

SOP-02

Statement of Purpose - PhD in Data Science (Mathematics Department)

When I was studying mathematics, I often wondered how these concepts applied in the real world. Sitting in my linear algebra and statistics classes, I would ask myself: where do these ideas show up beyond textbooks, and how can they solve real problems? This curiosity led me to explore data science. I began attending tech events and conferences in Islamabad focused on machine learning and data analytics, and started learning Python on my own. Combining coding with mathematics felt natural, and I became fascinated by the possibility of using mathematical theory to extract meaningful insights from data.

Mathematics has always been my favorite subject. In high school, I loved spending hours solving problems and discovered I excelled at it, scoring 94/100 in my FSC Part II. My teachers often noted my curiosity and focus as a front-bencher, eager to absorb each concept deeply. This enthusiasm naturally led me to pursue a bachelor's degree in mathematics, where I could explore each topic Algebra, Geometry, Trigonometry, Calculus, Statistics, and Probability in greater depth. During my undergraduate studies, I performed strongly across semesters, earning GPAs as high as 3.9 in several terms, and graduated with a cumulative CGPA of 3.5. Over time, I realized I was most drawn to applied mathematics, particularly linear algebra and its practical uses

One of the most transformative experiences during my undergrad was tutoring my peers. Helping classmates understand challenging courses in later semesters allowed me to question and solidify my own understanding. I realized I loved teaching and the satisfaction of breaking complex concepts into digestible ideas. This experience also strengthened my analytical and communication skills, which became invaluable as I transitioned into applied data science.

In my final semester, I wanted to explore how mathematics could directly connect to the real world. I attended various events in Islamabad focused on data science and machine learning, including a program by Atomcamp, a leading data science and AI education startup. Inspired, I approached the founder about bridging mathematics with data science. He recognized my potential and offered me a merit scholarship for a six-month rigorous bootcamp. During this time, I simultaneously self-studied Python and attended nightly classes, balancing bootcamp projects with my final semester assignments. The experience was intense but transformative. Linear algebra and statistics, once abstract, were now tools I applied to real datasets, reinforcing my love for both theory and practice.

Shortly after graduation, I secured an internship as a data analyst and was soon offered a full-time role at Atomcamp, where I also became a teaching assistant. Over four

months, I led two-hour weekly sessions for 50 trainees, helping them understand complex data science concepts while managing curriculum and project assignments. I also contributed to multiple projects, applying my skills to real-world datasets. My performance earned me several promotions and recognition, including Employee of the Quarter 2025. To continue giving back, I became a mentor on Topmate, providing 1:1 guidance to data science learners, and volunteered as a fellowship lead for Buildables, supporting early-stage professionals in skill development. Additionally, I challenged myself in competitive settings, participating in four hackathons and three coding competitions, including META, Hackt-nation by MIT, Calico by UC Berkeley, NASA Space Apps Challenges, and MIT Informatics Tournament, where my teams received global recognition and top placements.

While these professional experiences have strengthened my applied skills, I realized that my core passion lies in mathematics and research. I am particularly excited about Professor Y's work in applied topology and topological data analysis at X. My strong foundation in linear algebra and applied mathematics, combined with hands-on experience in data analytics, positions me to contribute effectively to his research. I am eager to explore how mathematical structures can provide principled insights into complex datasets, and to bridge the gap between theory and real-world applications.

I am applying to the PhD program in Data Science at the Mathematics Department of X because it provides the perfect environment to advance my understanding of mathematical foundations while engaging in cutting-edge research. I am particularly drawn to the opportunity to work with a diverse, collaborative community and gain deeper expertise in topological data analysis and machine learning. My goal is to contribute to meaningful research while continuing to mentor and teach, integrating my love for mathematics with practical data science applications.

I am confident that my academic background, professional experience, and passion for applied mathematics and data science have prepared me to thrive in this program. I look forward to contributing to the research community at X, learning from Professor Y, and developing innovative solutions at the intersection of mathematics and data science.

SOP-01

-When I was studying mathematics, I often wondered how these concepts were applied in real life. After classes, I would spend time researching how mathematics connects to the world beyond textbooks, and that is when I came across data science. I was fascinated by how data and statistics could be used to solve real problems. This curiosity led me to start learning the Python programming language on my own. I enjoyed combining coding with mathematics, but I wanted to understand how coding could be applied in practical and impactful ways.

This growing interest encouraged me to attend various events and conferences related to data science. At one such event, I met the founder of Atomcamp, a leading data science and AI EdTech platform. He noticed my curiosity and engagement and offered me a merit-based scholarship for their six-month data science bootcamp. The program was rigorous, especially as I was completing my undergraduate degree at the same time, but it allowed me to connect mathematics, data, and programming through real-world projects.

Learning from the bootcamp helped me understand the core concepts of data science, starting from data cleaning to data analysis, data extraction, and manipulation using tools like SQL and Python. This eventually led me to core concepts like machine learning, NLP (Natural Language Processing), computer vision, and LLMs (Large Language Models). 2 months after the bootcamp, I got my first internship as a data analyst. Right before my internship ended, seeing my enthusiasm for data science, I got hired by the same company where I had taken the bootcamp as a trainee. Now, I work as a teaching assistant, helping train other trainees from diverse backgrounds. I assist them in learning core concepts and troubleshooting problems. This teaching experience has opened my eyes to how much I enjoy helping students.

During my time as a teaching assistant, I also had the opportunity to work on a natural language processing (NLP) project focused on detecting human emotions. In this project, I applied my Python skills to scrape large datasets from multiple sources like Facebook, X, YouTube, Reddit, and editorial sites using libraries like BeautifulSoup, Selenium, and Scrapy. I then performed sentiment analysis to evaluate textual data. This experience helped me better understand how theoretical concepts translate into applied machine learning workflows.

After completing the bootcamp, and later as a teaching assistant at atomcamp. In these roles, I enjoyed helping students refine their understanding of data science concepts and apply what they had learned in practice. While these experiences strengthened my applied skills, they also made me aware of questions I could not fully address independently, particularly related to building better models, conducting deeper analyses, and using data more rigorously to inform decisions. While my professional roles strengthened my applied skills, they also revealed methodological and theoretical questions that I could not resolve independently. Having explored industry, teaching, and research-adjacent work, I am now looking for a formal doctoral

training to rigorously investigate these challenges. mathematical foundation with advanced technical skills and to engage more deeply in research. This motivation drives my goal of studying data science at the doctoral level and contributing to meaningful, real-world decision-making through data-driven research.

SOP0

When I was studying mathematics, I often wondered how these concepts are actually used in real life. After classes, I would spend time exploring how mathematics connects to the world beyond textbooks, and that's when I discovered data science. I was fascinated by how data and statistics could be used to solve real problems, and I wanted to understand how coding could make these applications practical and impactful. Motivated by this curiosity, I began learning Python on my own, combining my mathematical knowledge with programming to explore problem-solving in new ways.

To deepen my understanding, I attended various events and conferences related to data science. At one such event, I met the founder of Atomcamp, a leading data science and AI EdTech platform. He noticed my curiosity and engagement and offered me a merit-based scholarship for their six-month data science bootcamp. The program was rigorous, especially as I was completing my undergraduate degree at the same time, but it provided an incredible opportunity to connect mathematics, data, and programming through real-world projects.

During the bootcamp, I gained hands-on experience with the full data science workflow: data cleaning, data extraction, data analysis, and manipulation using SQL and Python. I gradually explored advanced topics including machine learning, NLP (Natural Language Processing), computer vision, and large language models. Two months after the bootcamp, I secured my first internship as a data analyst. Impressed by my enthusiasm, the same company later hired me and I now work as a teaching assistant, helping train other trainees from diverse backgrounds. Assisting students with core concepts and troubleshooting problems has shown me how much I enjoy teaching and mentoring skills I know will also support my growth as a researcher.

While working as a teaching assistant, I had the chance to lead an NLP project focused on detecting human emotions. I applied my Python skills to scrape large datasets from Facebook, X, YouTube, Reddit, and editorial sites using libraries like BeautifulSoup, Selenium, and Scrapy. I then performed sentiment analysis to evaluate textual data. This project not only strengthened my coding and analytical skills but also showed me how theoretical concepts translate into applied machine learning workflows.

These experiences clarified that while I had developed strong applied skills, there were deeper methodological and theoretical questions I could not fully address independently especially regarding model building, rigorous analyses, and using data to inform real-world decisions. Having explored industry, teaching, and research-adjacent work, I realized the need for formal doctoral training to develop a stronger mathematical foundation, advanced technical skills, and research expertise.

I am particularly drawn to **X's PhD in Data Science** because of its focus on combining theoretical rigor with applied research, and its collaborative research environment. Working with **Dr. Y** whose research in Topological Data Analysis, Machine Learning, and applied category theory aligns closely with my interests, presents an incredible opportunity to explore advanced methodologies and tackle complex problems. His mentorship would allow me to contribute to impactful projects that merge rigorous analytics with practical relevance.

X's PhD program provides the ideal environment to develop my expertise in data science while contributing to meaningful research. I am highly motivated to utilize my background in mathematics, coding, and applied data science to advance methodologically, develop innovative solutions and support data-driven decision-making in real-world contexts.