

# AI Project Street Fighter II Bot

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This README provides instructions for running the Street Fighter II AI Bot, which uses machine learning to play Street Fighter II Turbo on the BizHawk emulator.

## Setup Instructions

### Prerequisites

- Windows 7 or above (64-bit)
- Python 3.6.3 or above
- BizHawk emulator (provided in the project files)
- Street Fighter II Turbo ROM

### Installation

1. Install Python dependencies:

```
pip install numpy pandas scikit-learn joblib matplotlib seaborn
```

2. Install BizHawk prerequisites from the provided ZIP file

## Running the Project: Step-by-Step Guide

### Step 1: Emulator Setup

1. Run EmuHawk.exe from the BizHawk folder
2. Go to File → Open ROM (Ctrl+O)
3. Select "Street Fighter II Turbo (U).smc" from the single-player folder
4. Go to Tools → Tool Box (Shift+T) and leave it open

### Step 2: Data Collection

Data collection is required to train the machine learning model:

1. Open Command Prompt in the project directory
2. Run:

```
python data_collection.py 1
```

3. In the game, select a character and choose normal mode
4. Click the "Gyroscope Bot" icon (second icon in the top row) in the emulator
5. Play several rounds - the script will automatically collect data
6. Press Ctrl+C when done to save the dataset

Optional: Collect data for player 2:

```
python data_collection.py 2
```

### **Step 3: Model Training**

After collecting data, train the ML model:

1. Run:

```
python model_trainer.py
```

2. The script will:
  - Merge datasets (if both player 1 and 2 data exists)
  - Train a Random Forest model
  - Evaluate model performance
  - Generate feature importance analysis
  - Save the model as `sf2_model.joblib`

### **Step 4: Running the AI Bot**

To use the trained bot:

1. For player 1 (left side):

```
python controller.py 1
```

2. For player 2 (right side):

python controller.py 2

3. In the game, select character(s) and mode
4. Click the "Gyroscope Bot" icon to connect
5. The bot will play automatically using the trained model

## Two-Player Mode (Bot vs Bot)

To have two bots fight each other:

1. Open two separate Command Prompt windows
2. In the first window:

python controller.py 1

3. In the second window:

python controller.py 2

4. Select VS Battle mode in the game
5. Click the "Gyroscope Bot" icon to connect both bots

## Troubleshooting

### Connection Issues

- Make sure the emulator is running before executing the Python script
- Check that the BizHawk prerequisites are installed
- Verify you clicked the "Gyroscope Bot" icon in the emulator

### Model Performance Issues

- Collect more training data by playing additional rounds
- Try different characters to ensure the model generalizes well
- Verify that the sf2\_model.joblib file exists in the project directory

### Game Won't Start

- Ensure you're using the correct ROM file
- Check that the port (9999 for player 1, 10000 for player 2) isn't in use by another application

## File Overview

- `bot.py`: Main bot implementation using machine learning
- `data_collection.py`: Script for generating training data
- `model_trainer.py`: Script for training the ML model
- `controller.py`: Connects the bot to the game
- Various support files (`buttons.py`, `command.py`, etc.)

## Notes

- The bot will only be as good as the training data it receives
- For best results, collect at least 5-10 full rounds of gameplay data
- The model automatically falls back to rule-based behavior if no trained model is found