Proposal of a subject: Handwritten signature recognition system

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Problem

Handwritten signature recognition is an important challenge in the field of pattern recognition and image processing, especially in areas such as banking, finance, legal systems. In this project, we will develop a system that can recognize handwritten signatures from images or documents. This system will secure the signature verification process, minimize the risk of fraud, and ensure that important transactions and documents are authenticated reliably and efficiently.

The aim of this project are:

- Develop a signature recognition system that can accurately distinguish between different signatures and detect forged ones.
- Automate the signature verification process, reducing manual effort and time required for verifying signatures.

Some main tasks:

- **Collect Signature Data**: Collect multiple samples of each user's handwritten signature, since natural variations occur in every signature. You should lean and prepare signature images by filtering out noise, normalize these image to ensure consistent input.
- **Preprocessing Data**: You should clean and prepare signature images by normalize collected images (e.g., convert pixel values to a scale from 0 to 1), resize all images to the same dimensions to ensure consistent input, and apply noise reduction to improve the accuracy.
- **Feature Extraction**: The *Histograms of Oriented Gradients (HOG)* technique should be used in this project to extract key characteristics from the signatures, including curves, strokes, and spacing between different parts.
- **Model Development**: We will implement a machine learning model using the *Support Vector Machine (SVM)* algorithm, this is a commonly used classification algorithm for recognizing complex patterns like signatures.
- **Evaluation**: Test the system using new signature samples and evaluate its performance using metrics like *accuracy*, *precision*, and *false positive rate* to measure its ability to recognize valid signatures and detect forged signatures.
- **Application**: Implement a simple user interface where users can upload an image of their signature or capture a signature image using the camera and the system will detect which signature is valid and which is invalid.