Growing up in a family that is engaged in agriculture, I have first-hand experience of the problems faced by the modern agricultural industry. I have seen traditional farming methods suffer from a lack of workforce and inefficient use of resources. The desire to combat these problems and transform the agricultural industry by imparting intelligence to machines has motivated me to pursue a career in robotics. From high school, I took up vocational courses and projects in electronics and then went on to pursue engineering in Birla Institute of Technology and Science (BITS), Pilani, a top institution from India. Since then, by building an autonomous drone to detect and contain oil spills, giving back to my alma mater by fully automating the laundromat in my university, leading the robotics club of BITS to victory at prestigious competitions and by collaborating on various research-based internships, I have always been in the pursuit of solving real world problems while simultaneously developing my skills in robotics for my long term goals.

Passionate about agro-robotics, I wish to gain strong expertise in the same by working as a Systems Engineer at 'Blue River Technology' or as a Robotics Engineer at 'Ecorobotix' immediately after my Master's. In due course, I intend to implement the knowledge and experience gained to start my own company in India, an agriculture intensive economy with limited automation in farming. I want to build smart machines for eco-friendly and precision farming while keeping the costs competitive for small-scale farmers. However, I do realize that development of production-ready robots requires an in-depth knowledge of robotic sub-systems and an exposure to different aspects like market trends and business needs, which I'm sure to gain from the Master of Science in Robotic Systems Development (MRSD) at Carnegie Mellon University (CMU).

MRSD program, with its strong professional network, theory-to-practice driven curriculum and integrated business courses would streamline my approach towards my long term goals. Unique offerings like the MRSD Project course would not only help me transform my first agricultural bot from blueprint to reality but also give me invaluable opportunities to learn from and collaborate with a multidisciplinary team. An opportunity to work with companies like Harvest Automation or TartanSense during summer internship will help me gain corporate exposure and training alongside my coursework. A chance to learn about field robotics from centers of excellence like Field Robotics Center (FRC) would give me an understanding of the challenges involved in ground robotics. I would be a valuable asset to the Comprehensive Automation for Specialty Crops (CASC) project led by Dr. Sanjiv Singh and the FarmView project from Dr. George Kantor's Lab with my experience in UAVs and Machine Learning for the data-driven solutions the teams develop. This would also provide me hands-on experience in working towards autonomy in agriculture. I believe that research in fields of human-robot interaction and actuator technologies from rehabilitation robotics can advance agro-robotics for physical interaction with delicate crops. I plan to gain expertise in these concentrations through the MRSD elective courses and cutting edge research at CMU. Further, the opportunity to build a stellar professional network through the Swartz Entrepreneurship Center, understanding of the commercial sphere through the business seminars and interactions with Tepper School graduates will equip me with the skill set necessary for the entrepreneurial journey. All these features make MRSD program a perfect launchpad for my career.

I have prepared myself for the MRSD program and eventually for my long term goals since undergrad. To contribute to the business-oriented courses of the program and to learn them with ease, I pursued a minor in finance along with my major degree. Further, to develop strong fundamentals in robotics, I undertook projects and coursework in diverse themes. My belief in the power of innovation and the desire to add value through my skills led me to transform existing laundry machines in my hostel to function as a smart device and solve problems like handling coins and bookkeeping. I conceived, designed and implemented IoT based laundry system by designing a custom PCB that interfaced with all 16 machines on one end and with a web-app on other, and this solution was widely appreciated by students and the administration. My deep desire to learn about the 'intelligence' part of robotics led me to take up an internship in Machine Learning (ML) at Persistent Systems. My work focused on Automated-ML wherein I worked on frameworks like auto-sklearn. Through this internship, I learned to dig deep into problems, analyze variables and make calculated decisions effectively. It also reinforced the importance of real-world deadlines and the consequences of solving problems correctly and robustly in a corporate setting. This experience in ML will help me develop data-driven control systems and decision tools based on sensor data during MRSD projects.

I joined the student-run robotics club 'IORTA' in my first year. The team was working to facilitate efficient and rapid clearance of oil spills using a drone, raft and an eco-friendly chemical: spill-sorb. I developed the pipeline to detect oil spills from images and also led the hardware and subsystems team of the project. Later, we pitched this project at the EXPO competition, a UAE government's initiative to help students generate viable solutions for problems relevant to the Gulf region. The EXPO team, impressed with the ingenious solution, sanctioned a grant and has offered us a prestigious opportunity to showcase our project at the World EXPO, UAE in 2020. Besides the technical contributions, I studied the market share of post-oil spill management sector, the sources of revenue, market-reach

strategies and handled finances worth ~8000 USD. More importantly, since almost all challenges we faced were not in technical aspects but in developing business models or conveying proposals through short presentations to the investors, I realized that building a product is just half the battle won: one needs to be able to sell it as well! For this reason, I look forward to the business electives of MRSD program like the 'New Product Management' and 'Lean Entrepreneurship' seminars and prepare myself the commercial sector.

My decision-making capabilities, complemented by a passion for analyzing areas for improvement and formulating action plans towards executing them led me to head Team IORTA. Under my leadership, we are competing for the 'Window Cleaning Drone' proposed to ensure worker safety in high rise buildings. To overcome payload limitations and mechanical balancing of torques on the drone with the cleaning equipment, we are custom designing and printing the arm, replacing LiPo batteries with regulated power source to increase flight time, and designing sophisticated algorithms to detect windows. However, while working on such projects I realized the deep-rooted interdisciplinary nature of robotics and I noticed in some instances I was not able to effectively build an end product I had in mind due to lack of expertise team in either of the sub-domains like mechanical design or path planning. This realization solidified my interest in MRSD degree which offers opportunities to collaborate with the best minds from every discipline and learn through mutual knowledge transfer.

I constantly try to learn new things and with not wanting to limit myself to just working with drones, I approached my professor with a proposal to work with a manipulator in the lab. I wanted to construct a model of the world and estimate robot's state simultaneously, inspired by Dr. Michael Kaess and co-authors' work based on articulated robot motion for SLAM, and overcome the limitations of the manipulator related to inverse kinematics. Unfortunately, because of a lack of guidance in this regard, I was not able to achieve this and I rather devised another solution for controlling the joints by bypassing the Programmable Logic Controller (PLC) and designing a controller and drivers. At CMU, I look forward to learning autonomous navigation through courses like Robot Autonomy, Localization & Mapping and dive deeper into SLAM and high fidelity 3D mapping technologies through the capstone project.

For my undergraduate thesis, I am working on a balance bot in the BIRDS lab at the University of Michigan (UM) under the supervision of Prof. Shai Revzen. This is my first experience working with advanced controllers. I learned about concepts like non-minimum phase only when I failed to implement a few controllers in the beginning and I have known that realizing a controller on a real system is far more complex because of the extrinsic factors generally unobserved in simulations. The challenging part of my thesis was learning about non-linear systems on my own, but eventually, I designed and implemented a back-stepping controller using the Lyapunov theory to control the pitch angle of the bot. I am now working on backstepping for controlling the entire system and path planning and obstacle avoidance algorithms as well. This demanding project has given me a good appreciation of mathematics involved in dynamics, control and path planning algorithms in robotics. I feel more confident in my abilities to think in a comparative perspective and succeed in unfamiliar circumstances. It also reinforced the significance of experimental study for extracting optimal engineering solutions.

I studied in Dubai, a technological marvel and one of the world's most cosmopolitan city, which has given me an exposure to cultural diversity and broadened my perspective, establishing strong connections with students and mentors belonging to different cultures. While I made sure my academics were top-notch by studying all courses in-depth, I also partook in a spectrum of activities from conducting workshops to event management. Being a multitasker, I worked on projects for 6 hours daily after my classes and still attended my Kathak dance class over Skype. Holistic orientation towards both engineering and creativity has helped me develop a dynamic personality. On one hand, diligently pursuing my academic interests, coursework and projects has developed in me an analytical mindset, while on the other, extra-curricular activities have provided me with creative, managerial and leadership skills. Thus, I possess a multi-perspective view and will be able to uniquely contribute to the class and community at CMU. My drive to equip students with technical expertise has drawn my attention to 'Girls of Steel Robotics' group while my creative nature is excited about the Graduate Entrepreneurship Club and I would love to learn and contribute from the mutual knowledge transfer and the strong networking opportunities they offer. I would also like to promote Indian classical dance form by conducting short workshops through the SPIC MACAY chapter at CMU.

Placing the good of the society above self has always been and will continue to be important for me. Leveraging my skillsets to further this vision by empowering farmers with data-driven solutions and physically interacting robots thus eventually alleviating problems in this sector is my ultimate goal. However, I do realize the importance of formal education in robotic systems engineering and business principles for bringing about a quantum change and for leading the Agriculture-4.0 revolution in India. Hence, I believe, CMU, with levels of technological advances and preeminent graduate program would be the most important step for achieving my objectives. I look forward to being a part of the MRSD class of 2022 at CMU.