CSAW'25 MENA

جامعة نيويورك أبوظبي

NYU ABU DHABI

S M A R T
SustainabilityModularizationArtificialintelligenceRoboticsTechnology
construction research group

CENTER FOR CYBER SECURITY

CENTER FOR ARTIFICIAL INTELLIGENCE AND ROBOTICS

"HACK MY ROBOT" CHALLENGE

The S.M.A.R.T. Construction Research Group, in collaboration with the Center for Cybersecurity (CCS) at NYUAD and the Center for AI and Robotics (CAIR) at NYUAD, invites students from all universities in the MENA region to form teams to participate in the Fall 2025 "Hack My Robot" Challenge, part of CSAW'25 MENA. The finalist teams will receive robots to test their ideas before the final event, and they will get to keep the provided robots after the event. The winning team members will receive a cash prize and get the possibility of paid research/internship opportunities to expand the outcome of their work during the challenge into a scientific publication.

1. Introduction

Automation is a considerable part of the digital transformation in the construction industry, also referred to as Construction 4.0. The inclusion of robots and other digital agents is bound to happen sooner than later. Even though the industry is getting ready for increasing automation, it is not ready for all the implications and associated risks that will come with these disruptive changes.

One of these risks is cybersecurity. Safety concerns are magnified in construction projects where large autonomous machines perform tasks. Since construction sites are places where humans and machines work together, a potential attack to hijack the autonomous machinery can cause damage to the other site equipment, severe injuries to humans, or even loss of life. Given the interconnected nature of the construction sites that utilize such autonomous equipment, a potential attack can also compromise the security of the project data. Therefore, the criticality of providing robust cybersecurity on-site is growing with the increasing use of such cyber-physical systems.

With that being said, this challenge aims to show the possible implications of having a vulnerable robotic agent performing tasks autonomously on site to raise awareness about the importance of considering cybersecurity aspects while utilizing robotic systems in construction projects.

2. Overview of the Challenge

The challenge will simulate an autonomous earthmoving task on a construction site. It will include a "TurtleBot 3 Burger" (equipped with the necessary sensors), representing a fully functional autonomous bulldozer. The earthmoving task in the challenge will consist of the robot autonomously moving across different predefined positions, staying at each for a short amount of time, and returning to the initial position. The robot will store a sensitive file that, if compromised, would affect the project.

The challenge consists of two rounds:

2.1. Round 1 (Qualification Round and Registration): The first round requires the participating teams to fill out a Google Form to register for the challenge and answer the provided open-ended questions regarding the ways to compromise the described robotic system (see Section 3), potential improvements to secure it, and their motivation to compromise such a system. The finalist teams invited to NYUAD for CSAW'25 and get the chance to present their ideas to a group of judges from academia and industry will be selected based on their answers in this round. The registration and open-ended questions are accessible in this Google Form: https://forms.gle/jxZ5i2Y9jdSWYPJDA

2.2. Round 2 (Final Demos and Presentations): Based on the responses from the first round, up to **five teams** will be chosen and invited to NYUAD to participate in the second round during CSAW'25 (6-8 November), where they will need to demonstrate some of the ideas indicated in Round 1. Those invited will get a robot (TurtleBot 3 Burger RPi4 4GB) during the first two weeks of October, depending on their location. So, they will have time (about 3-4 weeks) to test their ideas indicated in the first round on the robot before the final demos. The travel and accommodation arrangements of the finalist team members from outside of the UAE will be covered by CSAW.

3. Overview of the Robotic System

The diagram of the robotic system used in this challenge is presented in Figure 1. The structure of the communications and integrations within the robotic platform is divided into five different levels based on their level of abstraction.

In **Level 0** of the structure, the physical components of the robot responsible for acquiring data and interacting with the environment (i.e., sensors and actuators) can be found. They can be grouped into two major subgroups: all the sensors embedded on the robot (i.e., LiDAR, gyroscope, accelerometer, and magnetometer) and the platform itself—housing all the different hardware such as sensors, computers, and locomotion means.

Level 1 involves the basic connections between the elements mentioned above and the computer embedded in the robot responsible for controlling everything. All sensors are connected to the robot computer through the ports on the computer board. There is a Wi-Fi router to create a Master Network, which provides the communication between the Robot Computer and External Computer.

Level 2 consists of the Robot Operating System (ROS) Network. The ROS Network can involve as many devices and computers as needed, as long as there is a device running the Master. In this case, the Robot Computer acts as a Master, and the External Computer connects to the ROS Network to interact with it. This interaction is bi-directional, allowing the robotic platform to attend to any command given by the External Computer, and the External Computer to visualize any data coming from the robotic platform. Within the ROS Network, multiple nodes are running, each managing all the different functionalities of the robot (e.g., autonomous

navigation, localization, all the different sensors, control of the motors). The ROS nodes publish/receive information in the way of ROS Topics and can receive/give commands in ROS Services.

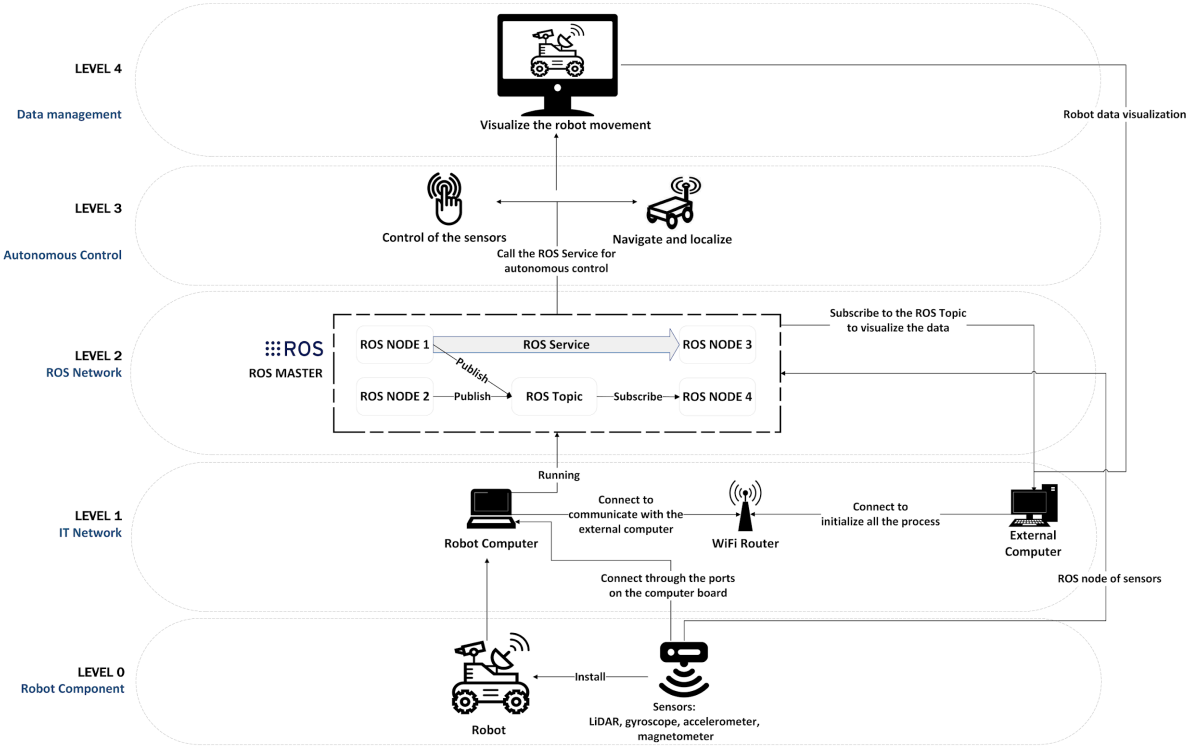

Figure 1. Diagram showing the different levels and components of the robotic system

Level 3 demonstrates the basic tasks fulfilled by the robotic system, which involves the autonomous control of the robot. By using the ROS Services and publishing into the ROS Topics, the platform can communicate with all the different sensors and actuators autonomously.

Level 4 is the Human-Machine Interaction (HMI) layer. ROS provides multiple graphical user interfaces (GUIs) to interact and visualize the information of the robot, the most important one being the visualization software for the robot sensors, running in the External Computer to achieve autonomous mapping and localization using SLAM algorithms. This level overrides any command issued by Level 3.

CSAW'25 MENA

جامعة نيويورك أبوظبي

NYU ABU DHABI

SMART Sustainability Modularization Artificial intelligence Robotics Technology construction research group

CENTER FOR CYBER SECURITY

CENTER FOR ARTIFICIAL INTELLIGENCE AND ROBOTICS

4. Competition Eligibility and Rules

The competition requirements are summarized below. Please read them carefully before proceeding with the registration.

· The competition is open to undergraduate and graduate students enrolled in any university in the MENA region*.

· Filling out the Google Form for registration and answering all the open-ended questions in the same form are required to be considered for the final round. The Google Form can be found here: https://forms.gle/jxZ5i2Y9jdSWYPJDA

· The teams cannot have more than four members.

· A student can compete under only one team. Joining multiple teams is not permitted.

· The five most successful teams will be selected based on the answers to open-ended questions in Round 1 (qualification round). These teams will be notified at the beginning of October and invited to NYUAD to participate in Round 2 (final round) during CSAW'25 (6-8 November).

· Each selected team at the end of Round 1 will receive a "TurtleBot 3 Burger RPi4 4GB" to their addresses during the first two weeks of October. These teams will get to keep the provided robots after the event*.

· The travel and accommodation arrangements of the finalist team members from outside of the UAE will be covered by CSAW.

* Eligible MENA countries: Algeria, Bahrain, Egypt, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Tunisia, and United Arab Emirates.

5. Important Dates

These are important dates for the challenge:

· **01 September 2025** – Qualification Round and Registrations Start

· **30 September 2025** – Qualification Round and Registrations Deadline

· **3 October 2025** – Finalist Notification

· **5 – 12 October 2025** – Finalist Teams Receiving the Robots

CSAW'25 MENA

جامعة نيويورك أبوظبي

NYU ABU DHABI

SMART Sustainability Modularization Artificial intelligence Robotics Technology construction research group

CENTER FOR CYBER SECURITY

CENTER FOR ARTIFICIAL INTELLIGENCE AND ROBOTICS

· **7 November** – Final Demos and Presentations

6. Prizes and Additional Benefits

The following are the final cash prize and the potential additional benefits that participating students can expect.

· The most successful team among the five finalist teams determined by the group of judges in the final round will be awarded a cash prize of **US$1,000**. The second-place prize is **US$750**. The third-place prize is **US$500.**

· All five teams selected based on Round 1 will keep the provided robots after the event*. The total cost of the provided equipment for each finalist team is approximately **US$800**.

· The winning team members will have the possibility of paid research/internship opportunities to expand the outcome of their work during the challenge into a scientific publication.

· The finalist teams will get to meet a group of judges from industry and academia and present their ideas to them.

7. Contact

Please direct your inquiries to Semih Sonkor: semih.sonkor@nyu.edu

CSAW'25 MENA

جامعة نيويورك أبوظبي

NYU ABU DHABI

SMART
SustainabilityModularizationArtificialintelligenceRoboticsTechnology
construction research group

CENTER FOR CYBER SECURITY

CENTER FOR ARTIFICIAL INTELLIGENCE AND ROBOTICS

**The finalist teams are allowed to keep the provided equipment after the competition with the condition of participating in the final round. If, for any reason, a team does not participate in the final round, all the provided equipment must be returned to the Hack My Robot competition organizers.*