SDS 293 - Modelling for Machine Learning

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1. Course Structure

To prepare students to tackle the course's motivating questions - especially What habits of mind do we need to develop to become machine learning practitioners? - there are a variety of assignments in this course. Each week will be a mix of reading about machine learning topics, discussing and debating concepts, deriving machine learning theory from existing knowledge, and constant reflection about our learning and professional development. All due dates are posted on the Detailed Course Schedule and are due on the stated dates AOE (anywhere on earth).

> **Note**
>
> The Detailed Course Schedule lists the best by dates for the course. To view it, please log into your **Smith** account.

1.a. Assignments

The work in this course can be broadly broken down into four types:

- **Routine Course Work,** including 12 labs, daily readings, and daily engagement journal
- **Problem Sets,** including 24 group problem sets and 11 individual starred problems
- **Professional development,** including two reflective writing assignments and persistent engagement with the course
- **Final Project** that teaches a recent machine learning paper to fellow Smithies (who are not in the course)

1.a.i. *Starred Problems:*

Each week, you will complete a starred problem. The goals of these problems are to 1) apply what we've discussed in class on your own and 2) reflect on your learning so far. To accomplish these goals, starred problems will all follow the same procedure:

1. Put away all course resources
2. Download that week's starred problem off moodle
3. Write your solution to the problem and upload it into moodle
4. Once properly uploaded, the instructor solution will appear
5. Compare your solution to the instructor solution
6. Complete a reflection worksheet about this problem and what you would like to review as a result of doing this problem

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These problems are based on completion (ie. you get the credit or not) based on both your solution and the content of your reflection. This means that you can get the problem totally wrong and still get full credit if you take the time to honestly reflect on your progress. This assignment structure is based on an assignment structure from Smith's Engineering Program.

1.b. Weekly flow for the course

Each week, you will have 2 group problem sets, a lab and an individual problem set due each week. Due to the calendar, we will have a change up to the weekly schedule following the thanksgiving break

Weekly Schedule -:

This course follows a predictable rhythm. The weekly flow will operate as follows:

Day	Course Preparation and/or Activity	Due Date
Wednesday	GPset in class	Lab from the previous week & Starred Problem
Friday	GPset in class	Recommended: reflect in your engagement journal
Monday	Lab in Class	GPsets from this week

> **Note**
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1.b.i. *Workload:*

According to federal standards, each four-credit course should equate to at least 180 hours of work over the semester. If you are taking 16 credits, that equates to 720 hours of work over the 15 weeks of the semester, from the first day of classes until the end of the final exam period. In the case of this course, you will spend nearly 12 hours each week on my class alone (including our three hours of class meetings per week).[1]

In considering the work for this course, I believe that the approximate 9 hours per week *outside* of class will breakdown something along these lines:

- 4 hours of class prep (working on the readings, posting questions, etc)
- 1 hour per week of lab wrap up
- 1 hour per week of GPset wrap up
- 2 hours per week on preparing and completing the starred problem

[1]Each of our 50 minute meetings is "counted" as 60 minutes. Since we meet 3 times per week, our "in-class contact time" is counted as 3 hours.

- 1 hour of “flex time” used to supplement any of the above areas and/or go to student hours

Notice that there is an hour of flex time. This is to accommodate weeks were you might want to spend more time on an assignment or a reading. For example, you might spend extra time working on a group pset or coming to student hours to discuss a reading.

If you find that the time you are spending on this class is a lot more than 9 hours per week *outside* of class or a lot less, let’s check in.

2. Resources Supporting SDS 293

Here is a list of additional resources supporting our class. Information about your instructor can be found on the logistics page.

2.a. Inclusivity for all students

Smith is committed to providing support services and reasonable accommodations to all students with disabilities. Please inform me early in the term if there are aspects of the course that need to be modified to serve your learning, health, or person. You may speak with me after class, during student hours, or during an appointment. To request an accommodation, please register with the Accessibility Resource Center at the beginning of the semester. To begin the process, either call 413-585-2071 or email arc@smith.edu.

Students in need of short-term academic advice or support can contact your class dean in the Dean of the College office. If you require some accommodation for religious or cultural purposes, please do not hesitate to let me know.

2.b. Spinelli Center

The Spinelli Center for Quantitative Learning is a resource to support students as they take STEM courses and as they engage in other quantitative work. To see the list of available peer tutors and other resources available at the Spinelli Center, please consult their website.

2.c. Jacobson Center

Smith has an additional resource for writing support: the Jacobson Center for Writing, Teaching & Learning make an appointment to take your work to the Jacobson Center on their website. In particular, you may choose to bring your work to Peer Writing Tutors Elisabeth Nesmith or Elina Gordon-Halpern, both SDS majors who tutor for the Jacobson Center. Contact Sara Eddy (seddy@smith.edu) for more information about their schedules or how to make an appointment.

The above language about the Jacobson Center was adapted from language from Sara Eddy. Used with permission

2.d. Library

The library has a wealth of resources on Machine Learning. I invite you to check them out!

> **Note**
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> Please note that for anything denoted as an E-Book at the library, there are limits placed on how many people can view the source. Instead, you can download sections (or whole books) for a period of time directly from the library.

3. Academic Integrity

Nothing is held more dear to a researcher than their integrity. To researchers, the most precious commodity is our ideas. While some researchers build tangible items that can be protected by patents, many researchers' products are ideas and theories, which are less likely to be protected under things like patents. Instead, it is academic integrity that governs our research communities, protecting our ideas from being stolen. The system of academic integrity relies on researchers trusting each other to be honest and to act with integrity.

3.a. Academic Integrity at Smith

As you may be aware of, Smith is continuing to transition towards an Academic Integrity Statement. This comes out of Smith's tradition of an Honor Code. This tradition goes beyond inviting students to act with integrity, instead it welcomes students as equal participants of the learning community, imbuing students with the same level of trust that we extend to our collaborators and colleagues.

The Smith College Academic Integrity Statement (as stated on the Academic Integrity page) says:

> Smith College provides its students with a world-class liberal arts education. The purpose of this education is not only to provide students opportunities for intellectual growth and advancement, but also to prepare its graduates to make powerful contributions to the world. Upholding the integrity of a Smith education, then, is at once a responsibility to oneself and to the community.
>
> The Academic Integrity Board (AIB) defines academic integrity as the alignment of students' behaviors in academic courses with Smith's commitment to the honest pursuit of genuine learning. Smith students are responsible for upholding their own integrity by adhering to all course policies and properly acknowledging all sources used in preparing academic work. When assignments require students to submit work that is the product of their own intellectual labor, faculty expect that students have neither used unauthorized resources nor engaged in unauthorized collaboration with others. When courses require students to submit work that is the product of intellectual engagement with fellow students, students should follow all of the guidelines set out for collaboration. All submitted coursework of any kind must be the original work of the student(s). Faculty are expected to clearly communicate to students how honest engagement is defined in each course.
>
> According to Smith's Statement of Purpose, "the world needs a place where knowledge is not the end, but merely the beginning of creating incalculable good. And we will always be that place." Delivering on this promise demands that students and faculty hold each other to the highest standard of academic integrity.

This trust bestowed to students in this statement is the same trust that exists in and among researchers within a research community, the same trust that exists between me and my collaborators. Simply put, at Smith, under the Academic Integrity Statement, I trust that you will each act with integrity, citing sources when you celebrate others' ideas and noting who you work with when collaborating.

This trust manifests in how assignments are created, in how work is completed, and in how we resolve instances where the trust has been broken. I create assignments knowing that while there are resources online that can offer complete solutions, and I trust you to not seek out such complete resources. I trust thatif you do stumble on a solution guide, you will not use it. Under this Academic Integrity Statement, students are expected to keep careful notes about the resources that they consult and the people that they collaborate with. We get to assume that the work handed in by a student is the creation of that student. Lastly, when there are concerns regarding potential violations to Academic Integrity, the resolution is determined by AIB, which has established by the community and trusted to seek restoration of the whole community's trust through education and action.

I regard our Academic Integrity with deep and profound respect. Being an educator at Smith wit this Academic Integrity Statement means we–your faculty–begin from a place of trust without any underlying suspicion of our students. Simply put, we-instructors and students-work from the assumption that all are acting in good faith and with the utmost integrity. This is an assumption that cannot be made at a school without this tradition and it is why it is a privilege to be both an instructor and a student at Smith under this Academic Integrity Statement.

3.b. Academic Integrity Practicalities

The work you submit should be your own and created by you, unless explicitly listed as a group assignment. With the exception of the starred problems, I do encourage you to ask for help from your peers or myself when you have questions; however, copying is never allowed. The line between copying and helping is subtle. Below are a few guidelines:

- Do not share nor give your work with other students; instead, offer to discuss the big ideas of the task at hand.
- Do not look at someone else's work (including online solutions); instead, ask if you could talk with them about your ideas and share where you are getting stuck.
- Acknowledge those you talk or work with at the top of **every** assignment, **including any generative AI tools**. I will not dock points for getting acknowledged help from others. If you generate a solution or an argument with someone, in addition to acknowledging that person, recreate the solution or argument on your own in your own words.

If you think you may have crossed the line between helping and copying, please talk to me. Do not let me discover that the line was crossed. If a violation of Academic Integrity is suspected, the student will be informed and will be given the opportunity

to meet with the instructor. After the meeting, the instructor will decide if further consideration by the AIB is merited, and if so, the suspected violation will be reported to the AIB by the instructor.

If you are unsure about how Smith's Academic Integrity Statement applies to our course, please consult with me or a class dean. We are happy to discuss this with you.

3.b.i. *Creation vs. Curation:*

In my role as your instructor, I am **curating** resources for you that I feel are best for the teaching and learning of machine learning. In this process of curation, I will give credit to those whose materials I have used and I will only use materials as allowable by copyright and fair use.

In this course, you will be asked to **create** solutions for group problem sets and for the final project. In these acts of creation, you are demonstrating you most current understanding of the concepts in our course. This course will give you lots of chances to demonstrate what you know and lots of flexibility.

I am aware that there is a tension between the curation that I am modeling and the creation that is being asked of you. My goal is to provide the best resources to you, which requires reading and sorting through many sources (curation). Your goal is to learn as much machine learning as deeply as possible, which requires a lot of practice, trying out machine learning ideas, reflecting on your attempts, and trying again (creation).

4. Assessment

Just like beginning a project, we begin this course with nothing completed yet; similarly, we begin the semester with no points, just yet. As assignments are assigned and returned we will slowly build points towards the 1000 possible points. In keeping with this philosophy, each assignment adds to your total score. In more traditional courses, one might begin with 100% and have their grade slowly chipped down to a final score. Instead in this course, we are building our grades up in concert with our knowledge about machine learning. View each assignment as a reflection of the depth of your machine learning knowledge base.

4.a. Grading Practicalities

This class uses points as the method for evaluation. There are more than 1000 possible points in the course with small "cushions" built in along the way. The 1000 points that you are working to accumulate for your final grade are distributed as follows:

1. **Group Problem Sets:** 522 total points -
    - 24 group problem sets, each with 18 possible points, for a max total of 342
    - 12 individual starred problems, each with 18 possible points,for a max total of 180
2. **Routine Course Work:** 306 total points -
    - 12 Lab assignments, each with 9 possible points, for a max total of 90
    - Daily engagement journal for a total of 216 points
3. **Final Project:** 100 total points with an optional checkpoint
4. **Professional development:** 72 total points -
    - Two Reflective Writing assignments, each with 12 possible points
    - Class engagement in person and on slack, for a total of 48 possible points

4.a.i. *Types of grading:*

There will be three kinds of grading for this course: 1) rubrics, 2) on completion, and 3) with student input.

1. The following assignments will fall under typical rubric grading: group problem sets, your engagement journal, and the final project. Depending on the assignment, detailed rubrics may be issued before the assignment is submitted, while in other cases only general outlines will be given in advance of the assignment.
2. The following assignments will be graded on completion: the labs, the individual starred problems, and reflective writing assignments. Note that completion here means that the work was completed in good faith. The act of turning in something does not guarantee a score of completion. But any work that is clearly done in good faith will be marked as complete and will earn full marks.

3. The class engagement part of the course will be graded with student input. In the sixth week of the course and during the last week of classes, you will be asked to complete a self-evaluation of your class engagement in context of the class engagement list. Your self-evaluations will be a critical part of determining this section of your grade, but not the only determining factor.

Translating to the "real world":

This course iterates on each concept, pushing your knowledge to grow with each activity. This kind of iterative work is critical for learning new things and developing facility with them. The assignments scaffold as follows:

- **Reading and Prep work for class** - This is your first contact with the material. Just like meeting a person for the first time, you should pay attention to the big picture pieces, but not fuss over learning each detail perfectly. Instead, note questions in your engagement journal that you want to ask the next time you come into contact with the material.
- **In class meetings and Labs** - The course is designed to be largely hands on. Each class meeting will be mostly working on something: problem sets and/or labs. Problem sets are largely "pen and paper" while labs are in Rmarkdown. Both are intended to be playgrounds for learning the material; so take tons of notes, make mistakes, and try again! This is our second contact with the material, and just like meeting a person for the second time, you should have follow-up questions about the material
- **Individual Work** - Once we've read about the material and worked on highly structured activities, it is time to practice deploying concepts on your own from end to end. Our course has a weekly starred problem that is one step beyond the class activities in difficulty, and has a reflective learning component built in.
- **Final Projects** - After three different interactions with each concept, it is time to see where these concepts occur in the wild. The ultimate goal of the course is that you can read, situate, and discuss current papers in machine learning. In your final projects, you will create a small lesson to teach a recent paper to your fellow machine learning explorers. The primary goal of this project is to take the concepts from class and do something that stretches your knowledge.

Similarly, I have built the grading structure for this course to be more similar to how I experience the "real world" that is with systems built in to allow for life to happen. These systems come in a few forms:

- For the labs, group problem sets, and individual starred problems, the number of possible points is more than the maximum that I will use in my final computation. For example, there are 414 possible points for group problem sets, but yet, I will do my computation out of 342 points. This means that you can decide to not hand in 4 group problem sets for any reason. It could be because you are ill, you forgot about it, or you had too much work for your other courses. Note that pre-planned "dropping" of assignments should be used sparingly because we can not predict when life will happen (ie. illness, etc).

- For the final project, there is a checkpoint assignment that is completely optional, but if you complete it, you will be guaranteed at least 80 (of 100 possible) points. Missing the checkpoint is not a big deal, but can offer security to those with challenging finals periods. Additionally, the engagement journal will have prompts to help you brainstorm towards your final project.

These systems attempt to match my experience of being in the "real world." Assignments under the first system (ie. labs, group problem sets, and individual starred problems), you need to do about 80% of them well to get full credit for 100% in that portion of the grade. This matches my daily life where I can physically get to about 80% of my to-do list. Under the second system, it is often easier to edit a draft than to start from a blank page, and having small deadlines (where the reward is quick feedback) gives structure to larger projects.

While I do believe that each assignment for this course is important, I also believe that the college structure does not always allow you to practice "real world" decisions such as balancing your health with your work. So while I will not tell you to hand in an assignment or to not hand one in, I would love to listen to you practicing making these decisions.

4.a.ii. *Due Dates:*

Each week, there are three deadlines:

1. Labs
2. Starred Problems
3. Group Psets

All work is **due at 9am** on the date listed on the Detailed Course Schedule. This is a great moment to note these dates your system for keeping track of your work (ie. planner, calendar, etc). (If you want to really stretch here, do this for all assignments in all your courses.)

Flexibility:

In general, work should not be late. Later course content builds on previous content, and if one is spending time on an assignment that is passed due, then there is less time for the next assignment. Additionally the grading for this course has a number of flexibility systems in place, and I encourage that you take advantage of them as needed.

This all being said, there's a pandemic, and life is not normal. If you find yourself in need of a bit more time, send me a brief slack message at least a day before the work is due. In your message include 1) what flexibility systems you've already used, 2) why it is important to your learning that you get an extension, 3) propose a new due date for yourself, and 4) why the proposed extension will not hinder your ability to get the next assignment done on time. Your message should be no more than seven sentences long.

4.b. Letter grades:

Traditional letter grades will be assigned using the below listed minimum points:

Letter Grade	Number of points
A	950 - 1000 pts
A-	900 - 949 pts
B	800 - 899 pts
C	700 - 799 pts
D	600 - 699 pts

At the instructor's discretion, these grade cutoffs may be lowered at the end of the semester, but they will never be raised. Cut-offs not stated here for the pluses and minuses will be determined at the end of the semester.