U.S. Department of Justice

Office of Justice Programs

Office of Communications

Washington, D.C. 20531

GRANT NOTIFICATION Grant Number: 2016-DN-BX-0152

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Title of Program: FY 16 Research and Development in Forensic Science for Criminal Justice Purposes

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Amount of Award: $ 213,735 | Date of Award: 09/12/2016

Awarding Agency: National Institute of Justice
Alissa Genovese

Supplement: No

Statutory Authority for Program:
FY16(NIJ - S&LLEA DNA/Other Forensics) Pub. L. No. 114-113, 129 Stat. 2242, 2308; 28 USC 530C

Impact/Focus: Research | CFDA Number: 16.560

Project Description:

As submitted by the proposer:
Forensic footwear examination and interpretation is a complex and distributed activity influenced by a host of competing and evolving factors that vary as a function of case attributes and examiner experience. The entire pattern recognition process and ultimate conclusion drawn by the expert decision maker with regard to source is an amalgamation of several sources of variability that are not necessarily independent, nor linearly related. Although most experts can well-articulate their conclusions and justifications for a given case (even in the presence of variations between crime scene samples and known exemplars), it is much more difficult for the community to characterize and quantify intra- and inter-analyst variability in expert decisions across several cases that vary in terms of quality and complexity. Moreover, it is nearly impossible to directly state the probability of a single decision rule let alone a dominating rule. For this reason, the idea of inferring a preference model using a data mining technique is very attractive. Therefore, the aim of this project is to use the dominance-based rough set approach (DRSA) to better discern how examiners interpret the pattern recognition process of footwear comparison from start to finish. With this model, the expert need only answer questions regarding a questioned-source comparison and then provide an exemplary decision (e.g., identification, exclusion, etc.), and through the rough set approach, all available information regarding the expert's findings can be used to produce preferential model(s) that enable an understanding of the decision maker's reason(s) for his or her choice(s). In accomplishing this goal using the aforementioned method, four additional objectives will also be achieved: (i.) quantification of variability in expert decisions via accuracy and positive predictive value, (ii.) identification of factors that affect footwear examination and conclusions via decision rule induction, (iii.) evaluation of decision rule quality as a function of strength, support,

certainty and lift factor, and finally, (iv.) an evaluation of the interaction between factors (e.g., impression quality, number of concordant randomly acquired characteristics (RACs), examiner years of
experience, etc.) and expert decisions.

Note: This project contains a research and/or development component, as defined in applicable law.

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For more information about this grant, contact the Office of Justice Program's Office of Communications at 202/307-0703.