Pokemon GO Battle Assistant

A Machine Learning-Based Battle Prediction System

1 Introduction

The Pokemon GO Battle Assistant is an advanced prediction system that uses machine learning to help trainers make strategic decisions in Pokemon GO battles. By analyzing Pokemon statistics, battle mechanics, and historical performance data, our system predicts battle outcomes with high accuracy and provides recommendations for optimal team composition.

Our system currently supports 727 Pokémon species, covering the vast majority of creatures available in Pokémon GO.

2 Key Features

- **Battle Outcome Prediction**: Predicts the winner of 1v1 Pokemon battles using machine learning models
- **Pokemon Image Recognition**: Identifies Pokemon from images using Deep Learning computer vision models
- **Type & Move Analysis**: Evaluates effectiveness of different Pokemon types in battle
- **Data-Driven Insights**: Uses data from thousands of simulated battles for training

3 Data Sources

Our system utilizes three primary data sources:

1. **Pokemon Statistics & Rankings**: Comprehensive dataset of Pokemon attributes from PvPoke rankings site
2. **Battle Simulation Data**: 20,000 simulated battle outcomes with detailed performance metrics from PvPoke battles site
3. **Pokemon Image Dataset**: Collection of Pokemon images retrieved via DuckDuckGo Search API for training the image recognition model

4 Machine Learning Approach

Our system evaluates multiple machine learning models to find the optimal solution for battle prediction:

- **Logistic Regression**: A baseline model for binary classification
- **Random Forest Classifier**: An ensemble method that builds multiple decision trees
- **Gradient Boosting**: Advanced ensemble technique that builds trees sequentially
- **CatBoost**: An ensemble method optimized for handling categorical features

After rigorous evaluation and cross-validation, the best performing model is the CatBoost model, and is selected for deployment. The selected model learns complex patterns in:

- Pokemon type effectiveness relationships
- Stat advantages/disadvantages
- Move selection
- Overall battle performance

For detailed information about our machine learning approach, see the Modelling Report.

5 Deep Learning Approach

The image recognition component of our system employs deep learning techniques to identify Pokemon from photos:

- **CFAR Model**: A lightweight convolutional neural network for basic image classification
- **Custom CNN**: Advanced architecture with batch normalization and regularization techniques
- **Transfer Learning**: EfficientNetB0 pre-trained model adapted for Pokemon recognition

Our iterative approach explored multiple architectures to balance accuracy and computational requirements, with each model offering different trade-offs in performance and resource usage.

For comprehensive details about our deep learning implementations, see the Deep Learning Report.

6 Project Documentation

This documentation provides comprehensive details on:

- Data Collection & Processing
- Modelling Approach & Results
- Deep Learning Implementation
- Evaluation Metrics & Performance
- Project Development Process