One of the most important aspects of an academic career is the education of students. In this pursuit, I seek to (1) provide a conducive and welcoming environment to maximize students' learning and engagement and (2) provide motivated students with opportunities to learn advanced material beyond the classroom and engage in research. In particular, my background, which consists of a mix between theory and applications, allows me to (1) be versatile in the range of courses that I can teach and (2) provide a diverse set of research projects for interested and motivated students.

1 Teaching

Mathematics is not a spectator sport; one cannot simply learn it by watching others do it. Instead, one must engage and wrestle with it themselves. In teaching mathematics, I strive to challenge students to engage directly with mathematics by tackling problems so that they can appreciate and understand the utility and context of what that they learn in class. To make this process more approachable and welcoming, I aim to equip my students with the necessary tools to solve problems while also promoting student collaboration. In the future, I hope to employ active-learning techniques to provide further opportunities to encourage student engagement and collaboration.

1.1 Past Experience. My most valuable teaching opportunity was serving as a graduate-student instructor (GSI) during Winter 2023. I was in charge of Math 115A, a proof-based linear algebra course that all UCLA mathematics majors are required to take. Even though Math 115A is the first course in which many students see proofs, the syllabus does not explicitly teach students how to write proofs. They are expected to learn to write proofs themselves as they go. Many mathematics majors at UCLA find Math 115A to be one of their most challenging courses both because it is their first exposure to proofs and a high level of abstraction and because the course, as intended, provides little guidance.

To better equip my students to succeed, I spent the first week of the quarter discussing various proof techniques and going through examples of proofs. I wanted my students to experience proof writing on its own.

Throughout the quarter, I emphasized the important consequences of the course material, while also emphasizing the intuition behind the key results. I also asked my teaching assistant (TA) to provide additional examples of their use. During office hours, I walked students through problems and challenged them to further engage with them. In both office hours and lectures, I frequently asked students why certain results held and the justification for certain steps. Guiding students through problems and giving them a chance to arrive at solutions allows them to take ownership of solutions. As the quarter progressed, many students who initially felt uncertain about their abilities became much more confident in their understanding. In my teaching evaluations, one student who "was nervous to be taking one of the hardest classes in the math major" expressed their gratitude for "the strong foundation that [I] had helped [them] build for proof writing."

In addition to serving as a GSI, I have also been a TA at both UCLA and UCSB (where I was a Master's student) for many courses. This includes an assortment of calculus courses (including a sequence for non-majors) and linear algebra courses (both proof-based and not). Discussion sections give students the opportunity to reinforce their learning. As such, my core focus in them is problem solving, with which I aim to bolster students' confidence in solving problems through directed guidance and collaboration. By guiding them through problems and giving them room to share ideas with each other, students can gain insight into the inner workings of results presented in class and, as a result, improve their ability to solve problems on their own.

In the first half of a discussion section, I pose problems for students to work on. I encourage (but never force) students to work together, so that they have opportunities to learn from each other's approaches. I also go over important and relevant results as needed. While students work on the problems, I regularly check in with them on their progress, while offering suggestions on how to approach problems. In the second half of a discussion session, I discuss the solutions to the problems, particularly ones with which students have trouble. One of my greatest joys as a TA has been watching students who felt they were struggling gain confidence in their understanding of the material. This was especially the case in the calculus courses for non-mathematics majors, in which many students came into the course with the notion that mathematics is not for them.

1.2 Outlook. I look forward to teaching a variety of classes, including introductory courses (e.g., calculus), proof-based courses (e.g., abstract algebra and real analysis), and applications-oriented courses (e.g., numerical methods). I especially like to teach introductory courses and early proof-based courses. I also hope to develop new courses on subjects, such as topological data analysis and networks, that are related to my research.

To grow as an educator and improve the educational outcome of my students, I seek to incorporate several facets into my teaching.

Active Learning: I plan to incorporate elements of active learning with traditional lectures. I that believe both have clear benefits and the opportunity to complement each other. Traditional lectures provides a structured outlet to deliver course material, while active learning provides students with opportunities to take ownership of it. For each course that I teach, I plan to dedicate one class per week to an active-learning approach.

Two methods from active learning that I especially want to implement are inquiry-based learning (IBL) and group work. IBL gives students the opportunity of self-discovery by guiding them through processes to derive key concepts, thereby allowing them to take greater ownership of the material and its context. Group work allows students to work together, bounce ideas off of each other, and provides solidarity in knowing that they are not alone in their challenges.

While incorporating active learning with traditional lectures can look different across different courses, students in any type of course can benefit. In an introductory course (e.g., calculus) that focuses on basic computation, students can work on deriving formulas (e.g., trigonometric-substitution identities) to deeply understand them instead of relying on rote memorization. In a proof-based course (e.g., real analysis), students can work on proving important theorems (e.g., the mean value theorem) by proving bite-sized lemmas that combine to yield the theorem at hand. In an application-oriented course (e.g., network science), students can gain hands-on experience by working on group projects that consolidate the course material into a "deliverable" that they can take beyond the classroom setting. In all of these cases, active learning enriches students' learning outcomes by giving them the opportunity to actively engage with course material in a guided setting and therefore better understand the context for its use.

Balancing Theory with Computation: In almost all mathematics courses, both theory and computation are crucial. Theory provides the groundwork and foundation for key concepts, and computation allows students to work directly and tangibly with the objects of interests. For each course that I teach, I will incorporate both theory and computation while appropriately balancing them for the intended audience. For example, in a proof-based course, I will use computational examples to highlight theoretical ideas.

When I taught Math 115A (proof-based linear algebra), I chose to emphasize the theory because it was many students' first time seeing proofs, as well as their first exposure to mathematics with that much abstraction. While I also discussed some computational aspects of linear algebra (e.g., finding eigenvalues and eigenvectors), I spent much more time discussing and proving theorems. When I next teach a proof-based course, I will put more focus on computation than I did the first time (while still emphasizing the theory), as the computational aspects can help students put theoretical and abstract concepts into context.

Theory and abstraction can also improve understanding of the use of computational techniques. For example, in a calculus course, having a cursory understanding of changes of variables can help students appreciate the context and formulation of the chain rule. In such a course, I will give students intuition of the theory for them to better appreciate key results.

2 Undergraduate Mentoring

Mentoring undergraduate students has been an important part of my time as a Ph.D. student, and I look forward to doing more of it in the future. This includes reading with students through advanced topics, with the goal to guide them towards research.

My goal in mentoring students is to (1) provide opportunities for them to learn skills and gain experience outside of the classroom setting and (2) provide ample support and guidance for them to explore their own ideas. I suggest potential projects and general approaches to take, while also giving my students the flexibility to choose their specific paths. My research interests offer students a wide range of topics. Students interested in applications and computation can work in projects involving studying complex systems and applications of topological data analysis (TDA). Students who are interested in theory can work in theoretically-oriented projects in TDA.

2.1 Past Experience. My experience in mentoring undergraduate students includes my involvement in the Direct Reading Program (DRP) in the UCLA mathematics department and co-mentoring students in a research experience for undergraduates (REU) program.

The DRP aims to expose undergraduates to advanced topics in mathematics by pairing them with graduate-student mentors to do independent projects. I have guided my DRP students to explore topics that are related to my research. Some of my DRP students have transitioned into research mentees. This includes Amos Ancell, who is working on using TDA to study the accessibility of resource sites; Ruyi Lu, who has been studying opinion dynamics on directed configuration-model graphs; and Xiaohe Zhang, who studied opinion dynamics with a repulsion factor.

In summer 2021, I co-mentored (with my advisor, Mason A. Porter) four undergraduate students in UCLA's applied mathematics REU. The students' project focused on detecting anomalies in traffic data. I met with the students (both in groups and individually) multiple times a week to discuss ongoing progress and the directions that they were exploring. I also suggested and discussed possible methods to explore.

2.2 Outlook. Mentoring undergraduates, both in research and in directed reading, will be a fruitful and rewarding endeavor that will also enrich my research. It will complement my teaching by giving interested and motivated students the opportunity to enrich their understanding of mathematics while potentially also contributing to research.

One facet of research that I plan to include in my mentoring is to have students give presentations on their work. I plan to hold seminars for students to do this. This will help students concretize their work while also providing the audience (including students and potentially faculty members) with the opportunity to learn something new. I will also encourage students to attend conferences (such as the Joint Mathematics Meetings). Conferences provide opportunities to present one's work, and they also expose students to current research and potential future mentors and collaborators.

I expect that students will benefit from my mentorship, in both deciding future educational and career goals, and gaining skills that are relevant in a variety of settings. In particular, research experience will help students decide whether or not they wish to pursue graduate studies. In particular, it will help prepare students who wish to pursue graduate studies, while also providing relevant skills (e.g., programming and data analysis) to students who decide against graduate studies for their future vocations.