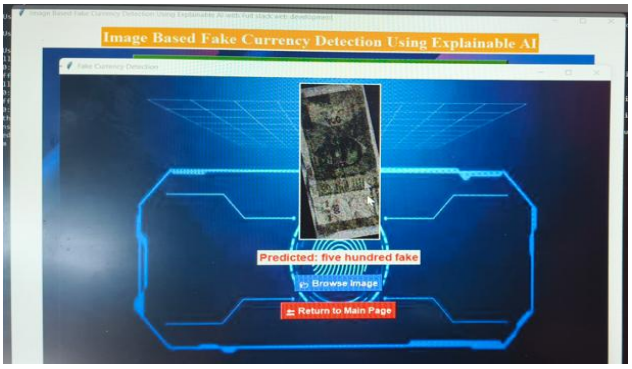
Results



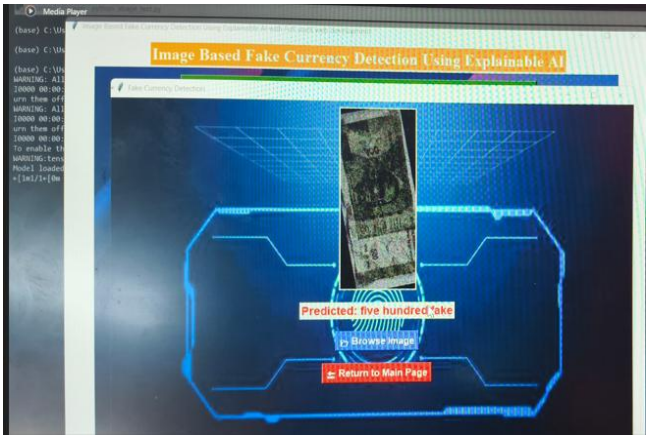
Login page

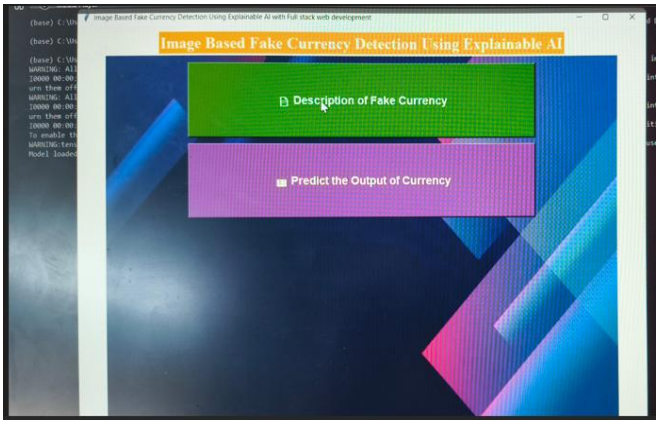


Input image



Currency detection





prediction

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Conclusion:

The purpose of this research was to investigate the feasibility of using Convolutional Neural Networks (CNNs) to identify counterfeit money. We achieved encouraging results in differentiating between real and counterfeit banknotes by using a CNN architecture that is especially built to handle image data successfully.

Future Scope:

We were able to improve the process's performance in the future, leading to more accuracy. Most algorithms are only applicable to one or two various denominations of currency, which limits their potential for further improvement. In addition, the picture of the cash is captured from either the front or back, but it may be even more accurate if captured from several perspectives. The detection of counterfeit cash is crucial because its circulation degrades a country's economy. It is possible to choose the most appropriate method of identification depending on the task at hand, as some of the approaches mentioned earlier are time and money saving. This shouldn't be restricted to only banks, but should also apply to stores and other locations that handle cash transactions.

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