

## The Reproducibility and Repeatability of Modified Likelihood Ratio for Forensics Handwriting Examination

**Authors :** O. Abiodun Adeyinka, B. Adeyemo Adesesan

**Abstract :** The forensic use of handwriting depends on the analysis, comparison, and evaluation decisions made by forensic document examiners. When using biometric technology in forensic applications, it is necessary to compute Likelihood Ratio (LR) for quantifying strength of evidence under two competing hypotheses, namely the prosecution and the defense hypotheses wherein a set of assumptions and methods for a given data set will be made. It is therefore important to know how repeatable and reproducible our estimated LR is. This paper evaluated the accuracy and reproducibility of examiners' decisions. Confidence interval for the estimated LR were presented so as not get an incorrect estimate that will be used to deliver wrong judgment in the court of Law. The estimate of LR is fundamentally a Bayesian concept and we used two LR estimators, namely Logistic Regression (LoR) and Kernel Density Estimator (KDE) for this paper. The repeatability evaluation was carried out by retesting the initial experiment after an interval of six months to observe whether examiners would repeat their decisions for the estimated LR. The experimental results, which are based on handwriting dataset, show that LR has different confidence intervals which therefore implies that LR cannot be estimated with the same certainty everywhere. Though the LoR performed better than the KDE when tested using the same dataset, the two LR estimators investigated showed a consistent region in which LR value can be estimated confidently. These two findings advance our understanding of LR when used in computing the strength of evidence in handwriting using forensics.

**Keywords :** confidence interval, handwriting, kernel density estimator, KDE, logistic regression LoR, repeatability, reproducibility

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