

Battery Health Prediction Using Machine Learning

- ❑ Predict battery health (%) using ML.
- ❑ Web app for easy prediction and suggestions.
- ❑ Built with Python, Flask, and Scikit-learn.

Problem Statement & Objective

Problem:

- Users face battery issues.
- No easy tool to know battery health.

Objective:

- Predict battery health using usage data.
- Show result through a web app.
- Suggest if user needs to optimize or replace battery.

Dataset Overview

Data Source:

20,000 samples with features like:

- Device Type (Phone, Tablet)
- Battery Capacity (mAh)
- Charge Cycles
- Avg. Temperature
- Fast Charging (Yes/No)
- Device Age
- Battery Health (%)


Data Preprocessing

Steps Taken:

- Converted Yes/No → 1/0
- Encoded text labels (Device type)
- Handled missing/null values
- Normalized or scaled data (if required)

Model Training

ML Models Used:

- Linear Regression 
- Random Forest (tested)

Training Steps:

- Split data using `train_test_split`
- Evaluated with R^2 Score & MSE
- Saved best model with joblib

Web App using Flask

Flask Web App Features:

- Form for user input
- Predict route shows result
- Color-coded progress bar:
 - Green = Good
 - Orange = Moderate
 - Red = Poor
- Suggest message: Optimize / Replace

Visualization Examples

Useful Charts:

- Box Plot → Detect outliers
- Bar Chart → Avg battery per device
- Line Chart → Health vs Age
- Histogram → Data distribution
- Pie Chart → Fast Charging support
- Scatter Plot → Usage vs Health

Tools & Libraries

Tools Used:

- Python, Jupyter, Flask
- HTML/CSS for frontend

Key Libraries:

- pandas, numpy → Data processing
- sklearn → ML modeling
- joblib → Save/load model
- matplotlib, seaborn → Visualization

Results & Future Work

Final Output:

- Working web app that predicts battery health
- Helps users avoid battery issues

Future Improvements:

- Mobile app for real-time input
- Graphs showing health over time
- Train on real-world data
- Separate models for different devices