ARMY
QUANTUM
NEXT
GENERATION
MINESWEEPER
CHALLENGE
2023

CHALLENGE PARTICIPANT
INSTRUCTIONS

# Welcome to the QNG2023 Minesweeper Challenge

Please read these instructions carefully.

In this year's Challenge, we're asking you to explore how quantum sensors could help detect land mines. The winning team will demonstrate the solution with the highest accuracy and speed within the Challenge ruleset.

Below you will find links to a simulation of the sensor attached to a drone.

Your task is to develop software that takes magnetic readings within the simulation to determine the location of mines, then add the capability to calculate a trajectory through an environment while taking readings.

## Getting started

1. Start by downloading the simulation training files and python script on the Challenge's GitHub page: https://github.com/ricohub01/qng23-challenge

2. We require all teams to submit their trial results using the test data by **12pm Wednesday 26 October** to confirm your connection with the testing platform, and you can proceed to the Challenge itself.

## Challenge stages

The Challenge will proceed through three stages marked by a live test where you will demonstrate your software.

You will accrue points and be ranked on your performance in these stages, which will be used to form a leaderboard and determine the winning team.

Further instructions for each stage will be provided via email.

## Stage 1

You will download files containing magnetic images of a field containing a random distribution of mines.

Your software must detect all mines in the images while achieving less than 10% false positives.

The files will be available for 48 hours starting **12pm Thursday 26 October**.

Once downloaded, you will only have **two hours** to submit your results.

Your score will be based on the number of times you found all the mines within 10% false positive allowance across each dataset and your average precision (measured by Hausdorff distance).

Points will be allocated to the top performing teams:

| | | |
|---|---|---|
| → | First | 5 points |
| → | Second | 3 points |
| → | Third | 2 points |
| → | Fourth | 1 point |

## Stage 2

You will download files containing magnetic images of a field containing a random distribution of mines and other metallic objects.

You must repeat the same task as Stage 1.

The files will be available for 48 hours starting **12pm Thursday 9 November**.

Once downloaded, you will only have **two hours** to submit your results.

Your score will be calculated in the same way as Stage 1.

Points will be allocated to the top performing teams:

| | | |
|---|---|---|
| → | First | 10 points |
| → | Second | 6 points |
| → | Third | 4 points |
| → | Fourth | 2 points |

## Stage 3

You will connect to a live simulation and provide real-time trajectory inputs to a drone in a set of scenarios containing a random distribution of mines and other metallic objects.

Within each scenario, you must provide a drone trajectory to detect all mines.

Your trajectory must comply with the drone flight rules, including that the drone cannot hop more than two dwell points in one time step.

The live simulation will be available for 48 hours starting **12pm Thursday 23 November**.

Your score will be based on the number of times you found all the mines within the 10% false positive allowance and precision allowance (to be provided) and the average speed (number of steps) of your trajectory.

Points will be allocated to the top performing teams:

| | | | |
|---|---|---|---|
| → | First | - | 15 points |
| → | Second | - | 9 points |
| → | Third | - | 6 points |
| → | Fourth | - | 3 points |

## Support

For technical support throughout the Challenge, raise an issue in the GitHub:
https://github.com/ricohub01/qng23

General Challenge questions should be raised at the fortnightly Q&A session or directed to:
support@quantumnextgen.com.au