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. The book shows that the simple version of the theory, what we dubbed legal probabilism 1.01, falls prey to several difficulties. Either we reject legal probabilism altogether or we move past its simple version. By taking advatange of the theory of Bayesian networks, the book takes the latter route and develops legal probabilism 1.02. This more sophisticated theory improves on the limitations of the simple version and rivals in explanatory power two competing accounts of judicial fact-finding: argumentation theory and relative plausibility. To add great precision to the claims made in the book, the analytical argument is supplemented with an **R** code implementation.

A prototype of legal probabilism 1.02 exists in the literature in forensic science and artificial intelligence. This prototype, however, needs further refinement. No comprehensive philosophical analysis exists of whether—and to what extent—legal probabilism 1.02 can meet the difficulties that plague legal probabilism 1.01. This book fills this lacuna in the literature.

Besides breaking new grounds, the books aims to introduce unfamiliar readers to the rich interdisciplinary literature on legal probabilism, often scattered through journals and books in philosophy, law, computer science, forensic science and psychology. Some chapters of the book presents original research and require technical background in probability theory. Others are introductory, suitable for an advanced undergraduate class.

The book is aimed at philosophers interested in legal epistemology and epistemology more generally. Many of the difficulties of legal probabilism resemble difficulties faced by Bayesianism in epistemology. The book will draw attention outside philosophy from legal scholars who have championed applications of probability theory to evidence law as well as those who have resisted this trend. Another target audience includes computer scientists interested in modelling evidential reasoning and decision-making under uncertainty.

1.2 Outline

Part I of the book outlines legal probabilism 1.01 (Chapter 1) and its foes (Chapter 2). The 1.01 version comprises a familiar repertoire: Bayes' theorem, likelihood ratios, probability thresholds, expected utility maximization. This repertoire has proven useful in several ways, especially in the assessment of explicitly quantitative evidence such as DNA matches and other expert evidence. At the same time, legal probabilism 1.01 is liable to a host of conceptual difficulties: the conjunction problem, the problem of priors, paradoxes of naked statistical evidence. These difficulties are well-known. Others are less familiar: the problem of complexity, soft variables, the difficulty with corroboration. Part I will instill interest in the topic among unfamiliar readers and refresh the seasoned reader about the main points of contention. Part I provides the essential background for a deeper examination of legal probabilism 1.01 and the development of its more sophisticated version 1.02 which is undertaken in Part II and Part III.

The remaining two parts of the book covers evidence assessment (Part II) and decision-making (Part III). Legal probabilism is both a theory of evidence assessment as well as a theory of decision making at trial. These two facets are best kept separate for analytical clarity.

Part II discusses in great detail three formal tools used for the assessment of evidence from a probabilistic perspective: Bayes' theorem, likelihood ratio and Bayesian network. This parts also discusses how these formal tools can be used to asessing evidence at trial, their strengths and limitations.

Chapter 3 and 4 develop a unified argument, first illustrating the applications of legal probabilism 1.01 and then examining its limitations as a theory of evidence assessment. More specifically, Chapter 3 presents Bayes' theorem and its simplest application, such as weighing one or two pieces of evidence. This approach is useful in many ways, for example, to avoid reaosoning fallacies such as the prosecutor's fallacy and base rate fallacy. But it also limited. Its limitations are discussed in Chapter 4. Most importantly, court cases often require fact-finders to weigh several pieces of evidence, sometimes conficting and liable to different intepretations. The hypotheses that the fact-finders are asked to evaluate in light of the evidence presented are structured stories or explanations of the evidence consituted by several sub-propositions. This level of complexity can hardly be modeled by a simple application of Bayes' theorem. A more sophisticated machinery for eviedence assessment is nedded. The more sophisticated machinery consists of Bayesian network.

Before discussing Bayesian network, however, the book describes an approach that is, in some important way, an alternative to Bayes' theorem and that many legal probabilist have found very useful: likelihood ratio. Bayes' theorem rquires an asessment of prior probabilities, and assessing the prior probabilisties of hypothesies is notoriusly difficult. A simpler apapch only uses likelihood ratios. While this approach is still not able to model complex bodies of evidence, it has proven useful in many ways. Chapter 5 describe, in great detail, the likelihood approach, its applocation and stregthens. It also examines its weakeesses.

Chapter 3, 4 and 5 combined sutiatated teh claim we need to move past legal probabilism 1.01. This task is accomplished in Chapter 6 through 9.

I Legal probabilism 1.01 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 problem of priors
  - 2.3 Naked statistical evidence
  - 2.4 The complexity problem
  - 2.5 Soft variables
  - 2.6 Corroboration
  - 2.7 The reference class problem
  - 2.8 Non-probabilistic theories

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

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.