A model of jury decisions where all jurors have the same evidence

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Abstract

Under the independence and competence assumptions of Condorcet's classical jury model, the probability of a correct majority decision converges to certainty as the jury size increases, a seemingly unrealistic result. Using Bayesian networks, we argue that the model's independence assumption requires that the state of the world (guilty or not guilty) is the latest common cause of all jurors' votes. But often – arguably in all courtroom cases and in many expert panels – the latest such common cause is a shared 'body of evidence' observed by the jurors. In the corresponding Bayesian network, the votes are direct descendants not of the state of the world, but of the body of evidence, which in turn is a direct descendant of the state of the world. We develop a model of jury decisions based on this Bayesian network. Our model permits the possibility of misleading evidence, even for a maximally competent observer, which cannot easily be accommodated in the classical model. We prove that (i) the probability of a correct majority verdict converges to the probability that the body of evidence is not misleading, a value typically below 1; (ii) depending on the required threshold of 'no reasonable doubt', it may be impossible, even in an arbitrarily large jury, to establish guilt of a defendant 'beyond any reasonable doubt'.

Keywords: Condorcet jury theorem, Bayesian networks, Parental Markov condition, conditional independence, interpretation of evidence

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