

Dear selection committee,

I am writing to express my strong interest in pursuing the doctoral program in medical robotics at Delft University of Technology. My name is Alperen Kenan, and as a mechatronics engineering master's student at Sabanci University, I am doing my research in the Human-Machine Interaction Laboratory. I firmly believe the focus of this Ph.D. position is a perfect fit for me considering the alignment with my ongoing master's thesis that investigates the bilateral teleoperation of surgical robots where I gained hands-on demonstrable experience in developing medical robotics. Furthermore, I had the chance to be an exchange student at TU Delft for six months during 2022-2023 Fall Semester and work at the HITLab in Cognitive Robotics Department.

Human-Robot Interaction, especially teleoperation and surgical robots has been the main research area of my master's studies and I would like to continue in that field at TU Delft in order to improve myself further. I am excited about the opportunity to work with Asst. Prof. Tim Horeman and Prof. David Abbink in the field of adaptive robots and contribute to the Advanced Laparoscopy (AdLap) project.

I obtained my bachelor's degree from the Department of Mechanical Engineering at Middle East Technical University (METU), an ABET-accredited institution in Ankara, Turkey. I gained a CGPA of 3.40/4.00 and my ranking was in the top 10% of the department. I learned various subjects during this program that will assist me in my journey in robotics such as computer-aided design, the strength of materials, machine elements, manufacturing technologies, theory of machines, numerical methods, mechatronics, kinematics, dynamics, principles of robotics, and control systems. While doing my bachelor's, I also completed a minor degree from the Department of Aerospace Engineering at the same university.

After graduation, I started my master's degree at Sabanci University in Istanbul, Turkey where I am studying at the Human-Machine Interaction Laboratory. My thesis subject is related to time domain passivity control of teleoperation systems, and I am trying to implement this methodology on a 6 Degrees of Freedom surgical robot in order to achieve haptic force feedback while preserving stability. I had to integrate 12 actuators and 13 sensors from different hardware interfaces while maintaining the high performance of the overall medical system. I obtained a CGPA of 3.68/4.00 and have taken courses in the fields of Robotics and Artificial Intelligence. In my Machine Learning course, I learned various models and combined Natural Language Processing with Image Processing for the final project, while in my Deep Learning course, I implemented Mask R-CNN method for Instance Segmentation of brain tumor images and learned how to optimize neural networks. In the Autonomous Mobile Robotics course, I was acquainted with the main technical areas of Sensing, Reasoning, and Acting. In my additional courses, I improved my knowledge about the forward & inverse kinematics of machinery and acquired insight into the processes behind computer analysis & simulation programs.

During my master's program, I did an Erasmus Exchange Program at Delft University of Technology. Here, I have taken courses about robotic software practicals, ethics of AI, and technology entrepreneurship. I had the chance to take Human-Robot Interaction course from Prof. David Abbink and I found the opportunity to join Haptic Interface Technology Lab (HITLab) as an intern to work with Asst. Prof. Yasemin Vardar for a project to stimulate paintings in the haptic domain using image processing and texture rendering.

My first engineering work experience was an internship in manufacturing at an armored vehicle company. I learned to do technical drawings using CATIA software and had the opportunity to observe and interact with the CNC machines such as milling, lathe, laser cutting, and robotic welding machines. It was an internship that required me to be in the field of industry and made me familiar with the common manufacturing processes. My second internship was in Research and Development office at ASELSAN, which is one of the top 100 defense companies worldwide. I learned how to use PTC Creo and designed a fatigue testing machine for the prototypes of a transmitter system. I made simulations for the system, designed the parts of the system, and selected linear motors for the setup. During my senior year, I started working at a part-time job in the optical design department of a defense company as a mechatronics engineer. I designed a universal joint mechanism for controlling the orientation of a camera and had training in Geometric Dimensioning & Tolerancing. Besides my university courses and my work experiences, I was also an active member of the METU Robotics Society, which is the first robotic student club in Turkey. I participated in robotic competitions around the country, was selected as a board member of the society, and became a coordinator at International METU Robotics Days.

During my academic and work experiences, I had the opportunity to learn and implement various computer programs. I used Siemens NX, SolidWorks, and CATIA for technical drawings and COMSOL for simulation purposes. I utilized MATLAB and Simulink for many numerical computations and Python for my Artificial Intelligence courses. During my Robot Software Practical course at TU Delft, I learned to use Linux, Git, C++, and ROS.

I hope to gain a better comprehension of Robotics by joining this Ph.D. program. Robotics is a field with a variety of disciplines, and I think my multidisciplinary background in engineering is a perfect fit for this challenging path. It would be an excellent opportunity to work in a multidisciplinary team with supervisors from different departments, students from different universities and specialized companies in robotics and medical devices. I want to strengthen my theoretical knowledge, increase my hands-on experience, and improve my research ability. I aim to continue my research in academia as a postdoc after obtaining my doctoral degree.

I had the opportunity to live in Delft for a period, and I fell in love with both the campus and the city. I already had my time to blend in with the city and I can easily envision myself fitting in with the university community again. I firmly believe I have the motivation, ability, and preparation to set out on this challenging path. Drawing from my educational background, experiences, and extracurricular activities, I am confident that I can make a valuable contribution to your project with my knowledge and skills.