

Summary of My Sonar Rock vs. Mine ML Project

Project Goal

This project uses machine learning (Logistic Regression) to classify whether an underwater object is a rock (R) or a mine (M) based on sonar echo data.

About the Dataset

- The data comes from the UCI Machine Learning Repository.
- Each row has:
 - 60 numerical values representing sonar echo strengths.
 - 1 label: 'R' for Rock, 'M' for Mine.
- These numbers represent how sound waves bounce off an object underwater.

How the Data Works

- Each number is the strength of reflected sound at a certain angle/time.
- Mines reflect stronger (higher) values.
- Rocks reflect weaker (lower) values.
- The model learns to identify these echo patterns.

Model Workflow

1. Import required libraries.
2. Load sonar data.
3. Split data into features (X) and labels (Y).
4. Split into training and testing sets.
5. Train a Logistic Regression model.
6. Evaluate the model.
7. Predict new sonar readings.

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Prediction Process

To predict a new scan:

```
new_data = (60 values)
```

```
np_array = np.asarray(new_data)
```

```
reshaped = np_array.reshape(1, -1)
```

```
prediction = model.predict(reshaped)
```

Result is either 'R' or 'M'.

Important Notes

- The input must have exactly 60 values.
- If your sonar device uses a different scale, standardize the input using the same scaler used on training data.

Standardization Code Example

```
from sklearn.preprocessing import StandardScaler
```

```
scaler = StandardScaler()
```

```
scaler.fit(X_train)
```

```
X_train_scaled = scaler.transform(X_train)
```

```
X_test_scaled = scaler.transform(X_test)
```

```
new_data_scaled = scaler.transform([new_data])
```

```
prediction = model.predict(new_data_scaled)
```

Why Standardization?

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Standardization adjusts all features to have a mean of 0 and standard deviation of 1. This helps improve model performance and ensures consistent input scale.

My Reflections

- Each sonar row represents how an object reflects 60 sonar pulses.
- Rocks give weaker echoes; mines give stronger ones.
- I can use my model to classify new data if its properly formatted and standardized.