**PROJECT: CURRENCY DETECTION**

**Abstract**

Counterfeit currency detection is a crucial task in financial security. This project implements a machine learning-based approach to distinguish between real and fake currency notes using image processing techniques. By utilizing OpenCV for image preprocessing and a RandomForestClassifier for classification, our system achieves efficient and accurate results. The dataset consists of images categorized as real and fake currency, which are processed and trained in a model to perform automated classification. This project aims to assist in detecting counterfeit currency with ease and reliability.

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**Introduction**

The rise in counterfeit currency poses a significant challenge in financial systems. Manual verification is time-consuming and prone to errors. This project presents an automated solution using image processing and machine learning to detect counterfeit notes effectively.

**Technologies Used**

* **Programming Language:** Python
* **Libraries:** OpenCV, NumPy, Scikit-learn, Matplotlib
* **Machine Learning Algorithm:** Random Forest Classifier
* **Tools:** Jupyter Notebook, VS Code

**Dataset Preparation**

The dataset consists of images of real and fake currency notes, categorized into separate folders:

* **Real:** Contains genuine currency images.
* **Fake:** Contains counterfeit currency images.

Each image is preprocessed by resizing and converting to grayscale before training the model.

**Implementation Steps**

1. **Data Loading**: Images are read from the dataset directory and assigned corresponding labels (0 for real, 1 for fake).
2. **Preprocessing**:
   * Convert images to grayscale.
   * Resize them to a fixed size (100x100 pixels) for consistency.
   * Flatten images into feature vectors for model input.
3. **Splitting Data**: The dataset is divided into training (80%) and testing (20%) sets.
4. **Model Training**:
   * A Random Forest Classifier is trained on the extracted features.
5. **Model Evaluation**:
   * Performance is assessed using a confusion matrix and classification report.
6. **Prediction Function**:
   * Allows users to input an image and receive a classification result (Real or Fake).

**Results & Analysis**

The trained model provides high accuracy in classifying real and fake currency images. The confusion matrix and classification report indicate the effectiveness of the approach. The model can be further improved by using deep learning techniques like Convolutional Neural Networks (CNNs).

**Conclusion**

This project successfully demonstrates a machine learning approach to detecting counterfeit currency using image processing. By leveraging the Random Forest Classifier, we achieved reliable results in classification. Future enhancements may include incorporating a larger dataset and advanced deep learning methods for improved accuracy.

**Future Work**

* Implementation of Convolutional Neural Networks (CNNs) for enhanced accuracy.
* Expanding the dataset to include multiple currency denominations.
* Deploying the model as a web or mobile application for real-world usability.