

Syllabus for STA531

Advanced Stochastic Modeling

Spring 2016, Duke University

1 General information

Lectures: Tuesdays and Thursdays, 11:45 AM – 1:00 PM, Biological Sciences 130

Course website: <https://sakai.duke.edu>

Textbooks:

- (BDA) *Bayesian Data Analysis, Third Edition*, by Gelman, Carlin, Stern, Dunson, Vehtari, & Rubin, 2014, CRC Press.
- (PRML) *Pattern Recognition and Machine Learning*, by Christopher M. Bishop, 2006, Springer.

Primary instructor

Jeff Miller

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Teaching assistants

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2 Outline of topics

From previous courses, you should already be familiar with the material from BDA chapters 1, 2, 3, 5, 11, and 14. Here is a list of what we plan to cover.

- BDA 4, 6, 8 (Fundamentals)
- PRML 8 (Graphical models)
- BDA 10, 12, 13 (Inference)
- BDA 16, 17 (Linear models)
- BDA 19–22 (Nonlinear and nonparametric models)
- PRML 13 (Sequential data)
- If time permits: PRML 5 (Neural nets)
- If time permits: BDA 23 (Dirichlet process models)

3 Schedule / Important dates

Key dates:

Midterm exam #1: Tuesday, Feb 16, at the usual class time and location.

Midterm exam #2: Thursday, Mar 24, at the usual class time and location.

Final exam: Friday, May 6, 2:00–5:00 PM

There will be no make-up exams, so please make sure you are free on these dates. If you absolutely must miss a midterm due to extraordinary circumstances, the weight given to your final exam will increase accordingly, so that you have the opportunity to make up the points.

Class will be held on the following dates:

Jan 14, 19, 21, 26, 28

Feb 2, 4, 9, 11, 16 (midterm 1), 18, 23, 25

Mar 1, 3, 8, 10, 22, 24 (midterm 2), 29, 31

Apr 5, 7, 12, 14, 19

Apr 21 and 26: Optional review sessions, at the usual class time and location.

4 Grades

Your overall score for the course will be determined by:

- 45% Homework
- 15% Midterm 1
- 15% Midterm 2
- 20% Final
- 5% Class participation.

5 Homework

Homework will be assigned regularly. Submit your homework electronically **in PDF form** via the course website.

- Mathematical exercises: Your solutions to mathematical exercises can be typed or handwritten, but must be clear and legible, otherwise no credit can be given. To electronify handwritten solutions, there are scanners available in the library, or you can use a smart phone (there are scanner apps to handle multiple pages), HOWEVER, if you use a phone, make sure your writing is clearly readable in the PDF.
- Programming exercises: For programming exercises, include (a) plots and numerical results when appropriate, (b) discussion of the results when appropriate, (c) any supporting derivations, written out separately from the code, and (d) your source code (typed). The TAs will not run your code (e.g., to generate plots, etc.), so anything you want them to see must be included separately from the code itself. You are free to use any programming language you choose.

The homework assignments will probably require a lot of computer programming. We will not be teaching you how to program—it is expected that you already know how.

Grading

All homeworks (and exams as well) should typically be graded by the TAs within one week. If there is a delay beyond this, please inform me. Grades will be posted on the course website on Sakai. If you have questions about your grade on a particular assignment, please try to resolve them with the TA who graded it before contacting me.

Policy on late submissions

Late submissions within 24 hours after the deadline will receive partial credit as follows: Your score will be penalized by a multiplicative factor that decreases linearly from 1 to 0 as a function of time. Work submitted later than 24 hours after the deadline will receive no credit. If, for some reason, you experience technical difficulties posting your assignment to the website, email it to one of the TAs, and the timestamp of the email will be used (but this should only be done as a last resort). If you are unable to finish the assignment on-time, you should still submit whatever you have completed—partial credit is better than nothing.

Policy on missed work due to extraordinary circumstances

In case of illness, personal emergencies, religious observation, varsity athletic participation, or other extraordinary circumstances, contact me (Jeff) as soon as possible, and if you are an undergraduate follow the guidelines here: <http://trinity.duke.edu/undergraduate/academic-policies/missing-work-classes>. If officially approved, you will have the opportunity to make up missed work due to such circumstances. Note that being busy is not an extraordinary circumstance.

Policy on collaboration

You are free to discuss homework problems with other people, HOWEVER, when you sit down to work out and write up your solutions, you must do this by yourself, without referring to solutions (or any notes related to solutions) provided by anyone else. Each student must turn in her/his own solutions. Two or more names on one assignment is not acceptable.

6 Academic dishonesty

Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity. Cheating on exams and quizzes, plagiarism on homework assignments and projects, lying about an illness or absence and other forms of academic dishonesty are a breach of trust with classmates and faculty, violate the [Duke Community Standard](#), and will not be tolerated. Such incidences will result in a 0 grade for all parties involved as well as being reported to the [University Judicial Board](#). Additionally, there may be penalties to your final class grade. Please review [Duke's Standards of Conduct](#).

7 Students with disabilities

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the [Student Disability Access Office](#) at (919) 668-1267 as soon as possible to better ensure that such accommodations can be made.