CPH 565 Midterm Study Questions Spring 2025

Instructions: You are welcome to collaborate with classmates in preparing for (but not actually taking) the midterm examination. You are also welcome to consult the textbook, content posted on Canvas, your own class notes, and pre-existing Internet sources (as described in the syllabus). **If you wish to use generative AI in your preparation, please follow the instructions at the bottom of this page.**

1. Define or explain the following as they were discussed in Chapters 1 through 4: epistemic, aleatory, support set, parameter space, discrete, continuous, frequentist, Bayesian, marginal, conditional, prior, posterior, mass, density, Z score, Mahalanobis distance.

2. Two coders put information from handwritten records into an electronic database. The first coder averages one mistake per ten records, while the second coder averages one mistake per five records. Suppose that a quality control audit is conducted and that a mistake is discovered in how information from record #100 was put into the electronic database. Describe in general terms how you would re-allocate credibility, based on results from the audit, between the possibilities that: [i] the first coder handled record #100; and, [ii] the second coder handled record #100.

3. Create a table of fictional data illustrating non-independence of getting a flu shot and contracting the flu, assuming that about 30% of people contract the flu. Carefully explain why your table illustrates non-independence.

4. Draw a picture showing a normal prior distribution (for a population mean, on some variable of interest) with mean α and standard deviation β. Draw in that same picture what you think the corresponding posterior distribution might look like, if the sample mean of the data (on the variable of interest) were close to α - 0.5 β. Please explain why you depicted the posterior distribution in the way that you did.

5. Draw a left-skewed unimodal distribution (i.e., having a single peak and with a long left tail). Show what a 95% equal-tail interval might look like with that distribution. Would you need to move the endpoints of the interval leftward or rightward to obtain the 95% highest density interval ? Please explain.

**If you wish to use generative AI in your preparation, please follow these instructions.**

a. Keep a written record of your prompts and the resulting outputs from generative AI. I reserve the right to ask you to submit this written record for my inspection, before and/or after the midterm examination, and to ask you follow-up questions.

b. Please fact-check and source-check any resulting outputs from generative AI that you may wish to incorporate into your formula sheets and/or your responses on the midterm examination (the preceding is hereafter abbreviated to “relevant material”). This can be done by searching the Internet for sources from which you can verify the accuracy of the relevant material, including any sources suggested by the generative AI itself. I anticipate that most of the relevant material will fall under common knowledge, as defined in academia. However, if some of the relevant material does not fall under common knowledge, then please cite any appropriate sources on your midterm examination, in the event that you incorporate relevant material which is not common knowledge into your responses on the midterm examination.

c. If your responses on the midterm examination include any text taken verbatim from the relevant material, then this must be signaled by quotation marks and accompanied by specification of the source. More generally, text taken verbatim from any source (even Canvas content or the textbook) is to be signaled and accompanied in the same way. However, you need not cite Canvas content nor the textbook on the midterm examination, if what you write is expressed in your own words (i.e., paraphrased, instead of taken verbatim).

d. If you have questions, please ask. 😊