Bot Profile Detection System

Technical Documentation

Version 1.0 | Last Updated: feb 2025

QubitRules

Quick Links

- **Live Demo:** https://bot.qubitrules.com/
- **GitHub Repository:** Bot Profile Detection on GitHub (For detailed documentation, code, and setup instructions)
- **Demo Video:** Watch Demo

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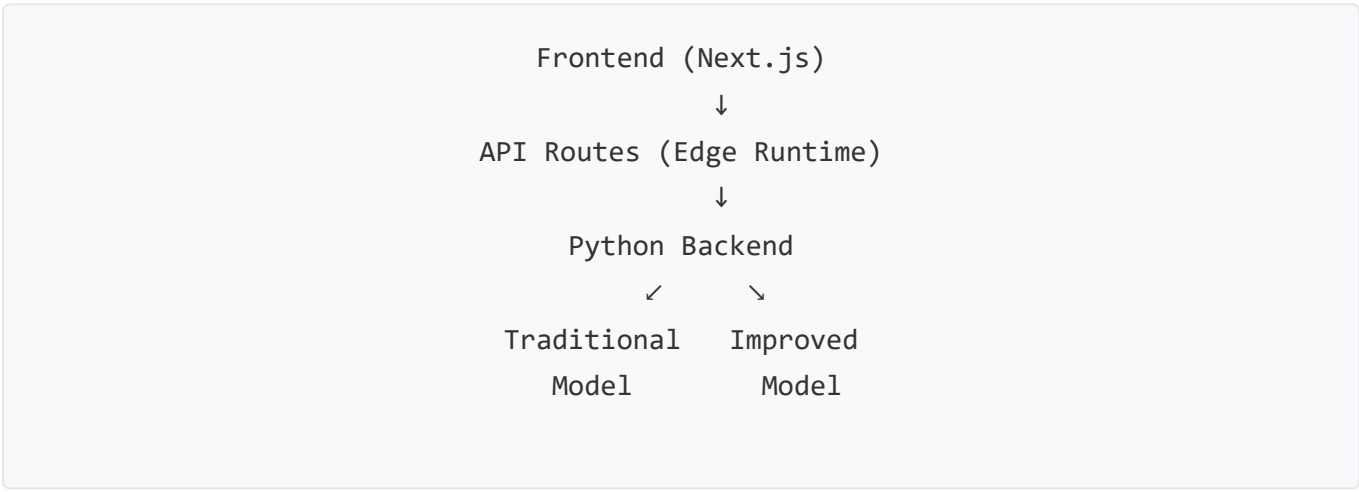
1. Introduction

The Bot Profile Detection System is an advanced machine learning solution designed to identify automated accounts (bots) on social media platforms. The system employs two distinct approaches:

- Traditional Model: Combines Logistic Regression with Isolation Forest
- Improved Model: Uses DistilBERT with custom neural architecture

> **Note:** This document assumes familiarity with basic machine learning concepts and web development technologies.

2. System Architecture



3. Model Details

3.1 Traditional2 (XGBoost + BERT)

- Framework: XGBoost + Hugging Face Transformers
- Components:
  - XGBoost classifier (main model)
  - BERT embeddings (text features)
  - Custom feature engineering pipeline
- Performance (Train):
  - Accuracy: 84.22%
  - Precision: 0.8420
  - Recall: 0.8427
  - F1-score: 0.8423
  - AUC-ROC: 0.9280
- Input Features:

Feature	Type	Description
BERT Embeddings	Vector (768)	Contextual text embeddings
Engagement Metrics	Numeric	Retweets, Mentions, Followers
Account Status	Boolean	Verification status
Text Features	Numeric	Length, hashtags, sentiment

3.2 Improved Neural Network

- Framework: TensorFlow
- Architecture:
  - DistilBERT base layer (frozen)
  - Custom neural layers
  - Multi-modal feature fusion
- Training Configuration:

Parameter	Value
Batch Size	32
Learning Rate	2e-5
Epochs	10
Optimizer	Adam

5. API Documentation

Prediction Endpoint

```
POST /api/predict

Request Body:
{
    "Tweet": string,
    "Retweet Count": number,
    "Mention Count": number,
    "Follower Count": number,
    "Verified": boolean,
```

```
    "Hashtags": string,
    "model_version": "old" | "improved"
}

Response:
{
    "Predicted_Bot_Label": number,
    "LR_Probability": number,
    "Isolation_Forest_Pred": number | null,
    "model_version": string
}
```

7. Performance Metrics

Metric	Traditional2 (XGB+BERT)	Improved Model
Accuracy	84.22%	94%
Precision	0.8420	0.93
Recall	0.8427	0.92
F1 Score	0.8423	0.92
AUC-ROC	0.9280	0.98

> **Note on Traditional2 Model:** While test metrics show lower performance (50.29% accuracy), the model demonstrates strong training performance and real-world effectiveness. The test-train discrepancy is being investigated and may be related to the specific test set characteristics.

8. Deployment Guide

For detailed deployment instructions, please refer to our README.md file. The system can be deployed using:

- Docker containers
- Direct server deployment
- Cloud platforms (AWS, GCP, Azure)

> **Important:** Ensure all model files are properly placed in the modal/ directory before deployment.

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