where you come first

Signature Verification

Project Presentation

UBL Marathon 2022'

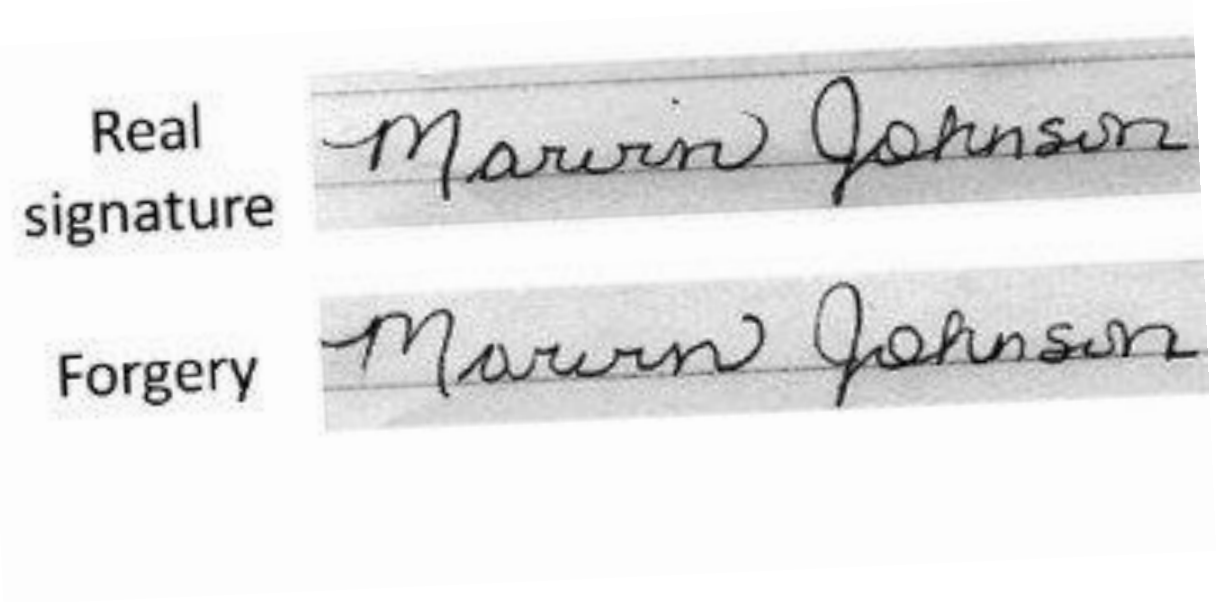
Team : PIAIC-ISL

Ascend

DATATHON Powered by UBL

Forgery detection

- **Signature forgery** refers to the act of falsely replicating another person's **signature**
- Sometimes even human eye is unable to detect the forged signatures.



Forgery scams

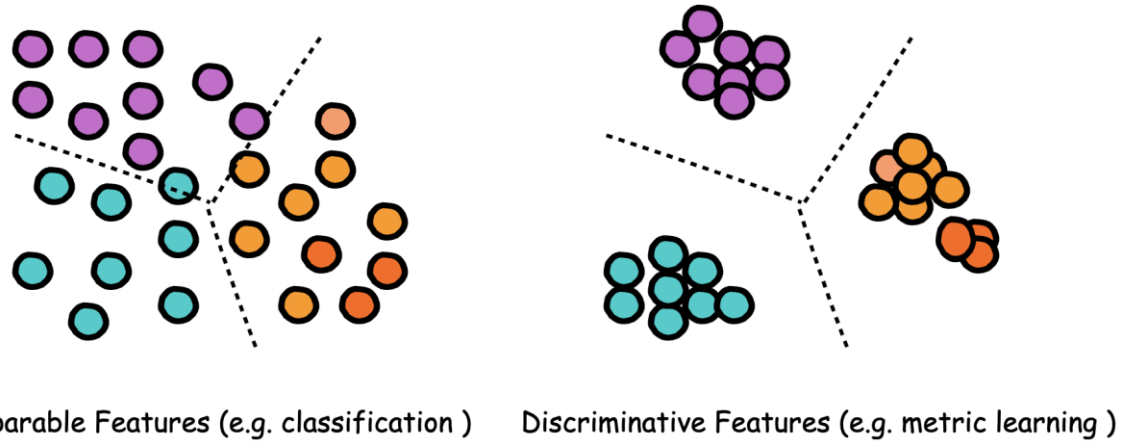
- Some banks, or their legal representatives, been faking signatures on **UK** court documents used to repossess people's homes and to recover other debts. The practice is taking place on industrial scale. It would mean a multibillion-dollar scandal that played out in the US was being repeated in the UK [1].
- In **US**, fake signatures on documents in the wake of the housing market bubble bursting in 2006-07, were among the "reckless and abusive mortgage practices" that resulted in a $25bn (£19bn) settlement between mortgage lenders and the US government and most US states in 2012[1].
- **KARACHI**: FIA has apprehended two men on charges of withdrawing around Rs1.5 million from a woman's bank account by faking her signature [2].
- **ISLAMABAD**: The amount of Rs7.6 million was fraudulently withdrawn from a bank account holder on a forged cheque and the branch manager was found involved in the fraud [3].

[1] https://www.theguardian.com/money/2019/feb/16/banks-faking-signature-campaign-evidence
[2] https://arynews.tv/rs1-5m-withdrawn-from-womans-account-with-fake-signature-fia/
[3] https://pkrevenue.com/banking-fraud-rs7-6-million-withdrawn-on-un-signed-cheque/

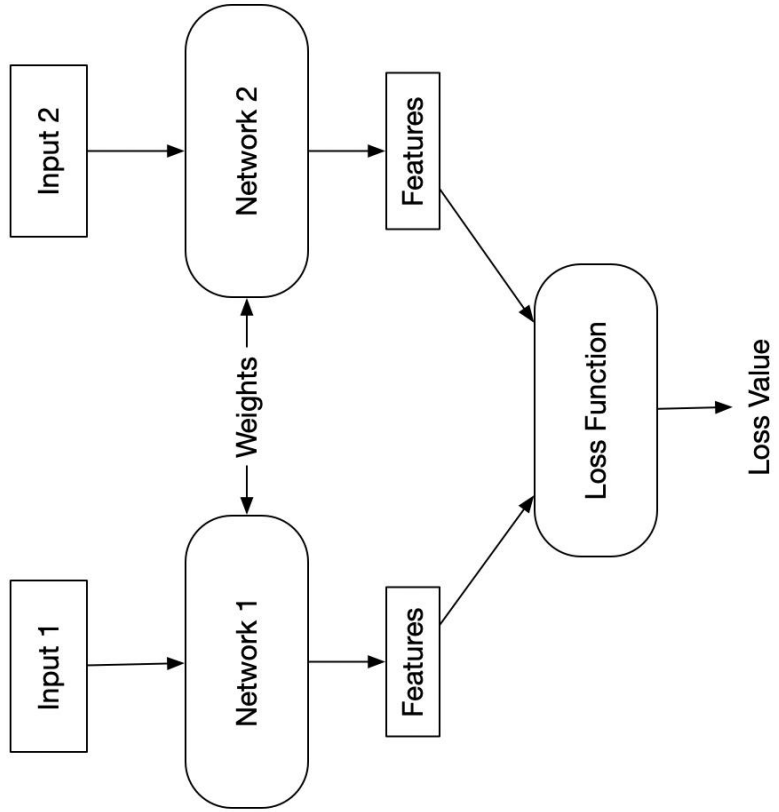
Solution

Deep Learning Convolutional Neural network

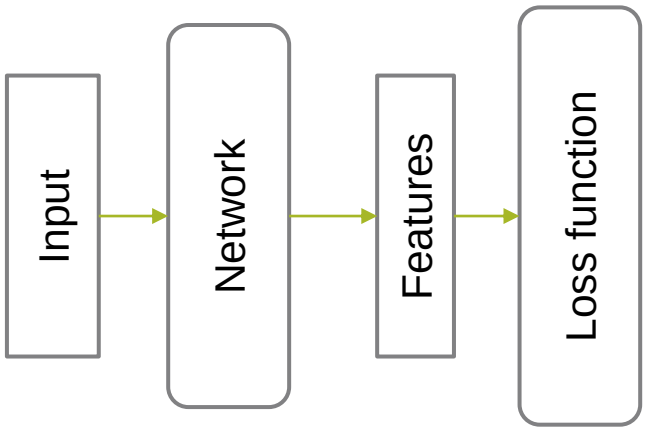
- Classification
- Metric Learning



Source: fastforwardlabs



Metric Learning



Classification

Dataset

Dataset	No. of Signers	No. of Genuine Signatures per Signer	No. of Forged Signatures per Signer	Language
CEDAR	55	24	24	English
BHSig260 (Hindi)	160	24	30	Hindi
BHSig260 (Bengali)	100	24	30	Bengali
UTSig	115	27	42	Persian
ICDAR 2011 SigComp (Chinese)	10	21 to 24	23 to 36	Chinese
ICDAR 2011 SigComp (Dutch)	10	23 to 24	8 to 16	Dutch
ICDAR 2009	79+19	12	24-36	Unknown
Test set	***30***	***5***	***5***	***English***

Data Preparation

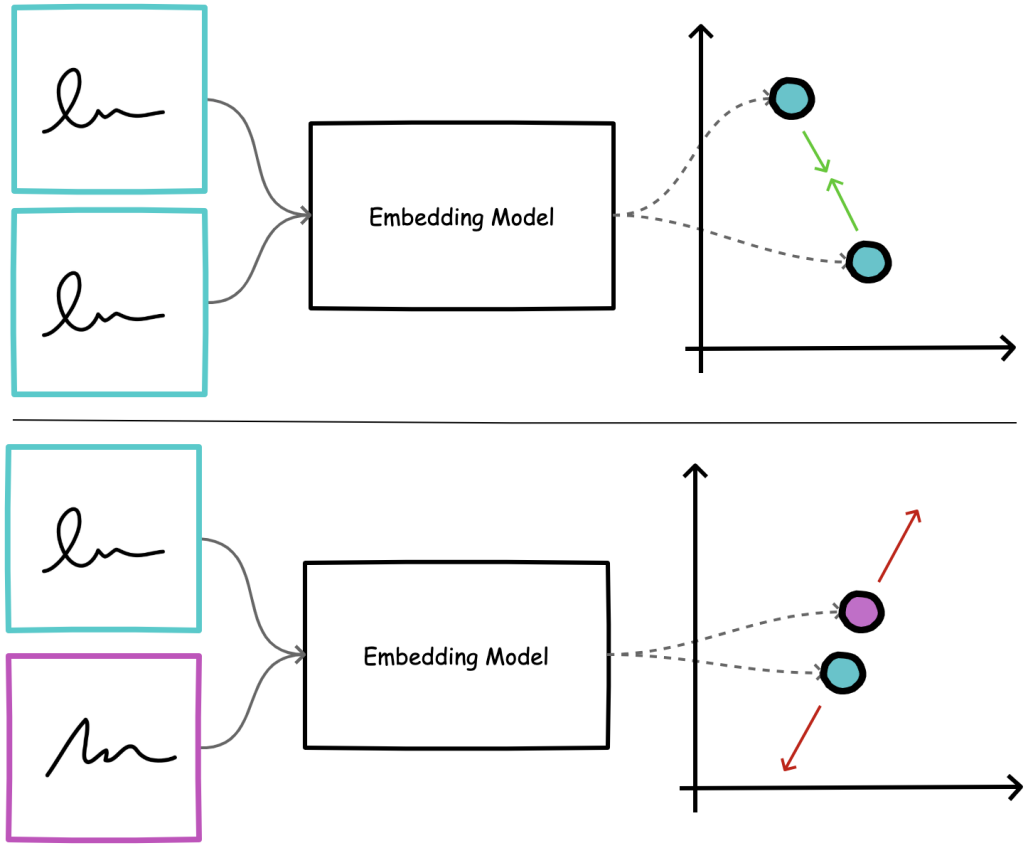
Binary Images

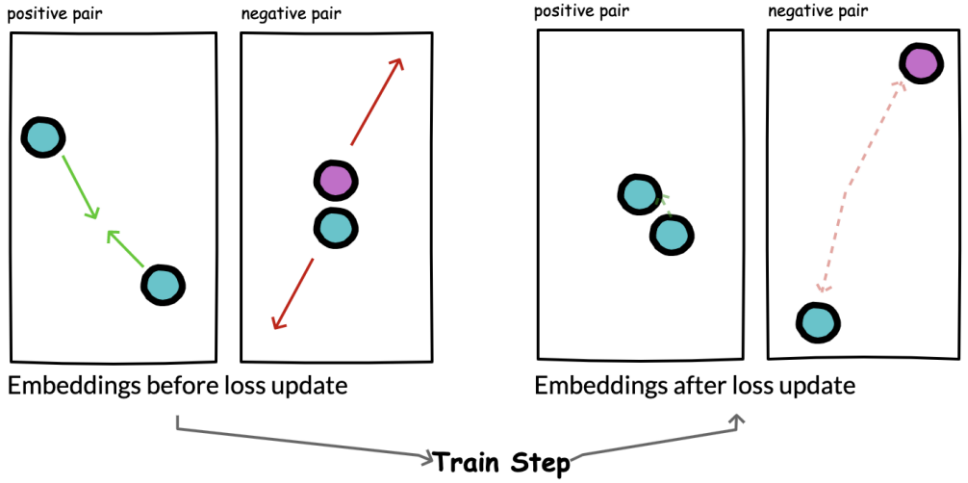
Images from different datasets are converted to binary images using otsu thresholding and saved as .jpg

Pair Creation:

- Select an image (say A) from genuine class
- Subset its dataset and writer from rest of data
- Randomly select the other image (say B) from that subset
- 50% time A and B are real image of same person and
- 50% time A is real and B is forged image of the same person

Model Training



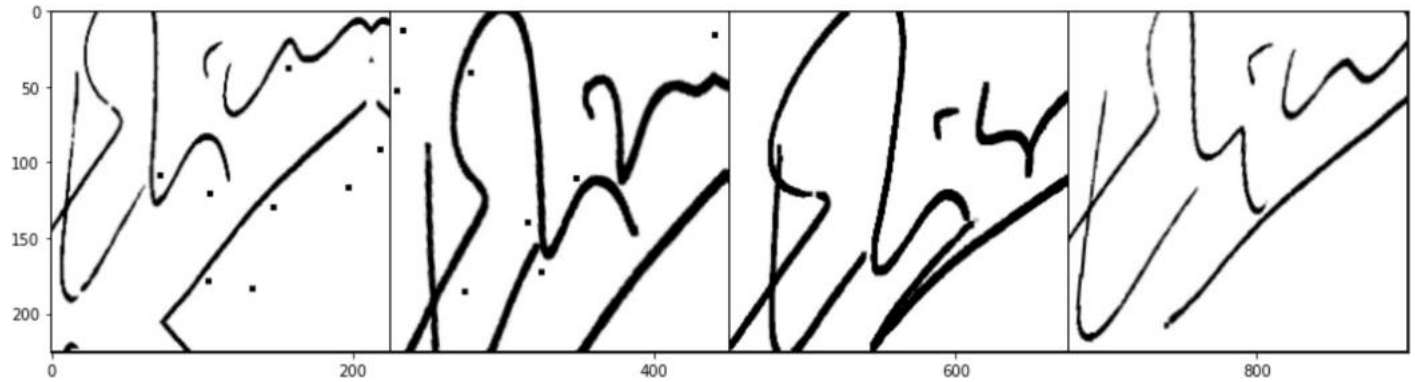


Source: Fastforwardlabs

Data augmentation

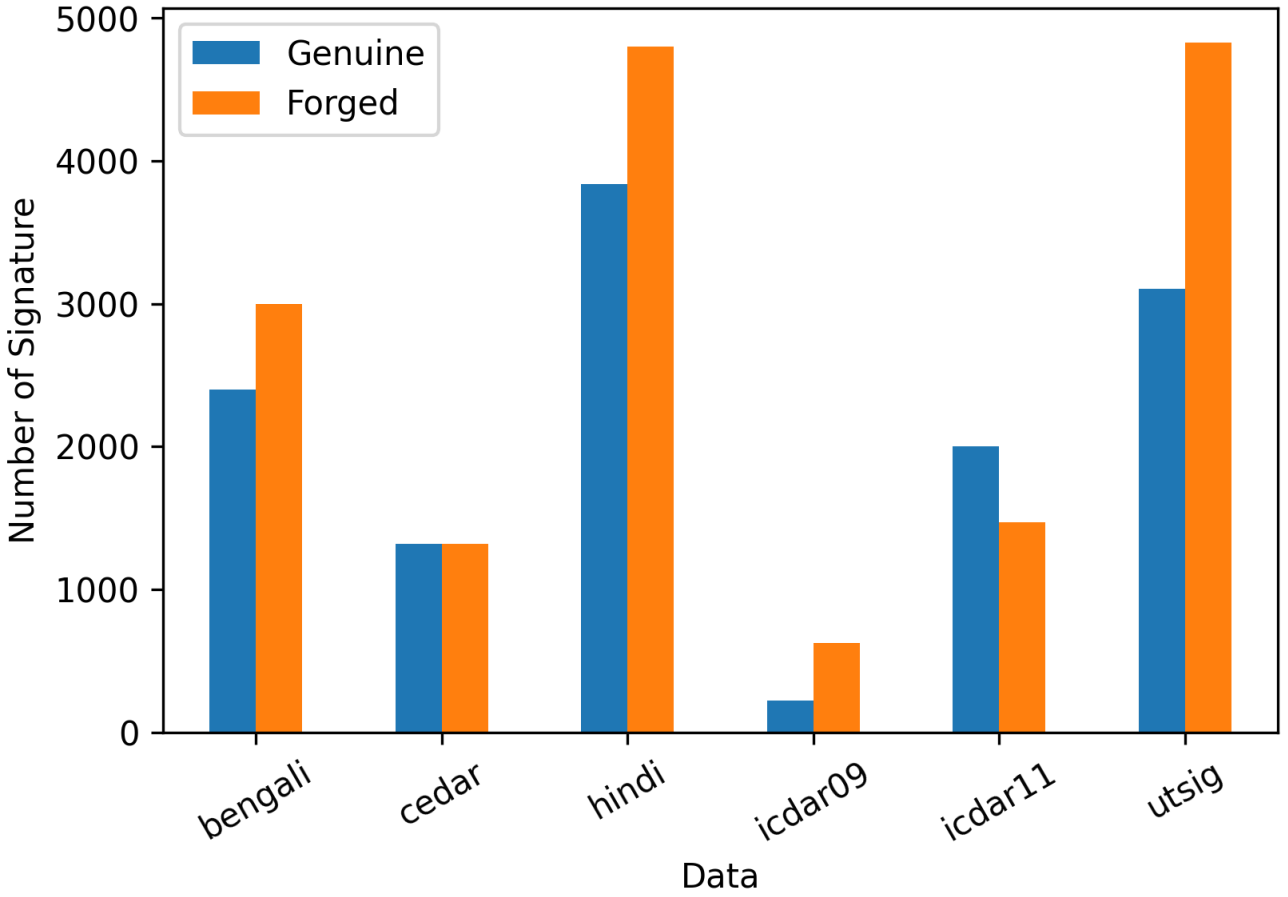
Augmentation consist of following modifications:

- Resize
- Random Crop
- Erosion
- Shift scale
- Rotate,
- CutOut



Sample Images after augmentation

Number of Signatures in each Dataset



Results

	precision	recall	f1-score	support
real	0.71	0.69	0.70	630
forged	0.71	0.73	0.72	664
accuracy			0.71	1294
macro avg	0.71	0.71	0.71	1294
weighted avg	0.71	0.71	0.71	1294

Dutch only

	precision	recall	f1-score	support
real	0.71	0.57	0.64	117
forged	0.64	0.77	0.70	117
accuracy			0.67	234
macro avg	0.68	0.67	0.67	234
weighted avg	0.68	0.67	0.67	234

Chinese only

Results

	precision	recall	f1-score	support
0	0.83	0.85	0.84	79
1	0.83	0.80	0.81	71
accuracy			0.83	150
macro avg	0.83	0.83	0.83	150
weighted avg	0.83	0.83	0.83	150

Results on test dataset

How to improve ?

Results are calculated on completely unseen data

Train our model on signature of all bank account holders

During test, model easily detect forged signature

Because it has already learnt the real signature

Salient Features of Work

MULTILINGUAL

EFFICIENT

OPEN SOURCE

Online weblink: https://piaic.herokuapp.com/

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Q&A

End of Presentation

Thank You!

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