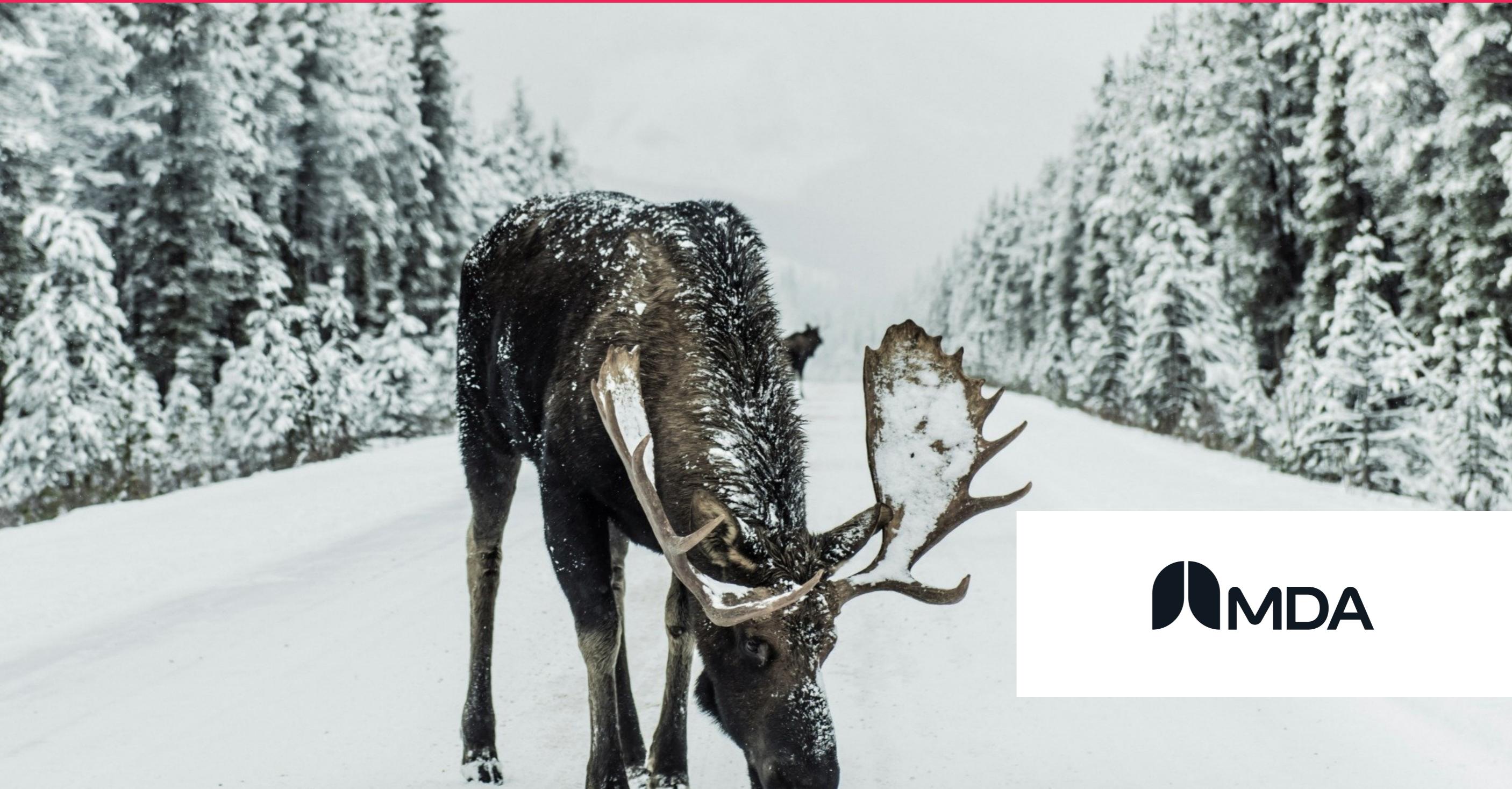


YTL PROGRAMMING



COMPETITION PACKAGE

2 MARCH 2024



MDA

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1.0 General Rules

1.1 Duration

All teams shall complete the challenge within 8 hours. The start time will be announced to all competitors after the competition briefing and question period. The design period shall immediately commence upon the delivery of the competition case document. Updates on the time remaining will be announced three (3) hours, one (1) hour, thirty (30) minutes, and ten (10) minutes before the end of the allotted time through Discord.

1.2 Deliverables

As part of Programming 2024, the following deliverables will be required:

1. *Code*
2. *Presentation*

1.2.1 Code

All code must be in the provided GitHub repository's "main" branch before the 8-hour deadline in order for it to be considered for judging. Basic instructions must be provided in a README.md on how to compile and run your code. This includes:

- The language and version your code uses
- A list of required packages (i.e. Pandas, NumPy)

Any specifications of this sort not included in the README cannot be assumed to be on the Directors' machine(s).

1.2.2 Presentation

The presentation file must be submitted in the provided GitHub repository's "Main" branch before the 8-hour deadline. The presentation itself must be submitted as a .pdf, .ppt, or .pptx file to prevent any changes from occurring after the end of the design period. We recommend that teams reserve adequate time to submit the presentation given that technical difficulties may arise. Any modification of presentation content after the deadline is strictly forbidden and may subject a team to disqualification. Your presentation must outline:

- The datasets you chose to incorporate and why,
- The design and implementation of your algorithm,
- The design choices that went into your interface.

1.3 Presentation Schedule

The randomized presentation order will be released thirty (30) minutes prior to the first presentation through Discord. Requests to switch presentation order will be declined to ensure fairness between teams.

Each team will have twenty (20) minutes to present their deliverables, followed by a ten (10) minute question-and-answer period with the judges. All team members must participate in the team's presentation.



2.0 Background

Many minerals and resources can be found in oceanic environments. However, there are also many types of marine life, environments, ecosystems, and areas of historical/cultural significance that need to be protected. Obtaining these valuable resources without considering marine health and preservation can be detrimental to the environment. Processes like drilling can disrupt the ocean floor, increase pollution with both noise and waste, and have a negative impact on biodiversity. Deep sea mining can also cause major disruptions to ecosystems and even global climate regulation.

Given the population spread and easily available resources being mined in excess, searching for resources on land is becoming more time-consuming and expensive. As a result, the areas in which they can be found are becoming more sparse. Not to mention resources which are only available in oceanic environments are even more expensive and difficult to mine.

The (fictitious) island of F.I.N. is known for their rich biodiversity, rare species, and mineral deposits in the ocean surrounding it. Their government has approved external corporations and organizations obtaining the resources surrounding their island. However, all proposals must show that the organization's acquisition of these materials takes into account avoiding at least one of the things on their list of preservation priorities.

You are tasked with designing a programmatic solution to figure out where to drill for off-shore resources. Your solution will be evaluated based on various factors which include but are not limited to: selection of datasets, algorithm, interface, presentation, and demonstration.

3.0 Competition Challenge

The company WANBIS Corp. has hired you, a group of engineers, to create the interface to be used in the pitch of their resource acquisition plan to the government of F.I.N.. They have provided your team with numerous time-series data sets involving the coastline and environment of the island, the locations of various resources, and the locations of various items on the country's preservation priority list.

You are tasked with using the coastline data, along with a minimum of one resource and one preservation priority dataset, to create an algorithm and interface to determine the most optimal drilling location(s). Your algorithm must provide the optimal location for each day while avoiding your chosen preservation priorities. Your interface must visualize this prioritization and provide optimal locations for obtaining resources.

Your algorithm must provide a continuous path for up to two drilling rigs for the acquisition dataset(s) you select. Both rigs do not have to use the same acquisition dataset(s). Each rig can extract multiple resources at the same time. Each rig can move up to 5 continuous units in any direction between days, or can remain in the same location. For safety, rigs must be a minimum of two units from each other at all times, even when moving between days. Rigs cannot be on land, but can be adjacent to it. Rigs can start wherever you choose and can only affect resources of the square it is on, not squares they travel over between days.

You have been given the table below that sorts the datasets into various categories as well as the datasets themselves.

Table 1. Dataset categorization

Item	Obtain, Preserve, or Informational
Oil	Obtain
Precious metals	Obtain
Helium	Obtain
Shipwrecks	Obtain or Preserve
Coral Reefs	Preserve
Endangered Species	Preserve
Temperature	Informational
Algal blooms	Informational
Wind	Informational

Each of the datasets is structured according to the example below. Please note that datasets represent a 100 by 100 grid of values, with locations on land having a value of NaN. Also, note that due to data collection errors by WANBIS Corp's scientists, several rows of data are missing for each dataset (and the intern at fault was fired) and the quantity and location of missing data is not consistent between datasets. However, you can assume there is no noise in any of the collected data. All datasets are unitless, with a higher number correlating to a higher quantity.

X	Y	Value
Integer	Integer	Float
...

Table 2: Dataset format

4.0 Objectives

4.1 Main Objective

You will have 8 hours to complete this competition. At the 8 hour mark, all deliverables must be submitted. Any changes made to the main branch of your repository after the deadline will not be considered part of your submission.

4.2.1 Code

- All code must be in the provided GitHub repository's "Main" branch before the 8-hour deadline in order for it to be considered for judging.
- Basic instructions must be provided in a README.md on how to compile and run your code. This includes:
 - The language and version your code uses
 - A list of required packages (i.e. Pandas, NumPy)
 - Any specifications of this sort not included in the README cannot be assumed to be on the Directors' machine(s)

4.2.1 Code Deliverables

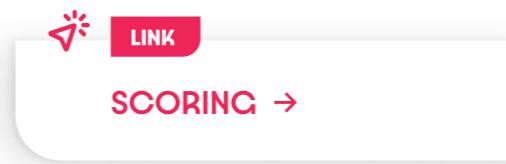
- Selection of datasets to use
 - A minimum of 1 acquisition and 1 preservation dataset must be used in conjunction with the coastline data. However, using more datasets in your design may result in a bonus point per extra dataset successfully incorporated into the design up to a maximum of 3 bonus points.
- Successful incorporation means each used dataset and its prioritization is in some way visualized as a component of the interface.
- Algorithm
 - Your algorithm must find the coordinates of places where WANBIS Corp. can acquire the resource(s) you selected while avoiding preservation priorities.
- Interface
 - The interface must visualize the coordinates output by the algorithm. This can be done as a list, a heat map, etc. Be creative!
 - The interface must be understandable to someone who has no knowledge of the algorithm you designed. It should be intuitive and easy for a user to interact with.

4.3.1 Presentation

- Presentation
 - Only presentations submitted in the provided GitHub repository's "Main" branch before the 8-hour deadline will be used in presentations to the judging panel. No work may be done on the presentation after the deadline has passed.
 - Your presentation must outline:
 - The datasets you chose to incorporate and why,
 - The design and implementation of your algorithm,
 - The design choices that went into your interface.
- Demo
 - You will be expected to give a short demonstration of how your program works by interacting with your interface.
 - The program will be loaded on one of the Director's machines and must run on it. You can assume the Directors have installed any languages and packages you have specified in a README in your submission. Be sure that your instructions to compile and run your code are detailed enough for the Directors to set up your program.

5.0 Judging

The judges will be using the following rubric to evaluate the scores of each team. This matrix will determine how well your team meets the objectives and requirements of the design challenge and ultimately, the top contending teams. The judging matrix, and all generic competition rules can be found in the CEC 2024 Rule Book.



6.0 Communication & Language

6.1 Questions & Answers

Only the Programming Directors shall be permitted to answer questions on behalf of the CEC Programming challenge during the competition period. All questions and inquiries along with their responses will be posted publicly to the programming-la-programmation in the CEC Discord, in both English and French. Questions may be asked up until time or end of the challenge.

6.2 Technical Assistance

To ensure fairness, the Programming Directors have developed multiple documents in GitHub that will assist in technical matters. If that does not suffice, teams may additionally request help from Programming Directors to help with issues which are strictly technical issues in nature.

Programming Directors reserve the right to refuse assistance or questions if they believe that it poses an unfair advantage to other teams, or that the question asked may disrupt the integrity of the competition.

6.2 Presentation Language

Teams can choose to present in either French or English. To ensure fairness and due to limited translation resources, teams must indicate if they will speak French for any amount of their presentation at check-in on the first day of competition.

For teams that select French as their presentation language, professional live-interpretation services will be provided to judges who are not bilingual during the presentation.