SAPIENTIA INTERNATIONAL
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Sapientia International Courses

MIT Artificial Intelligence and Robots Summer 2022

Learning the most advanced robot theory knowledge at MIT, experiencing the science and technology in practice, and feeling the power of intelligent technology and human wisdom.



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SI Courses MIT Artificial Intelligence and Robots

Summer 2022

Introduction

In 320 BC, the Greek philosopher Aristotle first proposed the idea of a robot.

In the 9th year of Jianxing (AD 231), according to records, Zhuge Kongming invented the wooden cow and flowing horse, which could carry grain and rice, day and night.

In 1913, Henry Ford's first automobile assembly line was put into operation.

In 1966, the world's first mobile robot was born in the Stanford University Artificial Intelligence Laboratory.

In 2015, the robot Sophia officially obtained Saudi citizenship.

In July 2021, the Blue Origin spacecraft successfully entered space and returned safely, realizing the first commercial space journey of mankind.

For more than two thousand years, mankind has never stopped the conception and research of robots, and has never given up the continuous exploration of intelligent equipment. Today, robotic smart devices have served all aspects of our lives, helping to promote the continuous progress and development of human technology. Robotics is destined to lead the new fashion of electrical and electronic research in this century, and the Massachusetts Institute of Technology, known as the cradle and creator of modern robots, is pushing the field of robotics forward with continuous innovation and development.

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Massachusetts Institute of Technology, or aka MIT , is located on the shore of Lake Charles in Cambridge, Massachusetts, USA. It is a world-renowned private research university and is known as "the world's best technological university." As of 2020, 85 Nobel Prize winners have worked or studied at MIT. Qian Xuesen, Pei IM Pei, Bernanke, etc. are all alumni of MIT. In the past century of development, MIT has developed into an extremely important high-tech knowledge hall and R&D base in the world. Robotics is an interdisciplinary subject involving mechanical engineering, electrical and electronic engineering, and computer science. These are undoubtedly MIT's ace majors. Robotics is committed to the design, assembly, and manipulation of intelligent machinery, and achieves the control, monitoring, environmental sensing and signal processing of intelligent machinery through computer programming. Intelligent machinery can not only replace human labor, work in the worst and most dangerous environment, but also simulate the appearance, behavior, and consciousness of people, and has an immeasurable application prospect. Sapientia International and the Massachusetts Institute of Technology (MIT) have tailored a two-week inspiring and exploratory summer camp for young people in China and the United States who love and are committed to studying intelligent machinery technology. The students of Sapientia International will truly walk into MIT and listen to the basic courses of MIT Robotics Experiment Course. The training plan is based on "Enlightenment + Practice + Innovation" and covers core courses such as Mechanical Design, Hardware Programming, and Microelectronics. In the 14-day intensive learning, students will learn to master the basic knowledge and application examples of robot design and production, exchange learning experiences with MIT and Harvard students, and practice the production of automatic robots under their guidance. The students of Sapientia International will experience top-notch science and technology in theoretical study and lab experiments, expanding their imagination and innovation.

During the program, students will also visit several well-known robotics laboratories at MIT and Harvard University, such as MIT Media Lab, MIT Bionic Robot Lab, Harvard Biorobot Lab, Harvard Micro Robot Lab, etc. , Discuss with young scientists about their cutting-edge technology research, such as underwater robots, smart actuators, wearable robots, etc. The interest development projects of the summer camp every evening include visiting science and

technology museums and personally experiencing various intelligent machinery and equipment. Sapientia International provides a variety of interesting and practical intelligent machinery. Sapientia International will provide each group of students with an new intelligent mechanical experience and exploration time with completely different external form and internal logic every day, such as drone control experience, Star Wars robot programming experience, Hexagonal robot design experience, iRobot automatic navigation experience.

The smart machines made by the students of Sapientia International will participate in a competition where MIT professors and industry professionals serve as judges. Students exercise teamwork, expression of academic thoughts, and critical thinking through interactions such as discussing competition strategies, designing competition robots, and debugging programs with their teammates. The topic of the robot competition will also closely follow the theme of the MIT Robotics Competition held by MIT every year, so that students can get more reference, and can stand on the shoulders of giants to further innovate and create! The judges will make detailed comments on the design and competition performance of each group, and give suggestions for design improvement. The teaching assistant team will also provide post-match coaching to the students according to the suggestions given by the judges to ensure that the students truly master and understand the feedback from the judges. Outstanding students will have the opportunity to further participate in the professor's scientific research projects. During the project, the teaching team of Sapientia International will make observation records based on the students' learning situation, and will give a detailed personal evaluation report after the end of the program. Students who perform well will receive a recommendation letter from the professor.



Our Advantages

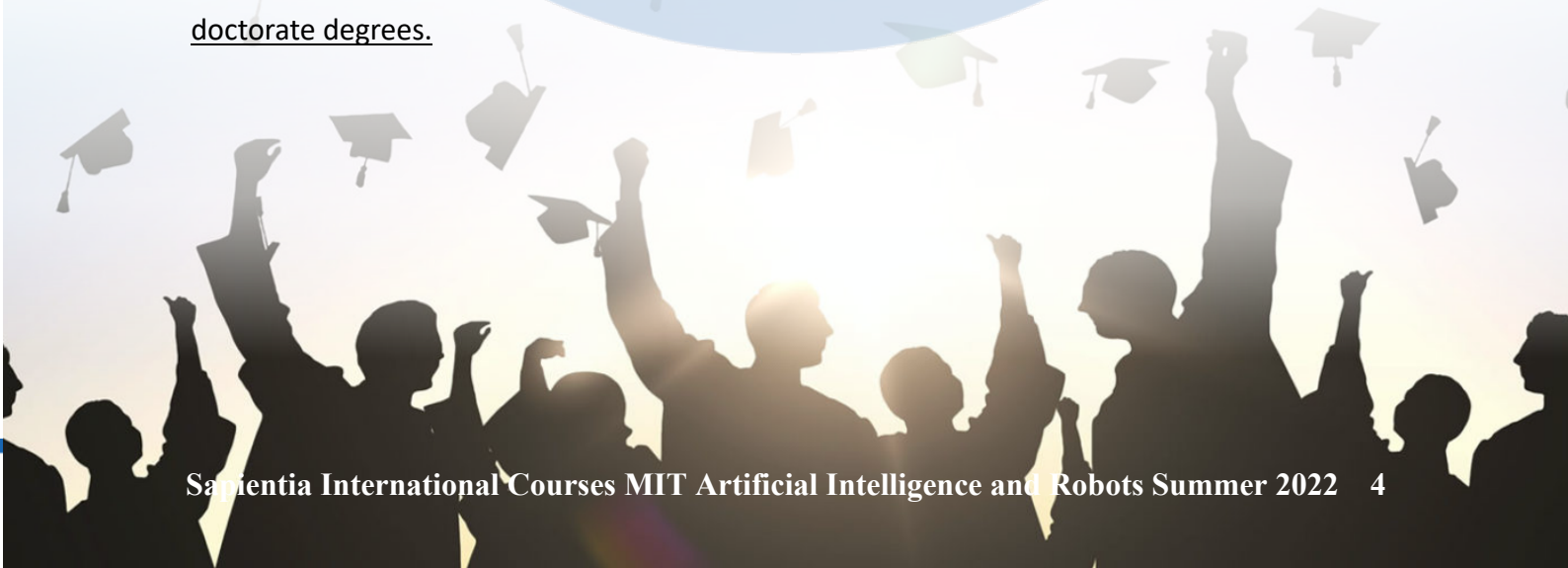
1、The world's top faculty and small class size

Sapientia International adheres to the concept of "world's superb university education". The instructor of this project is a tenured professor at Massachusetts Institute of Technology,

who is a leader in the field of robotics in the world. In order to ensure the quality of teaching and maximize the gains of students, we adopt a small-class teaching model, and the number of students in each class is limited to 12-15. In addition, each teaching class will be equipped with student assistants from famous schools to follow up the students' learning progress and tutor students' after-school homework to ensure that any questions are answered in a timely manner.

2、The industry's leading education achievements

Sapientia International has become a peer leader with its quality and reputation. Since its establishment in 2015, Sapientia International has helped more than 100 previous students to improve their background in a targeted manner, allowing them to fully explore and exercise their personal potential, and at the same time determine academic and professional goals that meet their personal ideals and interests, and break through the mindset to seize the key opportunity, which made them successfully enter their dream schools at home and abroad, and pursue further studies in undergraduate, master, doctoral and other degrees. According to our follow-up survey, our students successfully entered Harvard University, Yale University, Columbia University, New York University, Massachusetts Institute of Technology, Stanford University, Princeton University, Fordham University, Rutgers University, Boston University, Boston College, University of California at Los Angeles, University of California at Berkeley, University of Southern California and other well-known universities for bachelor, master, and doctorate degrees.



Previous Students Cases

2017

Sapientia International MIT Artificial Intelligence and Robot Summer Camp encourages students to design and manufacture intelligent robots with strong practicality and high creativity during the study period. In 2017, three high school students, inspired by indoor sweeping robots, designed and developed a snow sweeping robot suitable for outdoor use. According to relevant laws and regulations, private owners or public entities need to ensure that the pedestrian roads in the area do not accumulate snow when snowing. Therefore, we can often see workers sweeping snow outdoors when it snows. This undoubtedly increases the safety hazards and occupational injuries of snowplowers. Intelligent snow sweeping robots came into being, which not only guarantees the snow sweeping quality, but also fundamentally reduces workers' occupational injuries. The students in this group fully considered the complex outdoor terrain and the influence of snow and low temperature, and carried out special design and enhanced many aspects in design and production. The design was favored by the professor due to its unique thinking and super high practicability. Under the further guidance of the professor, the design has undergone a series of optimization and improvement. In the end, the core members of the project and the professor successfully applied for a patent together as a co-inventor. The three students entered the three well-known science and engineering colleges: Carnegie Mellon University, Georgia Institute of Technology, and University of California - Berkeley, to study for undergraduate degrees in computer and electronics related majors.

2018

The vigorous development of e-commerce has driven the rapid growth of the logistics industry. In the operation of logistics, the last-mile delivery cost often takes up a relatively high proportion. Realizing the automated unmanned operation of the last mile of logistics distribution has become a common goal pursued by various logistics companies and

technology companies. In 2018, four high school students faced difficulties in the MIT classroom and successfully manufactured short-distance transportation robots. The students completed the design and production of the key parts of the robot, as well as the compilation and operation of the key codes in a very short time. In the later stage of the project, under the guidance of the professor and teaching assistant, the students carried out point-to-point test verification. A large amount of field test data confirms that the robot can autonomously achieve accurate point-to-point, door-to-door item delivery within 1.5 miles in a complex environment. The four high school students finally successfully entered the Massachusetts Institute of Technology, California Institute of Technology, Cornell University, and Johns Hopkins University for undergraduate studies.

2019 year

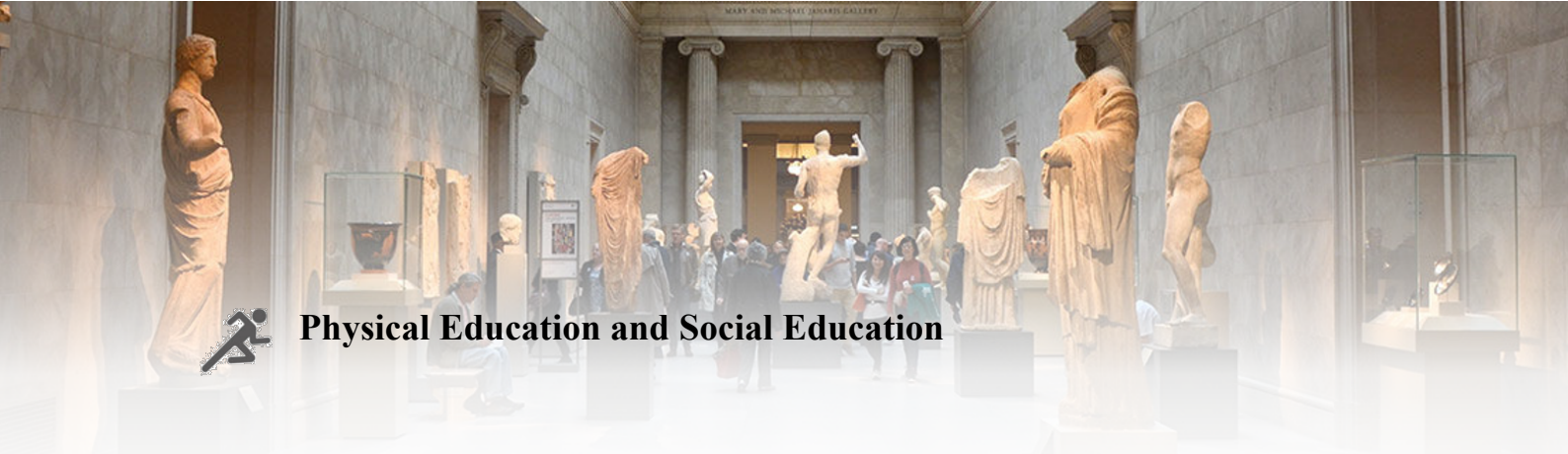
The theme of 2019 still revolves around smart life. The students were inspired by the octopus suckers and Spider-Man, and successfully created an automatic high-altitude glass wall cleaning robot that looks exactly like a *big spider*. The robot has many application scenarios, and can automatically clean vertical smooth surfaces such as glass outer surfaces and windows of high-rise buildings. The robot has multiple movable tentacles that can easily cross short-distance obstacles such as window frames and floor slabs, so as to truly achieve automatic cleaning of glass windows on the same floor or even on the adjacent floor. After the project, the students continued to improve and perfect the design, and finally successfully applied for a patent for the invention. The five students who participated in the project were all high school students. Their achievements in the project within a short period of time once again impressed the professor of MIT, and after the end of the project, they received continuous tutoring and letters of recommendation from the professor. These five high school students have entered Georgia Institute of Technology, Columbia University, University of California, Berkeley, and Johns Hopkins University for undergraduate studies. One of the students has entered the Worcester Polytechnic Institute, which is ranked first in the field of robotic mechanics.

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Sapientia International MIT Artificial Intelligence and Robots Summer 2022 Teaching Schedule

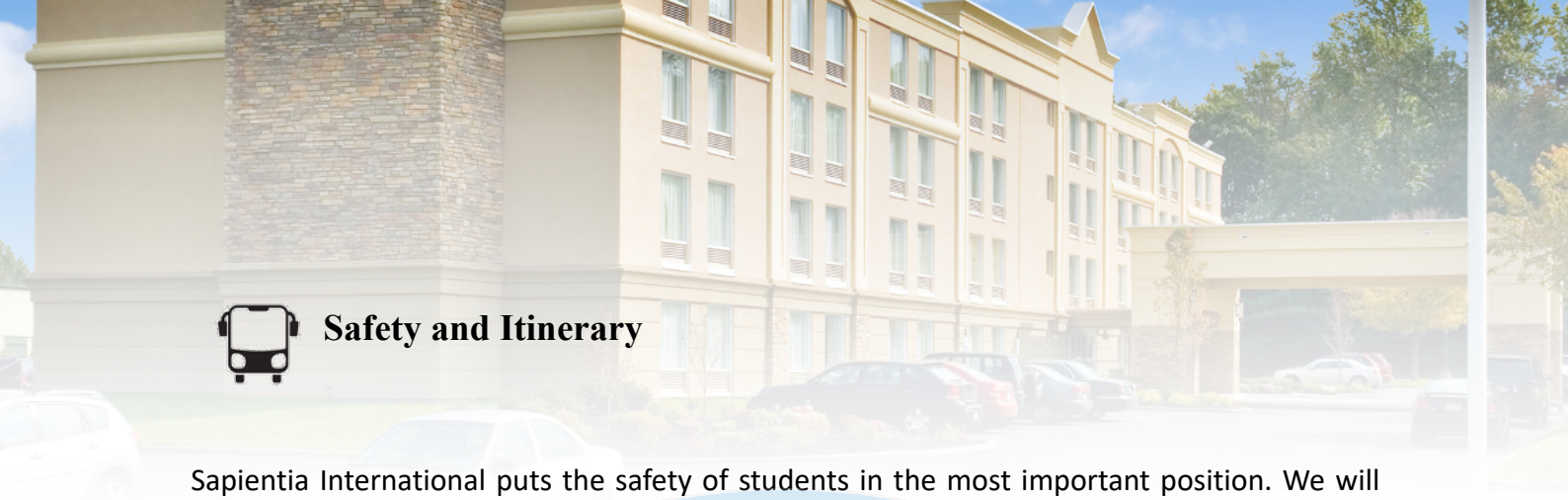
Teaching Schedule*			
Date	AM	PM	Evening
The First Day	After a brief opening ceremony and introduction of precautions, the students will officially start the 14-day MIT camp.	• Introduction to Summer Camp Course Arrangement • The summer camp course officially started	On the evening of the first day, students are advised to take a good rest, adjust the jet lag.
The 2nd to 5th Days	• The first week of class learning will focus on the basic knowledge of robot design. The students will learn *Robot Programming Theory, Introduction to Robot System, Programming Practice, Principles of Electric Motors, Process Control, and Mechanical Principles and control, Robot Kinematics,* and other general and basic related courses. • The instructor will lead the students to carry out not less than 2 hours of physical activity per week.		• Self-study • Tutoring and Q&A • Fun fact contest① •Journal Club② • Special lectures on further studies and industry ③
Weekends of First Week	• The students will visit MIT and Harvard several well-known robotics laboratories, such as the MIT Media Lab, the MIT Bionic Robot Lab, and the Harvard Biorobot Lab under the organization of the Sapientia International Teaching Team. Students will discuss their cutting-edge scientific and technological research with young scientists, such as underwater robots, smart actuators, wearable robots, etc. We encourage students to make full use of the weekend evening time to study and recharge. However, considering the specific situation of the students, we do not make mandatory attendance requirements for evening self-study on weekend nights.		

The 8th to 13th Days	In the morning of the second week, students will further study advanced courses related to robots, including *Differential Wheel Robot Control, Introduction to Advanced Robot Technology, Sensor Principles, Robot Combat Strategy, Design of Malleable robots*, etc.	In the afternoon, the students will design and assemble their own robots in small groups. The professor will determine the relevant topics based on the topics of the annual MIT Robotics Competition. The robots made by the students will be tested by the robot competition at the end of the project.	• Self-Study • Tutoring and Q&A • Group study
The 14th Days	**Robot competition** The robots designed and produced by each team will be contested. The professor will record and comment on the results of the contest and the performance of the robots during the confrontation, and finally select the group robot with the best overall performance. The judges will make detailed comments on the design and competition performance of each group, and give suggestions for design improvement. The teaching assistant team will also provide post-match coaching to the students according to the suggestions given by the judges to ensure that the students truly master and understand the feedback from the judges. Outstanding students will have the opportunity to further participate in the professor's scientific research projects. During the project, the teaching team of Sapientia International will make observation records based on the students' learning situation, and will give a detailed personal evaluation report after the end of the project. Students who perform well will receive a recommendation letter from the professor.		
Note	* This teaching arrangement and planning may be adjusted appropriately according to the learning situation of the students. • ① Sapientia International will carry out interesting extracurricular activities related to the learning curriculum, such as fun fact/knowledge contests. • ② The teaching team of Sapientia International will select 1-2 cutting-edge or representative papers or case study reports related to robot design and production. Students will spend about a week of reading time, understand thoroughly, carry out reading reports under the leadership of teaching assistants, dig in-depth academic information and knowledge points, and conduct reasonable academic evaluations and extended thinking on the content of the papers. • ③ Sapientia International will invite professionals from related industries to give lectures on the frontier development of robotics and intelligence; prestigious school admissions interview teachers, senior students of prestigious schools, etc. will give lectures on students' application and planning.		



Physical Education and Social Education

A good health is an important prerequisite for adapting to the high-intensity school life. In the face of heavy schoolwork pressure, the concept of exercising while squeezing time has rooted into the hearts of the students at prestigious schools. In fact, the gymnasiums of prestigious schools are well-equipped, and the equipment and facilities are not inferior to or even surpassing professional gyms. Columbia University, located in Manhattan, has established a complete five-story gymnasium on the campus, and scientifically and rationally divides different fitness venues, including trails, basketball courts, yoga halls, fencing halls, judo halls, swimming pools, etc. , to ensure that students can exercise unimpededly and train competitive sports skills. To meet the high requirements of sports such as rugby, baseball, and tennis, Columbia University has invested 12 million US dollars to build a professional stadium outside the campus, covering an area of more than 61 acres. In fact, physical exercise is not only a means for students from prestigious schools to maintain their health. Physical activity, with its irreplaceable social attributes, is also a magic weapon to maintain campus social interaction and the spirit of the alma mater. The annual recruiting season of student clubs, sports clubs registration and participation can be very popular. Physical exercise is an important weapon to stimulate fighting spirit and temper personal qualities. In major sports events such as the Olympics, many medal winners of the US delegation come from college students, and the annual National Sports Tour is a carnival for students. Outside the campus, sports culture also runs through the daily life of American society and is the basic medium for local people to socialize. Sapientia International is committed to the comprehensive development of the students' comprehensive quality, embedding physical education courses while studying in school. Special physical education classes are set up according to the differences of the students' gender, physical fitness, specialty and hobbies. In addition to traditional American sports such as basketball, rugby, and baseball, students will also have the opportunity to experience yoga, Zumba, lacrosse, tennis and other sports activities. Outside the campus, Sapientia International also regards social networking as an important platform for comprehensive quality improvement. Apart from school work on weekends, we will organize students to visit museums and important historical and cultural relics; watch musicals, concerts, sports events; watch art exhibitions and other activities。



Safety and Itinerary

Sapientia International puts the safety of students in the most important position. We will conduct strict pre-departure safety training for students to ensure that they have a more comprehensive understanding of local social security and other aspects. The team of Sapientia International will prepare commonly used drugs for the students and accompany the progress of the entire project. In the event of a student's illness or any health emergencies, our team members will accompany them to see a doctor as soon as possible. We will put safety at the top of the entire summer camp program in the United States, scientifically and rationally arrange the food, clothing, housing and transportation of the students and provide advice on booking tickets. We will give priority to school dormitories, international student apartments, and qualified family dormitories as the students' first accommodation option to ensure the safety and stability of the accommodation area. In case of outings and visits, we will act in a unified manner under the leadership of the teaching team. According to the geographical location and conditions of the visiting place, we will choose the best travel plan such as public transportation or chartered bus to eliminate the worries of students and parents.

