Abstract: Due to the growing popularity of scientific evidence, such as DNA and fingerprint matching, the communication and interpretation of legal evidence has become a real challenge [1, 2, 3]. This is illustrated by some of the recent miscarriages of justice (like the notorious cases of Sally Clark and Lucia de Berk). The automated extraction of rules, arguments and counter-arguments from Bayesian networks will facilitate the communication between lawyers and judges on the one hand and forensic experts on the other.

We propose a method that unifies models of legal proof from two different approaches to legal reasoning: Argumentation [4, 5] and Bayesian networks (BNs) [6]. Argumentation models are closer to the natural way of human reasoning, while BNs can represent uncertain information better than the qualitative argumentative models can. One of the goals of our research is to automatically generate arguments from a given BN. We follow the ASPIC+ [5] definition of an argument where every argument is either a simple variable instantiation or the application of a rule. The ASPIC+ framework resolves conflicts between arguments by means of an ordering on those rules. Our method of identifying rules is based on a notion of strength which implies that this ordering follows naturally from the strength of the rules. We use a strength measure that equals the probability of the conclusion given the premise divided by the prior probability of the conclusion. This particular measure of strength, also known as the normalized likelihood [7], corresponds with the intuition of positive influence. A rule, contrary to a BN arc, represents a reasoning step and therefore rules in both directions (along and against the direction of the arc in the BN) can exists simultaneously. We calculate the strength of every candidate rule and discard the rules that have a strength less than or equal to one. With the remaining rules and their ordering the ASPIC+ argumentation framework defines the applicable arguments and their attack relation. We explicitly disallow the application of rules against the direction of the corresponding arc in
the BN after rules along the direction of an arc. This has the effect that a reasoning error that was identified by Pearl [8] can no longer be made. The described method can be used to explain the probabilistic results of the Network in terms of arguments.

References:


