Ocean Guard AI Final Design Report Summary

Group 4: Serafin Gargantiel, Meleena Torres, Abdoulaye Diallo, Sangmin Shin

1 Project Overview

Ocean Guard AI is an AI-powered system that helps monitor ocean activity by using underwater drones, sonar sensors, and satellite information. Its goal is to detect threats to marine life, activate safe deterrents, warn conservation teams, and collect data that researchers can study later. The system brings together different tools to make it easier to understand marine life and protect vulnerable species.

2 Purpose of Project

The purpose of this project is to help conservation teams respond faster when marine animals are in danger. Many current monitoring methods are slow and only cover small areas, so people often miss critical moments. Ocean Guard AI solves this by giving real-time alerts and reliable data. It also supports research by building large datasets that show patterns in species behavior, migration, and how the environment is changing.

3 Scope of Work and Stakeholders

Ocean Guard AI focuses on four main tasks: gathering data from drones, detecting predator-prey events, sending alerts to users, and activating safe deterrents when needed. The system involves several groups, such as marine biologists, conservation teams, NGOs, government agencies, and researchers. Each group uses the system differently, whether it’s viewing alerts, making decisions, or studying long-term trends.

4 System Requirements Summary

Ocean Guard AI has several important requirements. It needs to collect data continuously, use AI to detect events, and send alerts quickly. It also needs to be accurate and able to handle information from multiple drones at the same time. Security is important too, so the system must protect user data and allow only authorized access. Since the system will be used in the field, the interface has to be simple, easy to learn, and accessible for different types of users.

5 System Design Summary

The system is organized into different parts that work together. The threat detection subsystem looks at sonar and video data to find events. The alert subsystem sends notifications to the right people. The deterrent subsystem controls safe tools like lights or sound signals to protect animals. The headquarters subsystem shows maps, charts, and reports so users can understand what is happening in the ocean. Each subsystem has its own role but connects to the others to make the whole system work smoothly.

6 Constraints

There are several challenges the project must deal with. Drones operate in harsh underwater environments where pressure, cold temperatures, and corrosion can cause problems. Network connections underwater are weak, so the system has to keep working even without strong communication. The project also requires a lot of resources, including expensive hardware and a large team with many different skills. There are also legal rules about environmental protection and data privacy that the system must follow.

7 Project Issues and Risks

Some risks include the AI making mistakes, drones malfunctioning, or the system being targeted by security threats. There may also be issues with sharing data between different countries or organizations. Scaling the system to cover more regions could also introduce technical problems or slowdowns.

8 Future Considerations

In the future, the system could be improved with better AI models, stronger and more efficient drones, and deeper integration with satellite systems. The project could expand to more locations and partner with additional research groups. Over time, the data collected could help create predictive tools that guide conservation decisions and support global marine research.