SUSTAINABLE DEVELOPMENT GOALS

KARUNYA HACKS

Data Science for Social Good

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AQUATIC ANIMALS

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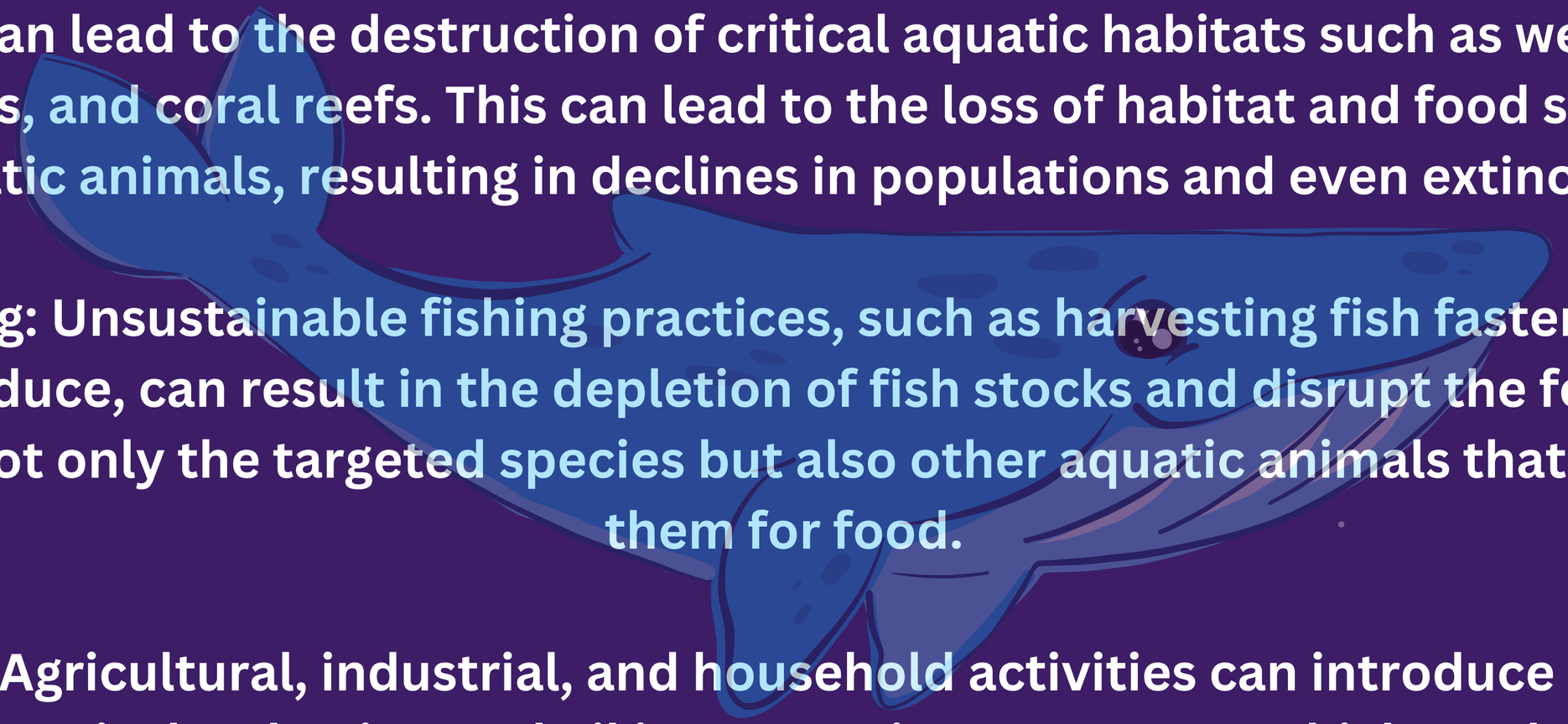
Problem Statement:

Aquatic animals face a variety of challenges in their natural habitats, including habitat loss, overfishing, pollution, and climate change. These challenges can have significant impacts on the health and survival of aquatic animals and the overall health of aquatic ecosystems.

Mapping



Habitat Loss: Human activities such as development, deforestation, and damming of rivers can lead to the destruction of critical aquatic habitats such as wetlands, mangroves, and coral reefs. This can lead to the loss of habitat and food sources for aquatic animals, resulting in declines in populations and even extinction.

Overfishing: Unsustainable fishing practices, such as harvesting fish faster than they can reproduce, can result in the depletion of fish stocks and disrupt the food chain, affecting not only the targeted species but also other aquatic animals that depend on them for food.

Pollution: Agricultural, industrial, and household activities can introduce pollutants such as chemicals, plastics, and oil into aquatic ecosystems, which can harm or kill aquatic animals and cause long-term damage to their habitats.

Solutions:

Habitat Restoration: Efforts to restore damaged habitats such as wetlands, mangroves, and coral reefs can help to provide critical habitat and food sources for aquatic animals.

Sustainable Fishing Practices: The implementation of sustainable fishing practices, such as setting catch limits and using selective fishing gear, can help to maintain healthy fish populations and minimize the impacts of fishing on other aquatic animals.

Pollution Reduction: Implementing pollution control measures, such as reducing nutrient and chemical inputs, improving waste treatment facilities, and promoting the use of reusable and recyclable materials, can help to reduce pollution in aquatic ecosystems.

Climate Change Mitigation: Implementing measures to reduce greenhouse gas emissions, such as promoting the use of renewable energy and reducing energy consumption, can help to mitigate the impacts of climate change on aquatic animals and their habitats.

Datasets:

Global Marine Protected Area (MPA) Database: This dataset provides information on the location, size, and management of MPAs worldwide, which can help to inform conservation and restoration efforts for aquatic habitats.

Global Fishing Watch: This dataset uses satellite technology to track fishing vessel activity worldwide, providing information on the location and intensity of fishing activity that can help inform sustainable fishing practices.

Global Ocean Data Analysis Project (GLODAP): This dataset provides comprehensive data on ocean chemistry, including pH levels and carbon dioxide concentrations, which can help to inform research on ocean acidification and its impacts on aquatic animals.

Global Biodiversity Information Facility (GBIF): This dataset provides open-access data on biodiversity worldwide, including information on the distribution and abundance of aquatic species. This data can be used to inform conservation and management decisions for aquatic animals.

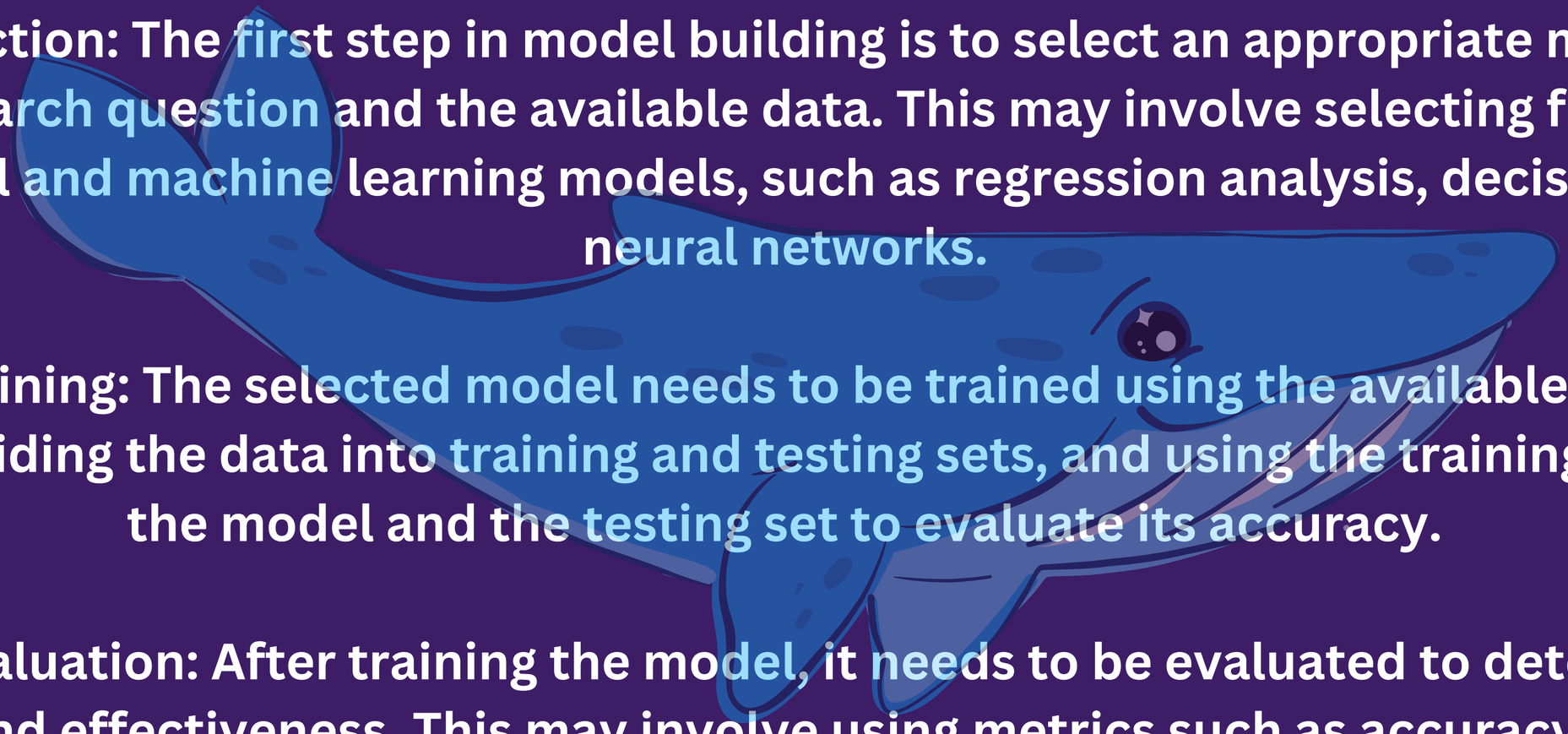
Data Analysis:

Data Collection: Data collection may involve various methods, such as surveys, satellite imagery, and scientific studies, to gather information on the aquatic animals, their habitats, and the threats they face.

Data Cleaning: After collecting the data, it needs to be cleaned and organized to ensure that it is accurate and usable. This may involve removing duplicates, correcting errors, and formatting the data for analysis.

Data Exploration: Data exploration techniques, such as visualization and statistical analysis, can be used to identify patterns and relationships in the data. This can help to inform conservation strategies and identify priority areas for intervention.

Model Building:



Model Selection: The first step in model building is to select an appropriate model based on the research question and the available data. This may involve selecting from a range of statistical and machine learning models, such as regression analysis, decision trees, or neural networks.

Model Training: The selected model needs to be trained using the available data. This involves dividing the data into training and testing sets, and using the training set to train the model and the testing set to evaluate its accuracy.

Model Evaluation: After training the model, it needs to be evaluated to determine its accuracy and effectiveness. This may involve using metrics such as accuracy, precision, and recall to measure its performance.

Some insights that can be gained from data analysis and modeling for aquatic animal conservation efforts include:

Identifying priority areas for conservation interventions: By analyzing the distribution and abundance of aquatic animals and their habitats, conservationists can identify areas where intervention can have the greatest impact in protecting endangered species.

Understanding the drivers of habitat loss and degradation: By analyzing data on factors such as pollution, climate change, and human activities, conservationists can better understand the drivers of habitat loss and degradation, and develop targeted conservation strategies to address them.

Some references that can be used for further reading on data analysis and modeling for aquatic animal conservation include:

Cooke, S. J., et al. (2021). A roadmap for effective conservation of freshwater fish: integrating ecology, physiology, and genomics. Biological Reviews, 96(1), 178-204.

Dwyer, R. G., et al. (2020). Predicting future species distributions: Challenges and opportunities for aquatic conservation and management in a rapidly changing world. Aquatic Conservation: Marine and Freshwater Ecosystems, 30(2), 237-257.