1 Introduction

• **Project goal**: Do/learn something interesting related to/using probability beyond what is in the syllabus.

• Don’t feel like you have to overdo it, just do one thing well.

• **Grading breakdown**: There are 100 possible total points to earn for this project. The breakdown is: project proposal–25 points, group report–50 points, individual report–25 points. If you choose to work individually, you will submit one report that will make up 75 points.

• **Due dates**: There are several due dates for this project. The first is **Friday, October 13th**, where you must submit a project proposal to me (Sean Carney–see contact information below). The content of the proposal is detailed below. The second due date is for the project itself. The due dates will be randomly assigned and will range from Wednesday, November 1st through Friday, December 1st. I will randomly assign due dates on Friday, October 13th.

• You may complete your project **on or before your due date**; you could be done next week!

• You may work individually or in groups of up to 4 people. The amount/depth of work produced should be proportional to the number of people in your group. Each group must submit one group report. Group members will also be graded individually, so you will need to keep track of and submit a statement of what you contributed to the project; this is the individual report.

• If you choose to work in a group, your **due date will be the earliest of all the group members’ due dates**. For instance, if Jack and Jill choose to work in a group, and Jack is randomly assigned November 3rd, while Jill is randomly assigned December 1st, then their project will be due on November 3rd.

• Most students should receive 90+ out of 100 points. I understand this is not your only class and you should be able to get an A putting 1 week of hard work into your project.

• You may need to read ahead in the textbook and learn something ahead of schedule in order to complete your project. If you need help, ask for it.

• **You must cite all sources that you use.** It is okay if you use the internet or other external sources to help your understanding. It is okay if you reference someone else’s work or use ideas or explanations that you did not come up with (this is how mathematics progresses, by citing results already known). However, you absolutely may not copy someone else’s work as your own.
• You may not use work that you have turned in for another class.

TA Contact Information

• Name: Sean Carney
• UT email: scarney@math.utexas.edu, please include “M362K” in the subject line.
• Office: RLM 9.128.
• Official office hours: by appointment, email me.

2 Project Proposal Requirements

You are required to submit a project proposal, worth 25 points, by Friday, October 13th. In order to get full credit for the proposal you must submit a one page document (typed, not written). You can email me the document or upload it to Canvas. If you plan to work in a group, you only have to submit one proposal per group. Note this is in contrast to the final project itself. The basic questions you must answer are:

• With whom are you working? List all group members.

• What will be the content of your project? You must detail what it is you intend to learn on this project. What problems do you wish to solve? Which concepts do you wish to understand? What questions do you want to ask?

• How do you plan to carry out your project? Please present an outline of how you are going to do what you are proposing to do. If you are learning a new concept outside of the syllabus, what sources do you plan to use? If you are designing a statistical experiment, how will you collect the data? And how do you intend to use the data you collect? If you want to write a computer program, what will you simulate?

If you wish to detail why this particular topic is interesting to you (e.g. it could be related to your major, or a personal life experience), please feel free to do so.

3 Project Ideas

After the project proposals are submitted, I will tell you if what you propose is enough to earn full credit. You can discuss project ideas with me over email or in office hours. Feel free to discuss project ideas with your peers or anyone else as well. I would highly recommend choosing a topic that you find interesting.

The format of the project is entirely up to you. Some example formats:

• Write a short paper (I would expect approximately 2 pages per group member–long enough to do something interesting, but no fluff please)

• Give a short presentation (I would expect approximately 3-5 minutes per group member)

• Make a video about your topic

• Present a problem/solution (I can help you find a good problem that isn’t too difficult)
• Write a computer program (in a language of your choice) demonstrating your project
• A combination of these (if, for instance, you have a larger group you could write a paper
and a computer simulation to go with it)
• Make up your own format (subject to approval)

The subject of your project is also entirely up to you. Your topic can be very applied, very
theoretic, or anywhere in between. A great place to find ideas is the Wikipedia page [List of
probability topics]. The following examples are meant to give you ideas. You can use them,
but don’t feel like you have to use one of the listed topics. Multiple groups/people can choose
the same topic if they take the material in a sufficiently different direction. If you choose a
topic that is very technical I don’t expect you to understand all the details. If you are really
interested in a topic but find that you are not able to understand it, ask me if there is a less
technical way of handling your topic (there probably is).

Your project does not have to be technical in nature, however. Some more applied topics
include, for instance:
• “Paradoxes” and their resolutions, e.g. the Monty Hall problem
• Ask an interesting question and design and implement a statistical experiment (e.g. look
at hurricane data, traffic fatality data, or some other interesting quantity and attempt to
uncover interesting correlations)
• Stock markets, arbitrage theory, fundamental theorems of asset pricing
• Risk management
• Monte-carlo simulations
• Random walks–applications and properties
• Disease outbreaks, epidemic models
• Population dynamics
• Econometrics
• Random algorithms, e.g. [Fast Randomized SVD at facebook research]
• Show something seemingly unlikely is not that unlikely
• Signal processing, error correction
• Cryptography, RSA encryption–how do “secure” online transactions work?
• Machine learning, neural networks
• Quantum physics
• Statistical mechanics/thermodynamics
• Weather models–e.g. storm modeling
• Betting strategies–e.g. NFL betting, NCAA basketball tournament strategies
• Oceanic flows


4 FAQ

- **How do I turn in project materials?** Via email attachment or canvas messaging attachment. If you have more than 4 files, zip them.

- **Do you have any preference on filetypes?** For papers a pdf is preferred, for programs turn in the source code files (.java, .c, .h, .m, .py, .nb, etc.), but not binary files.

- **Will I be counted off for sloppy language, bad grammar, spelling errors, or otherwise unprofessional work that I turn in?** Yes. Please edit your papers for clarity and precision before turning them in. You are trying to prove to me that you understand the material you are writing about.

- **What citation format should I use?** LaTeX standard, MLA, and APA are all acceptable. Be very clear about what is cited and what is your original work, plagiarism will be taken very seriously.

- **Will I be counted off for bad code style or otherwise unintelligible source code?** Yes.

- **Will I be counted off for inefficiency in my code?** If your program produces valid output and halts in less than 3 minutes, then you will not be counted off for inefficiency.

- **I’m giving a presentation, when do I present?** You must schedule a time to present with me on or before your due date.

- **I picked a very technical topic, is it okay to include things that I don’t understand?** Generally, no. The best way to handle a technical topic for the purposes of this project is to find a way to cover it that only uses tools we have seen in class. I am always available to help you find a less technical version of your topic. If you really want to do something technical, I still require that you understand what you write. If that means all you can do is give a definition and a simple example, so be it, as long as you understand. I would rather you do one thing well than cover a whole topic broadly.

- **My due date is [sometime between November 1st and December 1st], can I get an extension?** No.

- **What if I have a huge workload the week of my due date?** You are in charge of managing your own time, and you are solely responsible for completing your project by your due date. If you are worried about having too much work the week of your due date, then don’t wait until the last week to start.

- **What happens if I don’t turn in my project on time?** You will receive 0 points for the group/individual report.