SIGNATURE VERIFICATION SYSTEM

TEAM
Muhammad Saifullah Khan
Muhammad Mahad Tariq
Bilal Ahmed

ADVISOR
Dr. Muhammad Imran Malik

CO-ADVISOR
Dr. Muhammad Shahzad

MEET THE TEAM

MEMBERS

BILAL AHMAD
REQUIREMENTS ENGINEER

M MAHAD TARIQ
LEAD RESEARCHER

M SAIFULLAH KHAN
LEAD DEVELOPER

PROBLEM DEFINITION

AND ITS SIGNIFICANCE

PROBLEM STATEMENT

Signature is arguably the **most extensively used biometric** for **personal identification**, and therefore more likely to be used for **identity theft** with criminal intent than any other biometric, causing a **breach of personal security** which may lead to various **personal and financial losses**.

SCAMS COME IN ALL SHAPES AND SIZES

IDENTITY THEFT IS ONE OF THEM

Nearly 50% of all adults have been targeted by a scam

1 in 5 of them fall victim

https://www.gov.uk/guidance/protect-your-charity-from-fraud

HOW SERIOUS IS THE IDENTITY FRAUD ISSUE?

Fraudsters have **stolen $112 billion** in the past six years.
This means a **loss of $35,600 every minute.**

00:00

In just three minutes, fraudsters steal enough to pay for:

00:01

Average mortgage on a house for **2 years**

00:02

Groceries for the average family for **8 years**

00:03

College fees for **1 year**

Independently produced by: JAVELIN

Independently produced by: JAVELIN

IDENTITY FRAUD IN 2015

13.1 million

IDENTITY FRAUD VICTIMS IN 2015

$15

BILLION STOLEN

2015 AFP

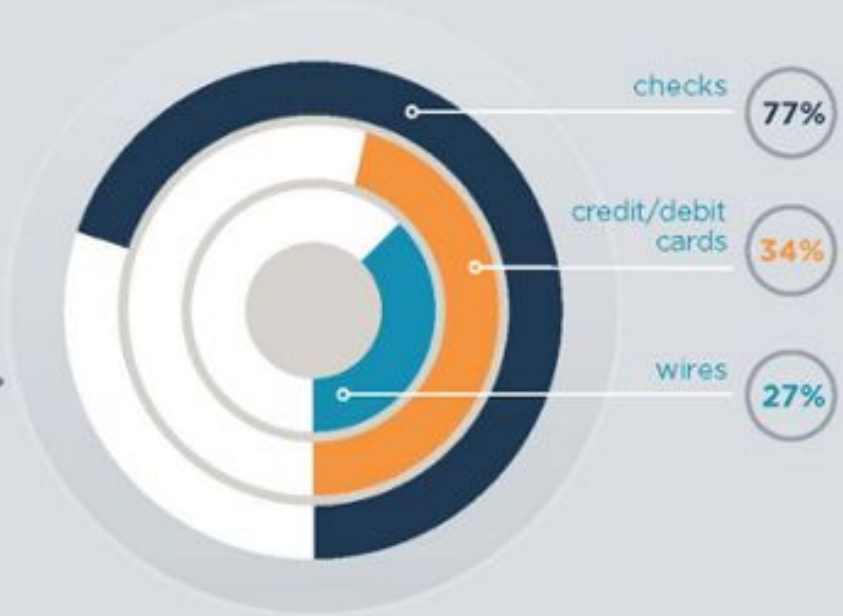
Payments Fraud and Control Survey

Underwritten by J.P.Morgan

62%

of companies were targets of payments fraud in 2014.

MOST TARGETED METHODS



YOUR IDENTITY IS AT STAKE!

IT HAPPENS ALL AROUND. IT CAN HAPPEN TO YOU.

WHO IS LIABLE FOR FORGED CHEQUES?

WHO DOES THE LAW PROTECT?

BANKS

OR

THEIR CUSTOMERS

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WHO IS LIABLE FOR FORGED CHEQUES?

WHO DOES THE **LAW PROTECT**?

BANKS

OR

THEIR CUSTOMERS

THIS IS WHERE WE COME IN

OUR SOLUTION TO SIGNATURE FORGERY

VALUE PROPOSITION

WHAT ARE WE OFFERING

Our system is a **computer software and hardware system**, which provides **banks and organisations** the capability of **automatically verifying handwritten signatures** on bank checks, to **avoid fraud and financial losses** due to fraudulent signatures.

PRIMARY CUSTOMERS

WHO NEEDS THIS SYSTEM

Banks

- 35 banks operating in Pakistan
- 271 total cities
- Roughly 5-6k bank branches

USER SEGMENTS

WHO CAN USE THIS SYSTEM

Banks

Organisations

Individuals

CHALLENGES

SOME PRACTICAL DIFFICULTIES

- Genuine signatures vary too!
- Automatic extraction of handwritten signature from cheque
- Few samples of genuine signatures available for training
  - Reliable prediction requires a lot of training
- One Class Classification Problem
  - Performance generally bad

SCOPE

FUNCTIONAL REQUIREMENTS

REGISTRATION

Enroll users in the system

INPUT: 8 signature samples

OUTPUT: Enrollment status (Success/Failure)

VERIFICATION

Establish signature authenticity

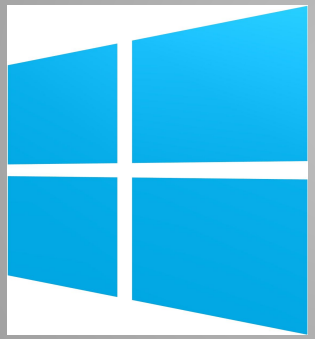
INPUT: Bank Cheque OR Signature

OUTPUT: Verification result (Forged/Genuine)

PLATFORMS

A SOLUTION FOR EVERYONE

LINUX



WINDOWS

MAC OS

ANDROID

GO-TO-MARKET STRATEGY

HOW DO WE ENGAGE CUSTOMERS

1. Involve banks in development process
    - HBL
    - Meezan Bank
2. Develop an online presence
    - GitHub
    - Project website
3. Acquire funding
    - KP Impact Challenge
    - Ignite
    - DICE Virtual Innovation

SUCCESS CRITERIA

WHAT WERE OUR GOALS

- Our algorithm performs at least as good as state-of-the-art.
- Prototype system is successfully developed.
- Acquire funding and start commercial development.
- Generate revenue by selling commercial product.

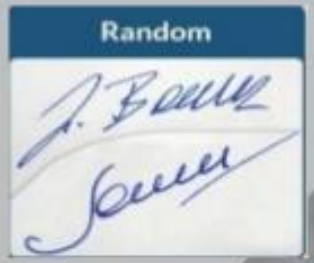
TECHNICAL DETAILS

IMPLEMENTATION, EXPERIMENTS, RESULTS

Types of Forgery

1. Random forgery:

Randomly sign. with person's own style.



2. Blind forgery:

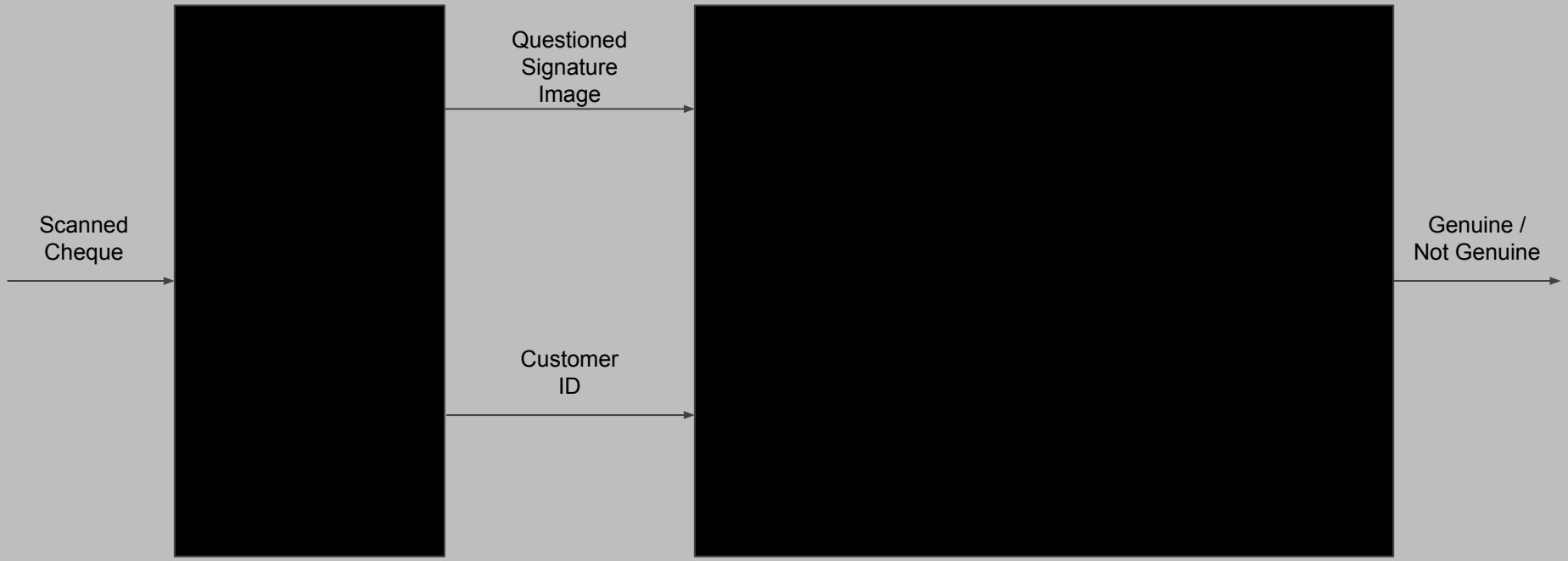
Own style without any knowledge of spelling.

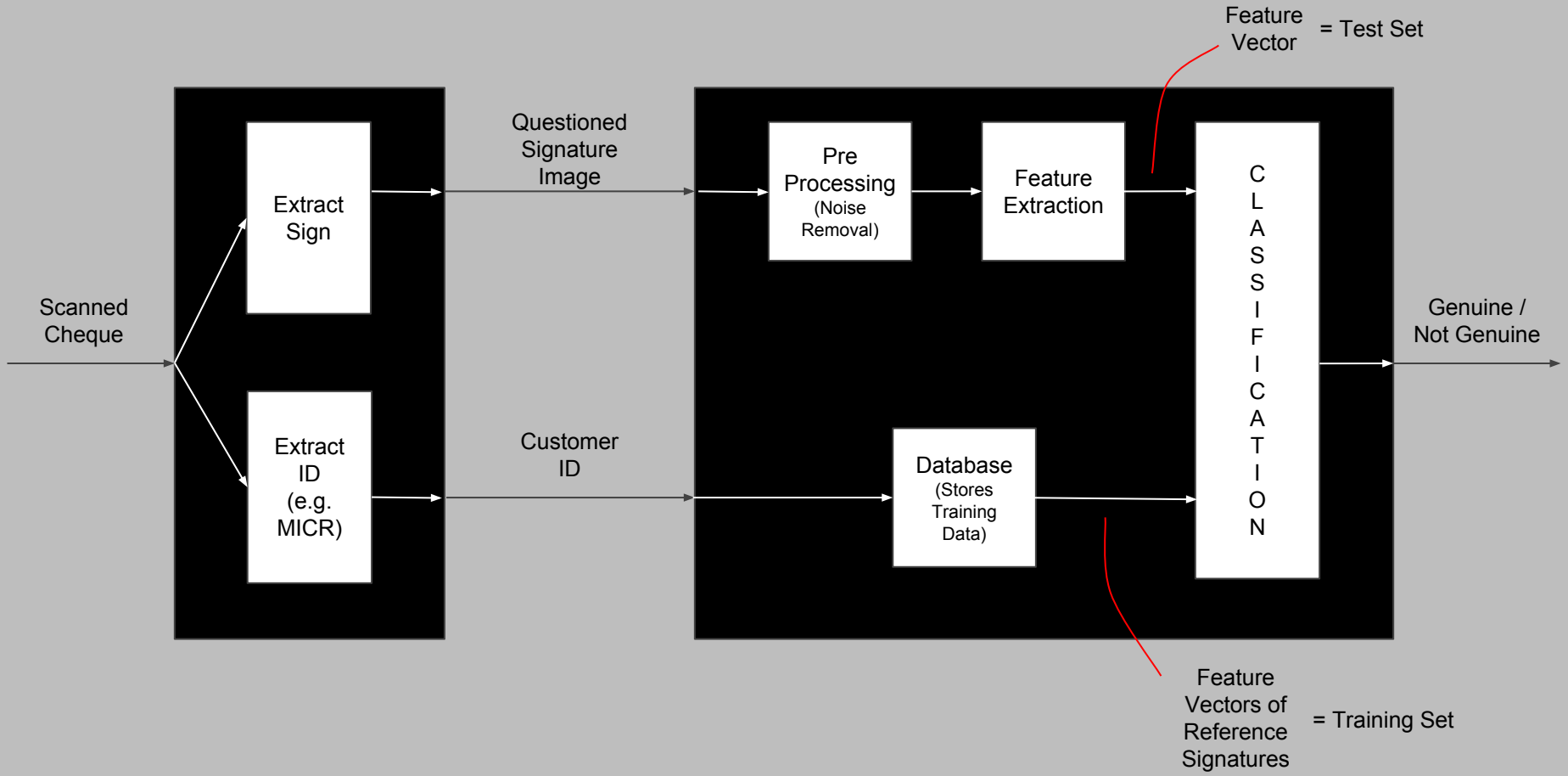
3. Skilled forgery:

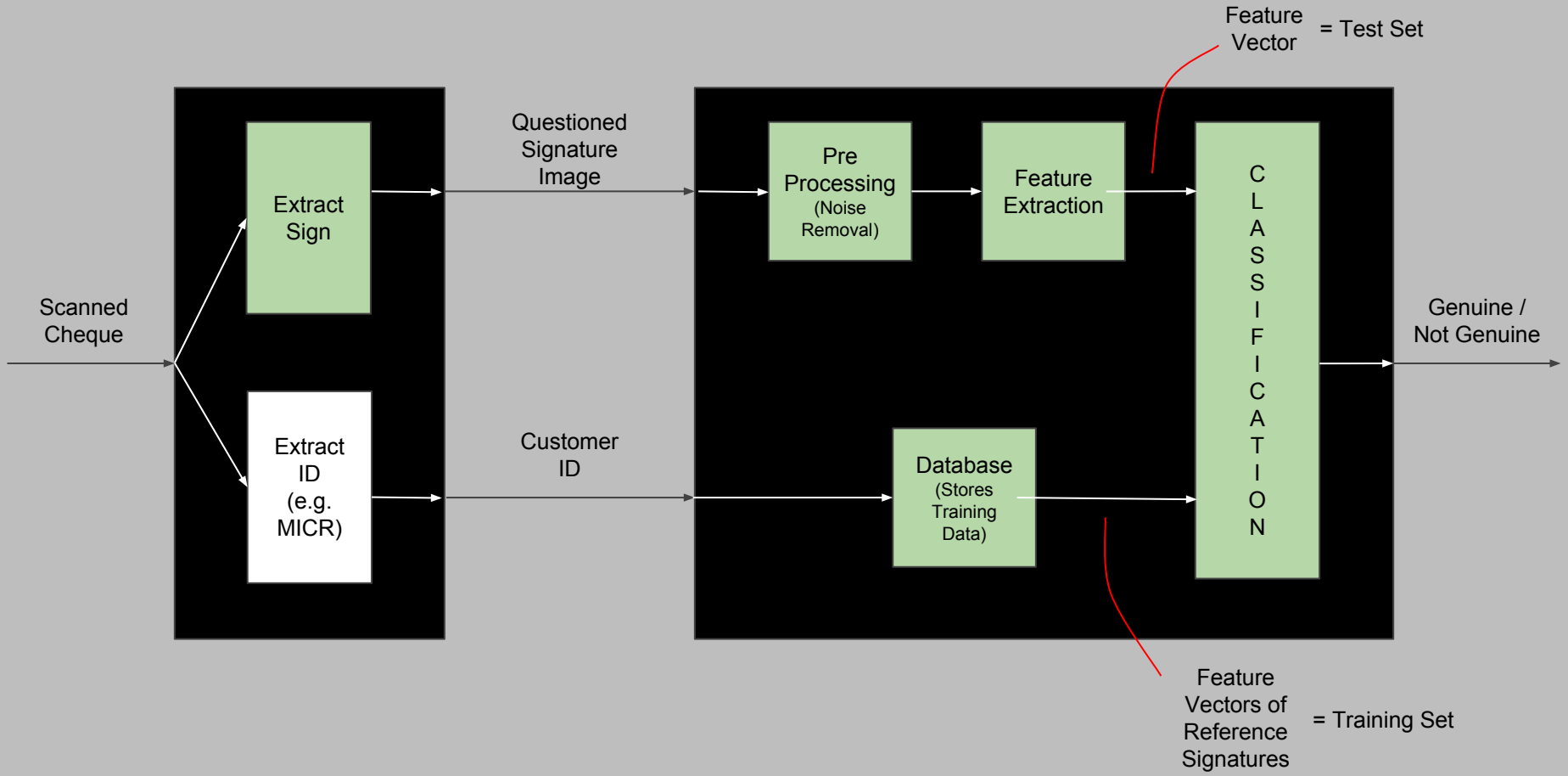
Experience in coping the signature.

Disguised Signatures

This signature is **performed by the original author**, however the author intentionally do it **differently from routine** so that they can **later claim that it was forged**.


Scanned
Cheque
Questioned
Signature
Image
Customer
ID
Genuine /
Not Genuine


Feature Vector
= Test Set
Extract Sign
Questioned Signature Image
Pre Processing (Noise Removal)
Feature Extraction
CLASSIFICATION
Scanned Cheque
Genuine / Not Genuine
Extract ID (e.g. MICR)
Customer ID
Database (Stores Training Data)
Feature Vectors of Reference Signatures
= Training Set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VERIFICATION PIPELINE

- Cheque Preprocessing
- Signature Extraction
- Analysis (Feature Extraction)
- Comparison and Evaluation (Classification)

CHEQUE PREPROCESSING

The digital image of the scanned bank cheque is preprocessed to remove cheque background and other noise. The output is a binary image of the bank cheque having white background with black text on it.

SIGNATURE EXTRACTION

In this phase, given the binary image of cheque, the actual signature is located and extracted from the whole cheque, discarding all other information including printed text, logos, and handwritten text other than the signature.

- Connected Components
- SURF
- Decision Trees

ANALYSIS

One we have the image of the actual signature, a set of features is extracted from it. These features are a quantifiable, unique description of the signature and define its intrinsic characteristics which allow us to associate it with a particular author.

- Convolutional Neural Network (CNN)
- Facenet (Experimental)

COMPARISON AND EVALUATION

This phase involves comparing the feature vector obtained from the unknown signature sample with feature vectors of known signatures of the alleged author, and deciding whether the unknown signature belongs to this author or not.

- One Class SVM
- FAR/FRR/ERR

RESULTS

SKILLED FORGERIES

Dataset	Accuracy
GPDS 960	93.5%
MYCT	87%
CEDAR	93%

RESULTS

SKILLED FORGERIES + DISGUISED SIGNATURES

Dataset	EER
SigComp2009	13.6%
SigComp2011/Chinese	23.4%
SigComp2011/Dutch	16.1%
SigComp2012	14.3%

DEMO

THANK YOU