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Teaching Statement

I strongly analogize teaching to writing a book: **a)** identify the audience, **b)** craft a compelling narrative, and **c)** leave a message that lasts beyond the reading. My primary goal as an instructor is to make the story of the course useful in the moment and durable throughout students' academic journeys.

Teaching Philosophy

a) Adapt teaching style/content based on my audience: I served as a TA for a 15-student graduate course on inverse problems and data assimilation in Winter 2025. These students already had strong backgrounds in linear algebra and probability, so I skipped re-teaching determinants and Gaussian densities. Instead, I enriched discussions by asking conceptual questions during office hours, for example:

- How does the prior covariance affect the posterior in the linear–Gaussian setting?
- What issues does a high-dimensional Kalman gain pose, and how can we avoid them?

These sessions shifted office hour questions from "How do I start?" to "Is this assumption necessary here?". Serving as a TA for a graduate course was also humbling and rewarding, in that many students connected material to their research and asked probing questions. What I realized was that graduate teaching was a two-way exchange, as I learned from research-driven discussions rather than only delivering content for the purpose of the homework. I hope to use this experience in the future graduate classes I will TA for.

In larger undergraduate classes (120 students) such as proof-based calculus and linear algebra in Fall 2023/Winter 2024, I unintentionally created a "sink-or-swim" impression by rushing through foundations in an eagerness to get to new content. Student questions and Google Forms feedback flagged confusion about basics I had assumed would come quickly. I learned the importance of pacing and clear narrative links between lectures to reinforce fundamentals, while accomodating for all students in the classroom irrespective of experience.

To address this, I re-designed recitation notes with **concise sidebars** (derivations, connections) to engage advanced students, while lectures emphasized solid foundations before new ideas. I now slow down deliberately, use clear worked examples, and encourage real-time questions to catch misunderstandings early. These changes created a **welcoming environment** where students feel safe admitting confusion and confident they won't be left behind. I explicitly normalize uncertainty, invite multiple solution paths, and make way for questions to ensure broad participation.

My teaching also extends beyond the university. I taught a Summer 2024 high-school mini-course on group theory to 20 math-competition students with limited exposure to pure math. I introduced set and number theory with visual examples (e.g., modular arithmetic via a clock) and reinforced the analogy as needed. Since they had no prior knowledge to work from, it was important to give many examples for them to rely on. By the end, these students were able to produce proofs for Lagrange's theorem entirely on their own.

b) Making students come back to the next lecture: Even the best cover cannot save a dull story. I sustain interest by:

1. Analogies — I have seen that building on existing knowledge eases the introduction of new concepts. When introducing vector spaces, I describe them as "sets with extra structure," then extend the analogy: linear maps as structured functions, kernels as preimages of zero, images as familiar subsets. This helps students see new material as an extension of what they know and keeps them curious about how the analogy develops next.

2. Big Picture — Like any new idea, students should know why a topic matters. I structure lectures to tell an ongoing story that motivates each new idea. In an introductory applied math course I TA'd, two weeks on numerical ODEs/PDEs naturally raised questions about solving large linear systems and finding roots which I used to motivate subsequent lectures. In office hours and recitations, I highlighted these connections, and questions became more targeted to assumptions and limitations rather than operational knowledge to complete the homework.

c) Real-Time Applications: Even well-crafted lectures fade if students cannot use the ideas, and I combat this fatigue by regularly polling students for extensions they want to see and adapt accordingly, showing how course concepts extend to problems they care about.

In introductory linear algebra, students requested recitations on infinite-dimensional vector spaces and numerical linear algebra. I turned these into guided explorations: for infinite-dimensional spaces, we discussed function spaces and drew parallels to the finite-dimensional case; for the latter, we worked through step-by-step numerical examples of the LU decomposition. Even though most people attending my recitation were not mathematics majors, they mentioned afterwards that these extension lectures motivated them to learn more linear algebra.

Similarly, in the intro applied math class, I proposed short TA research introductions tailored to student interests. For my talk on Langevin Monte Carlo, I paired a brief explanation with an **animation** of a particle exploring a complex target distribution. The visual made an abstract topic concrete and showed how mathematical ideas power real methods. By letting students help steer content and by making abstractions tangible, I aim to deepen understanding and foster excitement about where the material can lead.

Future Teaching & Mentoring Goals

I plan to continue developing as an instructor and mentor during my Ph.D. in applied mathematics at Brown. I taught a student-led course on high-dimensional probability in Winter 2026, focusing on concentration of measure, and I will apply lessons learned as a TA to course design. I also hope to extend my teaching beyond college settings through math-competition outreach, where I first honed problem-solving skills and fell in love with mathematics.

While I have not yet had formal mentoring experience, I will apply lessons from both my teaching and research experience when mentoring undergraduates during my Ph.D. I will ensure students see both the importance of the problem and the logic linking each step of a project. In applied mathematics, this is well supported by combining numerical investigations with theoretical proofs that explain the aforementioned observed behavior.