Adaptive Multi-Gradient Magnitude for Handwriting based Gender Identification

**Motivation**
- Gender identification plays a vital role in forensic applications, such as document authentication, suspecting person who committed crimes etc. In addition, it can be used for studying psychological behavior of the person.
- It assists forensic investigation to identify the actual crime along with the other biometric based methods.
- However, handwriting based Gender identification is challenging due to unconstrained handwriting and individual differences in writing.

**Proposed method**
- We explore Adaptive Multi-Gradient (AMG) Sobel kernels based feature for gender identification in this work.
- For each segmented text lines, the proposed method finds dominant points based on gradient directional symmetry of text pixels.
- The histogram operation is performed for the AMG features extracted corresponding to dominant points of respective Sobel kernels to find the values which contributes to highest peak.
- The feature vector is formed based on value of histogram highest peaks. The proposed method finds correlation between the feature vectors between first and successive text lines in the image.
- The consistency and inconsistency based on correlation is studied for gender identification.

**Experimental Results**
- We use 100 male and 100 female documents for experimentation. In addition, 990 images from QUWI, IAM-1, IAM-2 and KHATT.

**Conclusion**
- We have proposed a novel adaptive multi-gradient feature given by multi-gradient directional Sobel kernels for gender identification based on handwriting analysis.
- Dominant points are detected using gradient direction symmetry in normal and complement image.
- The correlation between first and successive text lines are used for gender identification.
- The method can be extended to word level in near future.