Investigation and development of interpretative methods and data for the evaluation of forensic footwear examination

Looking at AI solutions to improve the way footwear intelligence and evidence is used and reported within the criminal justice system.

Key details

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Police region	London
Collaboration and partnership	• Lancashire Constabulary • National Footwear Operations Group • National Fingerprint and Footwear Strategy Board This project is supported by the College of Policing Bursary scheme
Level of research	PhD
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Date due for completion	December 2025

Research context

Footwear examination is widely used in criminal investigations. Different models are used to evaluate findings worldwide. Although the UK has the National Footwear Database, it is not used to

support evaluation, leading to differences in opinion.

Miscarriages of justice show that misinterpretation of forensic evidence and failure to communicate the findings clearly to the criminal justice system (CJS) are key issues.

This research aims to develop a model for evaluation of footwear evidence, incorporating available data and expert judgement. Methods currently used will be evaluated to develop best practice and standardisation. An assessment of reference data will be made and options for better data sharing explored. Concerns and challenges to the current methods will be considered and used to inform the design of a model to deliver a reliable, transparent and consistent outcome. Sensitivity analysis will be conducted to understand the impact of current variations.

The initial aim is to provide a tool for practitioners to evaluate footwear evidence and communicate it to end users.

A model will then be constructed to enable triage of cases, ensuring that resources can be directed to investigations where forensic evidence is of value. By considering contextual information, it will mitigate the risk of cognitive bias, by removing the task of evaluating this information from the practitioner.

It is anticipated that additional variables can be incorporated into the model, including other forensic evidence, thereby negating the risk of double-counting and reducing the occurrence of confirmation bias. Factors influencing the reliability of and confidence in forensic conclusions will be incorporated, such as quality of evidence, availability and relevance of data, and competence and experience of forensic specialists.

A model will then be attempted for users outside the forensic community, including non-forensic evidence to enable users in the CJS to evaluate evidence, its significance as a whole and support decision-making.

Research methodology

A detailed systematic review will be undertaken to evaluate and classify the existing body of research in forensic footwear analysis and identify the gaps. This will follow the Campbell Collaboration method and will be developed in accordance with the Preferred reporting items for systematic reviews and meta analyses (PRISMA) checklists. EPPI reviewer software will be used to support the systematic review.

A study of cases actually submitted to an operational forensic footwear unit will be undertaken to understand their relationship to the research published in the literature and determine whether the areas of research identified in the systematic review meet the needs of practitioners. The most commonly occurring scenarios will be identified, together with circumstances which are difficult to evaluate using existing methods commonly in use.

These findings will then be used to inform the research to develop evaluative tools using Bayesian network modelling and existing data and knowledge. Models will be developed ranging from a simple Bayesian network based on a case challenged at the appeal court (R v T), followed by more complex models incorporating more information. A triage model will be produced to screen cases prior to examination. Finally, if time allows, the model will be expanded to incorporate other evidence types, both forensic and non-forensic.

Tags

- Forensics