**Signature Verification using Geometrical Features and Artificial Neural Network Classifier**

**Intra Class Variation** – difference between the signatures of a specific person

**Global Features** refers to features that describes the whole images   
**Local Features** refers to features obtained from image patches. (Small group of pixels)

Signatures are easy to spoof with some practice, and this makes them vulnerable to forgery. There are two significant types of forgery reported in the literature, i.e., skilled, and random forgery. In the skilled forgery, a person practices the genuine signature and tries to replicate it and in random forgery genuine signature of one user considered as the forged sample to the other signer. (Jain, 2021)

**Despite many signature verification algorithms present in the literature, intraclass variation is still an issue for the researcher. (Jain, 2021) – Problem 1**

Signature images have significant intra-class variations. To reduce the intra-class difference to some extent pre-processing is required before the extraction of the feature for better results. (Jain, 2021)

**Preprocessing:** Median Filtering, Binarization. Thickening, Dilation Operation (enhances the trajectories of the signature images), Otsu Segmentation, resizing.  
**Dataset Used:** MCYT-100, MCYT-75, GPDS, BHSig260, CVBLSig

**Feature Extraction: Two Global and Eight Local Features**

Global Features is obtained on the whole signature. It includes the number of connected components and the number of active pixels.

Local Features is obtained by dividing the signature image into 16 blocks of size 48 x 64. In each block, the extracted features include co-ordinates of the effective mass, distance between the center of mass and effective mass, number of active pixels, number of connected components, isolated points, average height, and width of the signature.

**Experimentation and Results:**

With these features, Artificial Neural Network is used as a classifier. The goal of the method is to know about the trajectory of the signature images. The ANN consists of 200 hidden neurons in one hidden layer and at the output layer SoftMax is used as the transfer Function. Scaled Conjugate Gradient is used for training with hold one out-validation.

The proposed method of (Jain, 2021) has recorded accuracy on the dataset BHSig Bengali and Hindi of 97.79% and 95.29%. On CVBLSig-V1 and CVBLSig-V2, It achieved 97.55% and 83.38% respectively.

The proposed signature verification method uses geometrical properties from the signature image. It works on a pixel level therefore it requires a long time to extract the features from the signature image.