Pose Correction System for Physical Therapy & Rehabilitation

Git hub Repository: https://github.com/IS06-Jithin/RehabApp.git

What you'll find in the repository

Module	Highlights
Data prep & augmentation	Jupyter notebook named 'model_training_evaluation_and_Inference.ipynb' that clean the original REHAB24-6 corpus and generate augmented training windows.
PoseQualityNet-KP	A 3-head CNN + Bi-LSTM that predicts exercise ID, repetition quality, and 14 joint-angle errors—only 3.4 M parameters.
Training • Evaluation • Ablation	Jupyter Notebook named 'model_training_evaluation_and_Inference.ipynb' that contains the code to reproduce all reported metrics and architecture variants.
RehabApp	Deployable application — FastAPI back-end, React front-end, SQLite persistence, Docker-compose one-liner.
Docs & assets	Techincal Report, Presentation and step-by-step usage guides.

RehabApp is an end-to-end AI physiotherapy coach that turns an ordinary webcam into a real-time form-correction assistant.
This repository bundles everything you need—from data preparation to a deployable FastAPI + React stack.

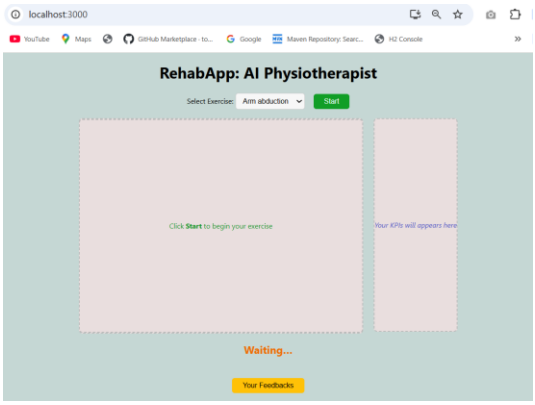
📂 Repository Layout

Path	What's inside
Data/	**Contains links and information about the data sources used.**
└ Data Source Links.txt	**Text file with links/references to the original and processed datasets.**
Data Preprocessing - Model Creation and Evaluation/	**Data-prep helpers and the main Jupyter notebook**
└model_training_evaluation_and_Inference.ipynb	**🔬 Data augmentation, model creation, evaluation, ablation study & inference**
└ Data-REHAB24-6_New/	**Augmented window tensors & meta-data generated by the notebook**

Path	What's inside
Documentation/	Project documentation, reports, and guides.
└Presentation/	Slides (PDF) and recorded project presentations.
└ Project Report/	Detailed project report (PDF and Latex code)
└ User Guide/	Instructions and guides for using Repo and RehabApp.
rehab-app-backend/	FastAPI service (main.py, model loader, SQLite storage, Dockerfile)
rehab-app-frontend/	React client (pose capture, WebSocket, dashboard UI)
docker-compose.yml	One-shot build & launch for both apps

⚡ Running the RehabApp Application:

1. **Clone the repository:**
    - git clone https://github.com/IS06-Jithin/RehabApp.git
2. **Command prompt/terminal navigate to RehabApp folder**
    - cd RehabApp
3. **Build and run with Docker Compose:**
    - docker-compose up --build
4. **Access the application:** Once the build is complete and containers are running:
    - **React Client (Frontend):** http://localhost:3000/ (allow webcam access when prompted)



5. **Using the App**
    - Select the exercise from the dropdown menu and click the **start** button
    - Perform the **selected Exercise**
    - Pay attention to the **visual/Auditory feedback** and correct yourself
    - Upon completion, click the **Stop** button and review your session summary
    - If you have any feedback on the App's usability, click the feedback button and provide it.

🛠️ Prerequisites

- **Docker & Docker Compose:**
    - **Windows / macOS:** Install Docker Desktop from docker.com.
    - **Linux:** Install the Docker Engine and the docker-compose plugin from your distribution's package manager or follow the official guide.
- **Git:** Download and install from git-scm.com.
- **(Optional) NVIDIA Driver + CUDA:**
    - Needed only if you want to benchmark the model on a GPU. CPU inference works out of the box.

✨ Model at a Glance

Architecture

Block	Details
Frame Encoder	1-D CNN (99 → 128 → 512 channels)
Temporal Encoder	2-layer Bi-LSTM (256 hidden units/direction)
Exercise Embedding	6 → 64 MLP

Block	Details
Prediction Heads	Quality (2-way) • 14-Joint Regression • Exercise ID (6-way)
Total Footprint	**3.41 M parameters (≈ 13 MB)**

Performance Highlights

- 🎯 **91.5% F1-score** on repetition quality assessment.
- 🆔 **99.5% F1-score** on exercise identification.
- 📐 **4.73° Mean Absolute Error** for joint-angle regression.
- ⏱️ **~30 FPS** on a mid-range CPU (or ~7,500 windows/second on GPU).

📄 License

✍️ Citation

If you use RehabApp or its components in your research, please cite it as:

```
@misc{rehabapp2025,
  author       = {Jithin Krishnan},
  title        = {RehabApp: AI-Powered Real-Time Physiotherapy Coach},
  year         = {2025},
  howpublished = {\url{https://github.com/IS06-Jithin/RehabApp}}
```