

My research lies in the philosophy of law, epistemology and their intersection. I am interested in questions about reasoning, evidence and probability, combined with legal and ethical questions about due protection against harm and fair allocation of risk. In exploring these questions, my work focuses on the use of statistical evidence at trial, the fairness of scoring algorithms, and the nature of legal reasoning and decision-making.

1. Statistical evidence at trial

One theme in my work is the use of statistical evidence at trial, especially as a lens to think about the risks of mistaken decisions and the rights of defendants against these risks.

The paper 'Profile Evidence, Fairness and the Risks of Mistaken Convictions (forthcoming in *Ethics*, co-authored with Collin O'Neil) examines the question of whether profile evidence—that is, evidence of a statistical correlation between possessing certain characteristics and committing a crime—can be used as evidence of guilt at trial. The case law tends to oppose its use, but the scholarly literature has struggled to justify this opposition, largely because this evidence can be strongly probative of guilt. The paper shows that if profile evidence were admitted at trial, defendants who fit profiles positively correlated with crime would be exposed to an unfairly higher risk of mistaken conviction compared to defendants who do not fit these profiles. By contrast, other forms of evidence, such as eyewitness testimony or trace evidence, do not raise the same fairness concerns.

Another question I explore in my work is whether statistical evidence, alone, can ever be enough to warrant a conviction. As is apparent from the so-called paradoxes of naked statistical evidence, the probability of a defendant's guilt, solely based on certain kinds of statistics, can be extremely high. But can this statistics-based probability warrant a conviction? My paper 'Trial by Statistics: Is a High Probability of Guilt Enough to Convict?' (forthcoming in *Mind*) defends a negative answer to this question. I argue that, even when the probability of guilt based on the naked statistics is high, the risk of falsely convicting an innocent can still be unacceptably high.

The two papers I described above show that statistical evidence tends to encroach upon defendants' rights to fair and due protection against the risks of false convictions. There are nuances, however. The statistics underlying DNA evidence and some other forms of expert evidence are not as problematic as group-based statistical correlations. My analysis captures these nuances, while other prominent accounts in the literature do not, as I explain in 'Proof Paradoxes and Normic Support: Socializing or Relativizing?' (forthcoming in *Mind*). I develop a more detailed account of different types of statistical evidence in my talk 'Varieties of Statistical Evidence' to be presented at the annual conference of the Philosophy, Politics and Economics Society in March 2020.

My published and ongoing work on the use of statistical evidence at trial form the backbone of my book-length project *Statistics in the Criminal Trial: Risk, Fairness and Truth*. Besides providing an overview of different forms of statistical evidence used in criminal trials, the book examines whether this evidence raises specific legal, moral and epistemological concerns, as many believe, or whether ‘all evidence is statistical’, as judge Richard Posner put it. I plan to submit a book proposal to a publisher by the end of the academic year 2019-2020.

2. Algorithmic fairness

A project I have recently undertaken, building on my work on statistical evidence, examines the fairness of algorithms predicting criminal behavior. These algorithms are used in some jurisdictions to help judges make decisions about bail and sentencing. In the computer science literature, algorithmic fairness is understood in terms of predictive parity and classification parity. Predictive parity requires that, for individuals belonging to different demographic groups, algorithmic predictions be equally reliable. Classification parity, instead, requires that similarly situated individuals, regardless of their membership in a demographic group, be exposed to the same risk of classification error. The received view, following a number of impossibility results, is that no algorithm can concurrently satisfy both conceptions of fairness, and thus there are tradeoffs between pursuing one or the other.

I believe this framing of the debate is mistaken. Classification parity and predictive parity can both be achieved so long as the accuracy of the algorithm—that is, its diagnostic ability to tell apart individuals who will commit crimes from those who will not—is adequate. Achieving algorithmic fairness requires adequate algorithmic accuracy, as I argue in the talk ‘Is Algorithmic Fairness Possible?’ (Rutgers University, November 2019). I demonstrate this claim by simulating a decision algorithm for binary classification, showing that departures from classification and predictive parity become smaller as algorithmic accuracy increases. I am now turning this talk into a journal article.

3. Legal evidentiary reasoning and legal proof

Another theme in my work concerns the nature of legal evidentiary reasoning and legal proof. Legal scholars have been vigorously debating whether a probabilistic, Bayesian framework is an adequate theory of evidential reasoning in the law. My paper ‘Evidential Reasoning’ in the *Handbook of Legal Reasoning and Argumentation* (Springer 2018, co-authored with Bart Verheij) highlights distinctive strengths and weaknesses of probabilistic and non-probabilistic theories. In ‘Probability and Plausibility in Juridical Proof’ (*International Journal of Evidence and Proof* 2019), I argue that the insights of Ronald Allen and Michael Pardo’s relative plausibility theory—the most developed non-probabilistic theory of legal evidentiary reasoning—can be expressed in the language of probability. The same conciliatory attitude motivated the work in my dissertation ‘Statistics and Probability in Criminal Trials’ in which

I put forward New Legal Probabilism, a theory of evidentiary reasoning that combines probabilistic and non-probabilistic elements.

Despite my conciliatory attitude, I have come to realize that the Bayesian approach, in some fundamental way, is inadequate as a theory of legal proof insofar as it is mostly concerned with assessing the posterior probability of a defendant's guilt. The reason for this inadequacy was stated earlier in the discussion about statistical evidence. That is, even when the posterior probability of guilt is high, innocent defendants can still be subject to an excessively high risk of false conviction. If I am right, the literature on the so-called prosecutor's fallacy has overstated the importance of estimating the posterior probability of guilt. I spoke on the topic last year at the CUNY Graduate Center in a talk titled 'Rethinking the Prosecutor's Fallacy'. I am now turning this talk into a journal article.

In another working paper, titled 'Probability Thresholds, Adversarial Scrutiny and Legal Proof', I focus on how the risk of false convictions can be reduced at trial. In order to keep this risk low—I argue—the evidence forming the basis for the decision should be subject to adversarial testing. Borrowing some of the language in Deborah Mayo's *Statistical Inference as Severe Testing* (Cambridge UP, 2018), my claim is that the prosecutor's case against the defendant should pass a 'severe test'. Thus, legal standards of proof cannot function as mere probability thresholds. They should instead serve as safeguards ensuring the prosecutor's case survived a severe adversarial test, and only if it did, would a conviction be justified.

I was recently invited to write the entry 'Legal Probabilism' for the *Stanford Encyclopedia of Philosophy*. This will give me an opportunity to further reflect on probability theory as a framework for analyzing evidentiary reasoning and legal proof.

4. Weight of evidence

Finally, I am undertaking a multiyear project together with legal theorist Christian Dahlman of Lund University, entitled 'Towards a Theory of the Weight of Evidence: Rethinking Trial Decisions.' The project brings together scholars in philosophy, law and economics, as well as partners outside academia such as the Swedish Police Authority. The central claim is that trial decisions should not only be guided by the 'balance' of the evidence, but also by its 'weight.' Even if the available evidence, on balance, tips strongly toward the defendant's guilt, it may be deficient and lack weight for a number of reasons. For example, the available evidence may be one-sided and partial, or relevant information may be missing. Except for few sparse suggestions in the literature, there is no well-developed theory of the weight of evidence to date. The project has three aims: (a) to offer a precise articulation of evidential weight; (b) to assess how considerations of evidential weight affect the accuracy and fairness of trial decisions; (c) to formulate guidelines for judges and jurors on how to assess the weight of evidence. The project has received support from the Söderberg Foundation in Sweden. I am now seeking support from funders in the U.S.