MSc in Mathematical and Theoretical Physics — University of Oxford

I would like to undertake a Master of Science in Mathematical and Theoretical Physics, as I am very dedicated to pursuing a research-related career in this field. This is why I have chosen to go to the University of Oxford, not only for its well established academic prestige but also for its unique postgraduate programme that combines the most up to date theoretical physics with its mathematical foundations. The opportunity to read among a wide variety of subjects and to follow a specific pathway that suits my research interests is what excites me the most about this course.

My interest in theoretical physics and applied mathematics began during my double degree program at the École Centrale Marseille, in France. Although I had already studied classical mechanics, thermodynamics and electromagnetism in Brazil, at the University of São Paulo, these courses were more oriented towards their practical applications to engineering, with many laboratory sessions and experimental activities. The French curriculum, on the other hand, had a greater mathematical rigor and a more in-depth study of physical concepts. Many exchange students did not adapt to the theoretical approach of the classes, but I was enthusiastic about understanding the mathematical tools and physical systems in more detail ($\star$). There I was able to learn complex analysis, continuum mechanics and quantum mechanics, for example, which will be fundamental to the degree I am applying for.

Most of these subjects were very challenging, not only because they were graded on oral presentations, unlike in Brazil, but also because some of their prerequisites were not met by exchange students. One particular demanding course — "Molecular Structures and Properties" — motivated some of the Brazilians and me to create a study group in order to catch up with the rest of the class. We reviewed the week's lessons, rehearsed for the oral assignments and discussed advanced exercises, which were kept in a shared folder along with other subjects. These activities later expanded to all exchange students and then to the rest of the school, and some of my lecture notes are still being used nowadays, over six years after they were taken. In the end, I was able to get one of the best grades in the class while helping others pass the exam.

Being in contact with more advanced physics topics sparked my curiosity to go further on what was being taught in class. It all started with the book "QED: The Strange Theory of Light and Matter" by Richard Feynman, which opened my eyes to other counterintuitive behaviors of subatomic interactions. While being a great introduction to the field, the popular science writing did not fully satisfy my appetite for a thorough understanding of small particles. This led me to the online textbook "Quantum Mechanics for Engineers", from the Florida State University, for an extensive and self-contained explanation of quantum physics. Later, I started studying the "Quantum Computation and Quantum Information Theory" course from the Carnegie Mellon University, since I wanted to have a better comprehension of quantum computers. More recently, following my desire to expand my knowledge about the cosmos, I have read the "Astrophysics for People in a Hurry" book from Neil deGrasse Tyson, an educational text that presents some of the concepts of astrophysics in simple terms.

In order to succeed at this Oxford master course, I believe that, besides my motivation, independence and resilience are required as well. This is where my work experience helps me the most. When I joined a technology startup as a software engineering intern, I had to understand the system's architecture without much support from the small team. Because of my outstanding performance, I was invited by the chief executive officer to co-found a big data company in the development of an analytics database. In the early days of the business, when our only client was threatening to leave the platform, we spent two months working more than twelve hours a day non-stop, including weekends and holidays, in order to deliver all requested features. This dedication was essential for maintaining the client, and demonstrates

that I can face any amount of stress to achieve my goals.

Recently I have left my position as tech lead of the organization in order to pursue a career in science. My desire to understand the fundamental laws of the universe outgrew my aptitude for programming, and after reviewing that all my free time activities were focused in expanding this passion, it was a straightforward decision to join the Mathematical and Theoretical Physics master's degree. Since I wish to get a more broader comprehension of nature, I intend to choose the Generalist Theoretical Physicist pathway of the course. I am particularly curious about general relativity and quantum field theory, as I believe these are both groundbreaking theories that will follow up on my educational background and reading interest. After completing the programme, I plan to apply for a PhD position at Oxford or another top tier institute in order continue my goal of being a researcher in the field.