**Mathematics for Machine Learning**          Instructor: Samuel Deng
**Problem Set 0**          samdeng@cs.columbia.edu
COMS 3770: Summer A 2025          **Due:** 05/30/2025 11:59 PM ET.

# What's this?

Welcome to the class! This is a very easy problem set that's just here to acquaint you to the basics of submitting something to Gradescope, typesetting LaTeX if you haven't before, and filling out a survey just to make sure that I can better accommodate you in this class. **This problem set is worth zero points, but please submit it just to make sure Gradescope and everything is up and running for you.**

If you have never used LaTeX before, there are plenty of online resources that can get you up to speed quickly. It may look slightly intimidating at first, but at the end of the day, LaTeX is just a language used to typeset mathematical documents. Learning to type in LaTeX is an essential skill for future CS courses and research (at least at Columbia), so getting comfortable with it now might save you some time in the future. Here's a quick 30-minute guide to get you started and this is a nifty little applet that lets you get the LaTeX command for any symbol you can draw on a trackpad.

This "problem set" is due on Gradescope on **May 30th, 2025 11:59 PM.** Please see the HW submission instructions on the course website for more details.

# Problem 1

[0 points] This problem is just here so you know where to find everything for the course. We won't be using the CourseWorks webpage for this course; instead, all resources, links, and materials will be posted on the course webpage. Hop on over there and complete the following tasks:

(a) Read the Syllabus for the course and familiarize yourself with course policies.

(b) Know where to ask for help: (i) Ed to post questions to your classmates, the instructor, and the TA(s) and (ii) office hours, updated on the Calendar on the course webpage. If you can't make these, email me (Sam), and we can set up a time to meet.

(c) All homework and lecture materials will be posted in Course Content on the course webpage as the class goes on.

(d) Make sure you're signed up for Gradescope, where all homework will be submitted. Email me if that's not the case.

(e) Make sure you're signed up for Ed, where announcements, class discussion, and questions on the homework will be posted. Email me if that's not the case.

(f) Note that there is an anonymous feedback form you can submit to at any point of the course.

Please email me if you have any questions or trouble with any of the above!

In your submission for this problem, just write: "I have looked through the course resources."

# Problem 2

[0 points] Here we'll practice writing a couple of LaTeX equations. For this problem, use the commands \begin{enumerate} and \end{enumerate} to create an alphabetized list and just copy each of these listed sentences in (a), (b), (c), and (d) down verbatim.

Note that, in (c), the vectors are **bolded**. In each problem set, there is an included macros.sty file that contains some LaTeX *macros* for you to use, which are just custom commands that may make typesetting faster. You may use these commands or ignore the file completely. For these bolded vectors, for example, you can find the custom macros \bm{x} and \bm{y}.

There's no need to hyper-reference the links; those are just for your reference.

(a) I can write inline math equations: $\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$.

(b) I can also write display math equations:

$$\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-x^2/2} \, dx = 1.$$

(c) Let $\mathbf{x}_1, \ldots, \mathbf{x}_d \in \mathbb{R}^n$ be a list of vectors. We can write a linear combination $\mathbf{y} \in \mathbb{R}^n$ of these vectors as:

$$\mathbf{y} = \sum_{i=1}^{d} w_i \mathbf{x}_i.$$

(d) I'm excited to learn some math for machine learning!

# Problem 3

[0 points] This is a relatively small class, so it'd be great to get to know all the students better and tailor this course to the students' needs. To this end, please complete the following tasks:

(a) Fill out the anonymous pre-course survey by the time you submit this "problem set" to Gradescope.

(b) Show up to one of my (Sam's) office hours, if only to introduce yourself! If you can't make any of the times, shoot me an email and we can set up a time to meet.

(c) Send me a short email (a few sentences) with subject **Math for ML Intro** letting me know about your year and program at Columbia, what you'd like to get out of the course, and what machine learning courses/jobs/research you'd like to do in the future.

(d) *(Optional, but highly recommended)* If you are comfortable doing so, make a quick (couple sentences) introductory post on Ed telling your classmates a bit about yourself. Use the `Introductions` tag on Ed to make the post.

In your submission for this problem, just write: "I've filled out the pre-course survey and sent Sam an email."