GenetiQStride API - README

Overview

GenetiQStride is an AI-driven genetic profiling system that predicts race potential, injury risk, and breeding scores based on genetic and performance-related inputs.

Installation & Setup

1️⃣ Install Dependencies

Ensure you have Python installed and run:

```
pip install -r requirements.txt
```

2️⃣ Train the Models

Run the training script to prepare the models:

```
python training.py
```

3️⃣ Start the API Server

Launch the FastAPI server using Uvicorn:

```
uvicorn app:app --host 0.0.0.0 --port 8000 --reload
```

The API should now be available at:

http://127.0.0.1:8000/ (locally)

Render link - https://genetiqstride.onrender.com

Postman API Requests

1️⃣ Check API Health

- **Method:** GET
- **URL:** https://genetiqstride.onrender.com/
- **Response:**

```
{"message": "✅ GenetiQStride API is running!"}
```

2️⃣ Predict Race Potential

- **Method:** POST
- **URL:** https://genetiqstride.onrender.com/predict_race_potential
- **Headers:**
  - Content-Type: application/json
- **Body:**

```
{
    "Breed": "Thoroughbred",
    "Sex": "Male",
    "MSTN_Gene": "C/C",
    "PPARδ_Gene": "T/T",
    "COL1A1_Risk": "Low",
    "ACTN3_Type": "RR",
    "Distance_Pref": "Short",
    "Champion_Lineage": "Yes",
    "Injury_History": "No",
    "Speed_Index": 85.2,
    "Stamina_Index": 78.5
}
```

- **Response:**

```
{"Race_Potential": 85.4}
```

3️⃣ Predict Injury Risk

- **Method:** POST
- **URL:** https://genetiqstride.onrender.com/predict_injury_risk

- **Headers:**
    - Content-Type: application/json
- **Body:**

```
{
    "Breed": "Arabian",
    "Sex": "Female",
    "MSTN_Gene": "T/T",
    "PPARδ_Gene": "C/C",
    "COL1A1_Risk": "High",
    "ACTN3_Type": "XX",
    "Distance_Pref": "Long",
    "Champion_Lineage": "No",
    "Injury_History": "Yes",
    "Speed_Index": 70.4,
    "Stamina_Index": 85.0
}
```

- **Response:**

```
{"Injury_Risk": 72.3}
```

Predict Breeding Score

- **Method:** POST
- **URL:** https://genetiqstride.onrender.com/predict_breeding_score
- **Headers:**
    - Content-Type: application/json
- **Body:**

```
{
    "Breed": "Quarter Horse",
    "Sex": "Male",
    "MSTN_Gene": "C/T",
    "PPARδ_Gene": "C/T",
    "COL1A1_Risk": "Medium",
    "ACTN3_Type": "RX",
    "Distance_Pref": "Medium",
    "Champion_Lineage": "Yes",
    "Injury_History": "No",
    "Speed_Index": 88.1,
    "Stamina_Index": 76.3
```

```
}
```

- **Response:**

```
{"Breeding_Score": 90.2}
```

5 View PCA Visualization (Genetic Trends)

- **Method:** GET
- **URL:** https://genetiqstride.onrender.com/visualize_pca
- **Expected Result:** A **PCA scatter plot** showing genetic trends, with:
  - **PC1 (Champion Genetic Index)** on the X-axis
  - **PC2 (Performance & Injury Risk Index)** on the Y-axis
  - **Red dots** for champion horses, **blue dots** for non-champions.

6 View API Documentation (Swagger UI)

- **Method:** GET
- **URL:** https://genetiqstride.onrender.com/docs
- **Expected Result:** Interactive API documentation for testing endpoints.

Notes

- Ensure all dependencies are installed before running the API.
- If any model-related errors occur, **retrain the models** using `python training.py`.
- Ensure `race_model.pkl`, `injury_model.pkl`, `breeding_cnn_model.keras`, `scaler.pkl`, and `label_encoders.pkl` exist before starting the API.