B24 Seeing Through Noise: Investigating Information Sampling and Weighting in Fingerprint Recognition

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After attending this presentation, attendees will better understand the visual processes at the root of fingerprint examination and comparison. Understanding the perceptual processes that underlie pattern recognition in fingerprint examination can lead to improvements in recruitment, training, and examination guidelines, as well as error mitigation.

This presentation will impact the forensic science community by improving understanding of the perceptual processes that underlie pattern recognition in fingerprint examination.

The present research seeks to model and compare the manner in which fingerprint examiners and naïve observers sample and weight information across different fingerprint regions. This research also investigated whether any differences in information sampling and weighting are due to: (1) differences in the information available in the print; (3) learned differences in expertise; or, (3) general perceptual biases.

Artificially generated fingerprints were presented as experimental stimuli to control for low-level cues of identity (e.g., luminance, contrast, and/or size information). Fingerprint stimuli consisted of a central core and a peripheral region. Each region could be independently manipulated, meaning that the core could be drawn from a different fingerprint identity than the periphery. The boundary of the regions was masked to avoid completion cues. Additionally, Gaussian noise masks were used to simulate the loss of detail typically encountered in latent prints. In a 2-Alternative Forced-Choice (2AFC) recognition task, a target and probe display were presented serially, for one second each, with a one-second inter-stimulus interval. To examine information sampling across the core and periphery regions, the relationship between the target and distractor was manipulated using five conditions: (1) only the core region is visible (core-only); (2) only the peripheral region is visible (periphery-only); (3) only the core region changes (core-change); (4) only the peripheral region changes (periphery-change); and, (5) both regions change (both-change). Additionally, three core-to-periphery size ratios were used to assess information weighting across the fingerprint regions. Participants, consisting of naïve observers as well as fingerprint examiners at different levels of experience, indicated their recognition response (match/no match) and response confidence (six-point scale) after every trial.

Initial results were analyzed using Signal Detection Theory, and models describing the weighting and integration of information from the core and peripheral regions will be presented. Additionally, the potential impact of these findings on fingerprint training, recruitment, and examination guidelines will be discussed.

Fingerprint Examination, Visual Processing, Information Sampling