

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need: Latent Fingerprint Image Quality Usage

Describe the need:

(1) Develop tools allowing the measure of latent image quality based on the image, its quality map or other features; (2) Research on the effectiveness and reliability of using automated latent finger image quality scores to systematically determine suitability and assign verification levels; (3) Research on the effectiveness and reliability of using quality scores to guide AFIS (Automated Fingerprint Identification System) searches.

Keyword(s): Latent print, Image Quality, AFIS, Suitability

Submitting subcommittee(s): Friction Ridge **Date Approved:** 2/1/2021

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

Yes. This information will be useful in the Examination series of documents because it will help to improve and standardize the analysis suitability decisions and to provide support for the choice of verification regimes.

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

RTI, UNIL and IDEMIA are currently conducting research under CTTSO contract N4175620C3022 to develop a new quality metric based on deep learning techniques that can support both examiners and AFIS work.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

Swofford, H., Champod, C., Koertner, A., Eldridge, H., & Salyards, M. (2021). A method for measuring the quality of friction skin impression evidence: Method development and validation. Forensic Science International, 110703. <https://doi.org/10.1016/j.forsciint.2021.110703>

Kalka, N. D., Beachler, M., & Hicklin, A. (2020). LQMetric: A Latent Fingerprint Quality Metric for Predicting AFIS Performance and Assessing the Value of Latent Fingerprints. Journal of Forensic Identification, 70(4), 443-463.

Chugh, T., Cao, K., Zhou, J., Tabassi, E., & Jain, A. K. (2018). Latent Fingerprint Value Prediction: Crowd-Based Learning. IEEE Transactions on Information Forensics and Security, 13(1), 20-34. <https://doi.org/10.1109/TIFS.2017.2721099>

Yoon, S., Liu, E., & Jain, A. K. (2015). On Latent Fingerprint Image Quality. In U. Garain & F. Shafait (Eds.), Computational Forensics: 5th International Workshop, IWCF 2012 and 2014 (pp. 67-82). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-20125-2_7

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

This research impacts “Determination of accuracy and reliability of forensic analyses and conclusions, including potential sources of error”, “Development and validation of standardized forensic methods and conclusions”, “Evaluation of the effectiveness of varied types of review and/or verification of casework, testimony, and investigative leads” and “Scientific foundations for expert conclusions of forensic evidence”.

5. In what ways would the research results improve current laboratory capabilities?

Latent fingerprint image quality measurements have proven to be inconsistent. Improvement in this technology is necessary to reduce error and improve efficiency. Improved image quality measurement will assist examiners in the ACE-V (Analysis, Comparison, Evaluation, Verification) process by assessing risk of error. Improved latent quality measurements will also help streamline examination and AFIS search workflows through systematically determining sufficiency, as well as suitability for AFIS, and level of verification required. This type of tool will also assist researchers in developing and validating chemical friction ridge detection techniques.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

It is difficult to standardize AFIS and ACE-V methodologies without reliable image quality measurement techniques.

7. In what ways would the research results improve services to the criminal justice system?

Improved image quality measurements (providing new tools) and understanding how to use those metrics will likely reduce examiner error rates, as well as boost workload efficiency by assigning examiner resources through rational business processes.

8. Status assessment (I, II, III, or IV):

II

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III

Existing current research is being conducted	II	IV
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This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.