Boosting Legal Probabilism (or Beyond Legal Probabilism 1.01)

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1 The Book

1.1 Brief Description

In one or two paragraphs, describe the work, including its rationale, approach, and pedagogy. (This book is... It does... Its distinguishing features are...)

This book boosts legal probabilism to its limits. It begins with legal probabilism 1.01, the simplest version of the theory, and examines why it falls prey to several conceptual difficulties. The bulk of the book develops legal probabilism 1.02, a more sophisticated version that addresses many of the limitations of its simpler version. The book also examines to what extent certain difficulties cannot be met becasue of inherent limitations of legal robabilism.

Legal probabilism 1.01 was developed in the 70ies and 80ies although its roots go back to the early days of probability theory to names such as Bernoulli, Laplace, Condorcet. The 1.01 version comprises a familiar repertoire: Bayes' theorem, likelihood ratios, reasoning fallacies, probability thresholds, expected utility maximization. This repertoire has proven useful in a number of ways, especially in the assessment of explicitly quantitative evidence such as DNA matches and expert evidence more generally. The assessment of nonquantitive evidence, such as eyewitness testimony, and the aggregation of quantitive and non-quantitive evidence have proven more challenging. Legal probabilism 1.01 is also liable to a host of conceptual difficulties: the conjunction problem, the problem of priors, paradoxes of naked statistical evidence. These difficulties are well-known and have commanded the attention of philosophers and legal scholars. Other difficulties are less familiar: the problem of complexity, the problem of soft variables, the problem of corroboration. Familiar and unfamiliar difficulties parallel objections that Bayesianism faces in contemporary analytic epistemology: the lottery paradox, the preface paradox, the problem of coherence, holism, second-order evidence. Legal probabilism 1.01 can hardly answer these challenges. Either we reject legal probabilism altogether or we move past its 1.01 version. This book takes the latter route.

A prototype of legal probabilism 1.02 already exists in the literature in forensic science and artificial intelligence. Bayesian networks have been added to the repertoire. Bayesian networks can formalize in probabilistic language notions familiar in argumention theory such as undercutting and rebuttign defeaters, as well as notions such as plausibility and coherence familiar from the story of model of judicial fact-finding. Once stories (narrations or more generall explanation of the evidence) are represented as Bayesian networks, features of can be explicated in terms of corresponding formal properties of the network.

The conceptual developments are accompanied by technical accounts. **R** code capturing to the technical features developed is made available to the reader.

A secondary goal is to present a unified introduction to multiple positive contributions of legal probilism to the status of legal evidence evaluation, as many such results are scattered over many professional journals from different fields, and only by understanding them (rather than focusing only on abstract philosophical thought experiments) the reader can develop a proper assessment of the situation.

1.2 Outline (new version)

I Legal probabilism and its foes
- 1 The emergence of legal probabilism
  - 1.1 Famous cases
  - 1.2 Probabilistic evidence
  - 1.3 Trial by mathematics
  - 1.4 Some history
- 2 A skeptical perspective
  - 2.1 The difficulty about conjunction
  - 2.2 The complexity objection
  - 2.3 The problem of corroboration
  - 2.4 The problem of artificial precision
  - 2.5 Naked statistical evidence
  - 2.6 The problem of priors
  - 2.7 The reference class problem
  - 2.8 Non-probabilistic perspectives

II Evidence assessment
- 3 Bayes' Theorem and the usual fallacies
  - 3.1 Assuming independence
  - 3.2 The prosecutor's fallacy
  - 3.3 Base rate fallacy
  - 3.4 Defense attorney's fallacy
  - 3.5 Uniqueness fallacy
  - 3.6 Case studies
- 4 Complications and caveats
  - 4.1 Complex hypotheses and complex bodies of evidence
  - 4.2 Source, activity and offense level hypotheses
  - 4.3 Where do the numbers come from?
  - 4.4 Modeling corroboration
  - 4.5 Stories, explanations and coherence
- 5 Likelihood Ratios and Relevance
  - 5.1 Likelihood ratio as a measure of evidence strength
  - 5.2 The risk of false positive and its impact
  - 5.3 Hypothesis choice
  - 5.4 Levels of hypotheses and the two-stain problem
  - 5.5 Relevance and the small-town murder scenario
  - 5.6 The cold-hit confusion
  - 5.7 Likelihood ratio and cold-hit DNA matches
- 6 Bayesian Networks
  - 6.1 Bayesian networks to the rescue
  - 6.2 Legal evidence idioms
  - 6.3 Scenario idioms
  - 6.4 Modeling relevance
  - 6.5 Case study: Sally Clark
  - 6.6 DNA evidence
- 7 Corroboration
  - 7.1 Boole's formula and Cohen's challenge
  - 7.2 Modeling substantial rise in case of agreement
  - 7.3 Ekelöf's corroboration measure and evidentiary mechanisms
  - 7.4 General approach with multiple false stories and multiple witnesses

8 Coherence
8.1 Existing probabilistic coherence measures
8.2 An array of counterexamples
8.3 Coherence of structured narrations with Bayesian networks
8.4 Application to legal cases
9 New legal probabilism
9.1 Desiderata
9.2 A probabilistic framework for narrations
9.3 Probabilistic explications of the desiderata
9.4 Bayesian network implementation
III Trial Decisions
10 The functions of the proof standards
10.1 Conceptual desiderata
10.2 Protecting defendants
10.3 Error reduction and error distribution/allocation
10.4 Dispute resolution and public deference
10.5 Justification and answerability
11 Standards of proof
11.1 Legal background
11.2 Probabilistic thresholds
11.3 Theoretical challenges
11.4 Specific narratives
11.5 The comparative strategy
11.6 The likelihood strategy
11.7 Challenges (again)
11.8 Probabilistic thresholds revised
11.9 Bayesian networks and probabilistic standard of proof
12 Accuracy and the risk of error
12.1 Minimizing expected costs
12.2 Minimizing expected errors
12.3 Expected v. actual errors
12.4 Competing accounts of the risk of error
12.5 Bayesian networks and the risk of error
13 Fairness in trial decisions
13.1 Procedural v. substantive fairness
13.2 Competing measures of substantive fairness
13.3 Bayesian networks and fairnesss
14 Alternative accounts and legal probabilism
14.1 Baconian probability
14.2 Relative Plausibility
14.3 Arguments
14.4 Sensitivity
14.5 Normic Support
14.6 Justification/foundherentism
14.7 Completeness
14.8 Relevant alternatives
14.9 Knowledge
15 Conclusions

1.3 Outstanding Features of the Book

- (First) comprehensive sustained philosophical discussion of legal probabilism.
- Multi-faceted in its incorporation of insights from various discussions present in legal, philosophical, and forensic research.
- With a practical accent, due to the implementation of the conceptual points by means of bayesian networks and **R** programming language.

what else?

1.4 Apparatus

a. Will the book include photographs, line drawings, cases, questions, problems, glossaries, bibliography, references, appendices, etc.?

Yes, the book will contain various plots, either of Bayesian networks, or some other data visualisations generated by `ggplot2`. The book also will contain bibliography.

b. If the book is a text, do you plan to provide supplementary material to accompany it? (Teacher's manual, study guide, solutions, answers, workbook, anthology, or other material.)

The book will be accompanied by an online-only appendix detailing the use of the `R` code in the book and the source code we used.

1.5 Competition

a. Consider the existing books in this field and discuss specifically their strengths and weaknesses. Spell out how your book will be similar to, as well as different from, competing works.

For now, let's list competition, and discuss key differences

Three types: BNs in the law, Philosophy & law, Statistics in law and forensics

- "Bayesian Networks and Probabilistic Inference in Forensic Science" by Taroni, Aitken, Garbolino and Biedermann.
- "Risk Assessment and Decision Analysis with Bayesian Networks" by Fenton and Neil.
- "Bayesian Networks With Examples in R" by Marco Scutari and Jean-Baptiste Denis.
- Alex Stein, foundations of evidence law
- Nance, Burdens of proof
- Schauer, Profiles, ...
- Ho, Philosophy of evidence law
- Robertson, Vignaux
- Lucy Dawid,
- Statistics for Lawyers etc.

b. Consider what aspects of topical coverage are similar to or different from the competition. What topics have been left out of competing books and what topics have been left out of yours?

c. Please discuss each competing book in a separate paragraph. (If possible, please provide us with the publisher and date of publication as well.) This information will provide the reviewers and the publisher a frame of reference for evaluating your material. Remember, you are writing for reviewers and not for publication, so be as frank as possible regarding your competition. Give credit where credit is due, and show how you can do it better.

2 Market Considerations

2.1 The Primary Market

1. What is the major market for the book? (Scholarly/professional, text, reference, trade?)
2. If this is a text, for what course is the book intended? Is the book a core text or a supplement? What type of student takes this course? What is the level? (Major or non-major; freshman, senior, graduate?) Do you offer this course yourself? If so, how many times have you given it? Is your text class-tested?

3. If the market is scholarly/professional, reference, or trade, how may it best be reached? (Direct mail, relevant journals, professional associations, libraries, book or music stores?) For what type of reader is your book intended?

3 Status of the Work

1. Do you have a timetable for completing the book?
a. What portion or percentage of the material is now complete?
b. When do you expect to have a complete manuscript?
2. What do you estimate to be the size of the completed book?
a. Double spaced typewritten pages normally reduce about one-third when set in type; e.g., 300 typewritten pages make about 200 printed pages. There are about 450 words on a printed page.
b. Approximately how many photographs do you plan to include?
c. Approximately how many line drawings (charts, graphs, diagrams, etc.) will you need?
d. Do you plan to include material requiring permission (text, music, lyrics, illustrations)? To what extent? Have you started the permissions request process?
3. Do you plan to class-test the material in your own or other sections of the course? (Any material distributed to students should be protected by copyright notice on the material.)

4 Sample Chapters

Select one or two chapters of the manuscript that are an integral part of the book. They should be those you consider the best-written ones, and do not have to be in sequence. For example, you might submit chapters 3, 7, and 14 of a 20-chapter book, so long as these chapters represent the content and reflect your writing style and pedagogy in the best possible light. It is also advisable to submit any chapter that is particularly innovative or unique. Sample chapters should contain rough sketches, charts, hand-written musical examples or xerox reproductions, and description of photographs to be included. The material need not be in final form, although it should be carefully prepared and represent your best work. In your preparation, emphasis should be on readability. Please do not bind your manuscript, as we will have to unbind it in order to make photocopies for reviewers. Also be sure all pages are numbered either consecutively or double-numbered by chapter.

5 Reviews

If we are interested in your project, we will commission outside reviewers to read and evaluate your proposal. We will, of course, obtain the best available reviewers to consider your work. If you wish to suggest the names of experts in your field whom you believe to be ideally suited to evaluate your proposal, you may provide their names, titles, and email addresses. While we are unlikely to approach these scholars to act as reviewers themselves, we may ask them for their suggestions for peer readers. Naturally, we do not reveal the names of reviewers without their permission.

6 Author Background

Please include a current CV or brief biography of your writing, teaching, and/or educational background and experience. Be sure to list any books that you have previously published, and any other information about yourself on why you are qualified to write this book.

7 Response Time

Please allow at least 6-10 weeks for the manuscript proposal evaluation and review process. We will contact you as soon as we have had a chance to thoroughly examine your manuscript proposal. Thank you for your interest in Oxford University Press. We look forward to reading your materials.