

## Computation of Likelihood Ratio from Small Sample Set of Within-Source Variability

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### Abstract.

In this paper we describe a new method of likelihood ratio computation for score-based biometric recognition systems given a small number of samples in the within-source variability dataset (also called target set). Generally the number of samples in the within-source variability dataset is less than the number of samples in the between-source variability dataset (also called non-target set) and therefore the probability density function (pdf) of the within-source variability dataset cannot be estimated reliably compared to the pdf of the between-source variability. The proposed method estimates the pdf of within-source variability from estimates of the within-source variability mean and variance and the pdf of between-source variability by minimizing the Kullback-Leibler distance [1] of the pdf of the within-source variability to that of the between-source variability given within-source variability mean and variance. It thus finds a conservative estimate of the pdf of within-source variability. Working out this optimization problem results in an log likelihood ration that is a second order polynomial of a given score value. We apply this approach of likelihood ratio computation in the area of face recognition. An existing commercial face recognition system [2] is used to obtain scores for the sets of within-source variability and between-source variability from a set of image data taken from SCFace database [3]. It contains images taken in uncontrolled indoor environment using five video surveillance cameras of various qualities. For each subject, there are also mug shots taken in same conditions as would be expected for any law enforcement or national security use. We explore the feasibility of using an existing biometric face recognition system in forensic application by discussing some specific cases in forensic framework.

### References

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- [3] Grgic, M., Delac, K., Grgic, S., "SCface - surveillance cameras face database", *Multimedia Tools and Applications Journal*, 51(3), 863-879, 2011.