Group Homework 1 Stat 100A Spring 2022

4/22/2022

120 Possible Points

Attempt 1 ⌄	◯ **IN PROGRESS** Next Up: Submit Assignment	🗩 Add Comment

Unlimited Attempts Allowed

4/12/2022 to 4/22/2022

⌄ **Details**

Goal of this homework 1

This first homework is heavily focused on the use and misuse of conditional, joint, total probability and Bayes theorem in practice, and how that happens or potentially could happen in different sources: (a) in the law ; (b) in our own judgments; (c) in artificial intelligence (d)   in the use of probability models in AI.The sources used for each part are described in the instructions section. We give here some hints.

The source reading for (a) and (b) carry the same message, and you must discuss with your group what that message is and how it manifests itself in the two contexts and label events and probabilities and refer to the well labelled and well defined probabilities.   For example: are (a) and (b) both talking about the prosecutor's fallacy? You must write the probabilities involved in both cases, using class notation for joint, conditional, total probabilities as needed and help us discover how the message is the same. Use Bayes theorem to explain.

(c) Is using a very key distinction between different probabilities. In what way could we fall in this context into the Prosecutor's fallacy and the heuristics problem in this context? How would the probabilities be rewritten in a way that they mean something totally different while being interpreted in the same way as the ones given.

(d) Uses similar probability concepts to to classify or identify images. But the concepts appear as probability density models. A little link to an external URL should be read before immersing yourself into the video. The representation of probabilities with density functions becomes more sophisticated and closer to how they are used in the more complex applications to self-driving cars, robotics, health care management and other applications.

Do not hesitate to contact Dr. Sanchez if some of the instructions below are not clear. Bring your

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Part I. Consult with your group, all of you give a review to all the items you must read or watch, and divide labor if needed but all of you should provide feedback, thoughts, agreements and disagreements to what others conclude. After reading and thinking, summarize briefly and compile your group's thoughts about the following:

- For (a): There is an article posted in our Module 2 on the Prosecutor's fallacy. Read that article, summarize the main points and probabilities and the message in the article. Use probability notation used in class, not just words. In your summary, be specific about what probabilities are which (conditional, total, joint, Bayes, etc.)

- For (b): There is a video in our Module 2 by Maureen Gray, our guest lecturer. Watch the video, summarize the main points and probabilities and the message in the video. Use probability notation used in class, not just words. Feel free to introduce notation for your sets. In your summary, be specific about what probabilities are which (conditional, total, joint, Bayes, etc.)

- For (c): you will read the discussion of fairness in artificial intelligence by a computer science professor who teaches a computer science course on probability to computer scientists.

  https://chrispiech.github.io/probabilityForComputerScientists/en/examples/fairness/ (https://chrispiech.github.io/probabilityForComputerScientists/en/examples/fairness/)

  Read the discussion, and summarize the main points and probabilities and message in the reading. Use probability notation used in class, not just words. In your summary, be specific about what probabilities are which (conditional, total, joint, Bayes, etc.). How could the misinterpretations mentioned in (a) and (b) manifest themselves in the tasks done in AI as described by this reading in (c)?

- For (d) Watch Dr. Ruiqi Gao's video about generative and discriminative probability models in Artificial Intelligence, after reading in the link right above it, about the difference between generative and discriminative models in a simpler way, and what they are in terms of our class notation. Based on that notation, what is the difference between the two types of models? Using probability models as in Ruiqi Gao's video, how could we run into the misinterpretations that are found in (a) and (b)?

Part II. Synthesis

- After reading/watching and summarizing the sources listed in Part I and thinking and discussing with your group about them, find what is common and different across all of them in all of them. See the hints given in the "goals" section. Use probability notation, not just words, and be specific instead of giving general comments. That is, support your statements with specific examples pertaining to the source talked about.   Use bullets or numbering to keep the discussion that you present easy to follow by the grader. For example, say "because this probability is inappropriately assumed to be this other probability (write the probabilities, define your events) this other probability is misinterpreted). Be organized and explicit, referring to the right source each time by

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- Since many of you come from different majors, add to your synthesis part how conditional probability and Bayes theorem is used in your major. For example, if I was an anthropologist I would search for "conditional probability in anthropology,"

Submission (before 4/22/2024, 11:55 PM)

- Submit **one pdf file per group**. All members of the group are responsible, so you must make sure that you all are present at the time of submission.
- The file name should be your four last names .pdf. For example, smith-lee-bastani-abderraman.pdf, for students with those last names.
- Your four full names must be written at the beginning of your document.
- Separate parts I and II. Your document must contain what is requested in both parts. Start with part I. Do not just copy formulas and statements. Put your group's reflection into it and be original in your writing of the conclusions and above all be specific about which case you are talking about. Do not use generic statements. Refer to the source and the example in the source.
- Do not make the document longer than 5 pages single space. Feel free to draw diagrams or images to illustrate.
- After you have submitted your work, the members of the group, individually and anonymously, will evaluate the group members according to several criteria. That evaluation must be honest and reflect the experience with each other. Each of you will have to say specifically what you did, how and in what way you contributed.

ˇ **View Rubric**

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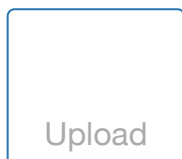
Some Rubric (1) (1)

Criteria	Ratings		Pts
Each of the 4 resources mentioned is summarized accurately, and briefly, with the main points well understood and explained using probability notation and referring specifically to the example in each source (10 points each)	**40 pts** **Full Marks**	**0 pts** **No Marks**	/ 40 pts
Description of criterion view longer description	**40 pts** **Full Marks**	**0 pts** **No Marks**	/ 40 pts
The file contains the names of the four students in the group at the very beginning of the file (5 pts)	**5 pts** **Full Marks**	**0 pts** **No Marks**	/ 5 pts
The file is neatly typed and the parts are separated and sources labeled with (a), (b), ..etc.), no ambiguous language is used that hides lack of undestanding and no verbatim copying of the source texts	**10 pts** **Full Marks**	**0 pts** **No Marks**	/ 10 pts

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Some Rubric (1) (1)

Criteria	Ratings		Pts
The file is pdf and name of four students is the filename (5 pts)	**5 pts** Full Marks	**0 pts** No Marks	/ 5 pts
Indication of plagiarism of other groups' work (0 points and a trip to the Dean of students' office)	**0 pts** Full Marks	**0 pts** No Marks	/ 0 pts
There is a contribution from each student giving an example from their major that uses conditional probability and the use is described for others to understand, and the source is cited in a way that we can access it	**20 pts** Full Marks	**0 pts** No Marks	/ 20 pts

Total Points: 0

Keep in mind, this submission will count for everyone in your Project Groups group.

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