**A new wrapper feature selection method for language-invariant offline signature verification**

According to (Banarjee, 2021), Researchers often use many features to improve the capability of signature verification models.

**Model and Experimentation:**

**Dataset**: CEDAR, UTSig, Sigcomp 2011 Dutch, Sigcomp 2011 Chinese, Sigcomp 2011 Bengali.

**Preprocessing**: Grayscale conversion, Binarization, Canny Edge Detection, SVD to convert the image into one dimensional static signal.

**Feature** **Extraction**: Classified into four categories: statistical, shape-based, similarity-based, and frequency based. Most feature extraction method in this paper are used for signals rather than image.

**Feature Selection:**

Feature dimensionality has a great impact on the classification of the model when lots of features are used.

When using many features some of it are redundant so feature selection is used to retain only the useful features from the original set thus resulting in the reduce dimensionality of the dataset. This results to more accuracy as well as efficiency in terms of time and memory complexity.

The aim of feature selection is to choose a subset of features from the original set with maximized classification accuracy and minimal number of features. Hence, FS problems are modeled as a binary optimization problem where the solution is limited to [0,1].

The motivation behind the development of BRDA is because RDA has shown impressive result compared to other state-of-the-art methods when applied to standard benchmark functions for optimization, real-world engineering optimization, etc.

**Results:**

The model used to classify whether the signatures are genuine or forged is the Naïve Bayes classifier then it was trained with WI and WD mode. The researchers tested the model on CEDAR (English), UTSig (Persian), Sigcomp 2011 Dutch, Sigcomp 2011 Chinese signature datasets. The evaluation metric used are EER and accuracy, it obtained **(WI: 0.01 & 99.36 | WD: 0.02 & 98.72)**, **(WI: 0.10 & 99.41 | WD: 0.11 & 98.98)**, **(WI: 0.03 & 99.28 | WD: 0.04 & 98.45)**, **(WI: 0.06 & 99.12 | WD: 0.02 & 99.03)** respectively. It obtained impressive results and is comparable and even outperform many state-of-the-art signature verification methods.

1. **Related Document about Feature Selection:**  
   Jia, H., Li, J., Song, W., Peng, X., Lang, C., & Li, Y. (2019). Spotted hyena optimization algorithm with simulated annealing for feature selection. IEEE Access, 7, 71943–71962. <http://dx.doi.org/10.1109/access.2019.2919991>.
2. Mafarja, M. M., & Mirjalili, S. (2017). Hybrid whale optimization algorithm with simulated annealing for feature selection. Neurocomputing, 260, 302–312. http: //dx.doi.org/10.1016/j.neucom.2017.04.053.