

Proto-Exam



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Advanced Methods in Applied Statistics
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Outline

- This is a basic template for what the exam will look like
- There will be 3-5 problems which are required to be completed
- There will be 2-4 selected problems of which only 1 or 2 will be graded. You get to choose which one(s) you do of the selection. Only the 1 or 2 which you choose will be graded. Partial, complete, or better work on additional selected problems will not be considered.
- This proto-exam is only a very, very simple example. The actual questions and/or topics on the final exam are not guaranteed to reflect what is shown in the following slides.

Required Problems -
Complete all of the
following

Problem 1

- Fit something given data and a range of possible underlying distributions

Problem 2

- Markov Chain Monte Carlo something
- Find the maximum a posterior value
- Sample the marginal likelihood to construct 1- and or 2-dimensional uncertainties

Problem 3

- Bayes something
- Use a prior or marginal likelihood to establish something

Problem 4

- Develop a Monte Carlo to create a range of possible outcomes from a combination of likelihoods/occurrences
- E.g. Traveling salesman Monte Carlo

Problem 5

- I have data and 3 possible underlying distributions. Using the hypothesis tests, which distributions fit my data and what are the corresponding p-values?
 - For 1-sided and 2-sided.
 - Truncated in the distribution range
 - Do the tails agree?

Selected Problems -
Submit solutions to
only one of the
following

Problem 6

- Use a nested sampling algorithm to find the global minima of an 11-dimensional likelihood landscape
- Over the range of -2 to 3 in each individual dimension, how many local minima/maxima are contained in the 11-dimensional space?
- Note: this could be a required question too

Problem 7

- Wavelet something, or possibly Fourier transform
- Calculate the high and low frequency components of noise contamination to a signal
- Remove the high/low frequency contamination and show the underlying distribution/signal