

SpineWise



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Team Introductions

Juan – Product Manager

Javier – Machine Learning Backend

John – Recommendations & Backend

Jason – Frontend & Analytics

Oleh – Frontend & UI/UX

Project Background

SpineWise started in **Capstone 1**

Continued into **Capstone 2**

Built by **7 team members total**

Focus: **Improving posture & spinal health**

Problem Definition

Many people sit for long hours

Poor posture leads to:

- Back pain
- Neck pain
- Long-term spine problems

People often **don't notice** when they slouch

Solution

- SpineWise is a desktop application for posture wellness.
- Created with computer vision and machine-learning to assist desk-bound users in monitoring their sitting posture and improving it over time.
- With a basic webcam, SpineWise assesses a user's sitting posture with labels of good, moderate, or bad, showing these trends over time and displaying them in a user-friendly analytics dashboard.



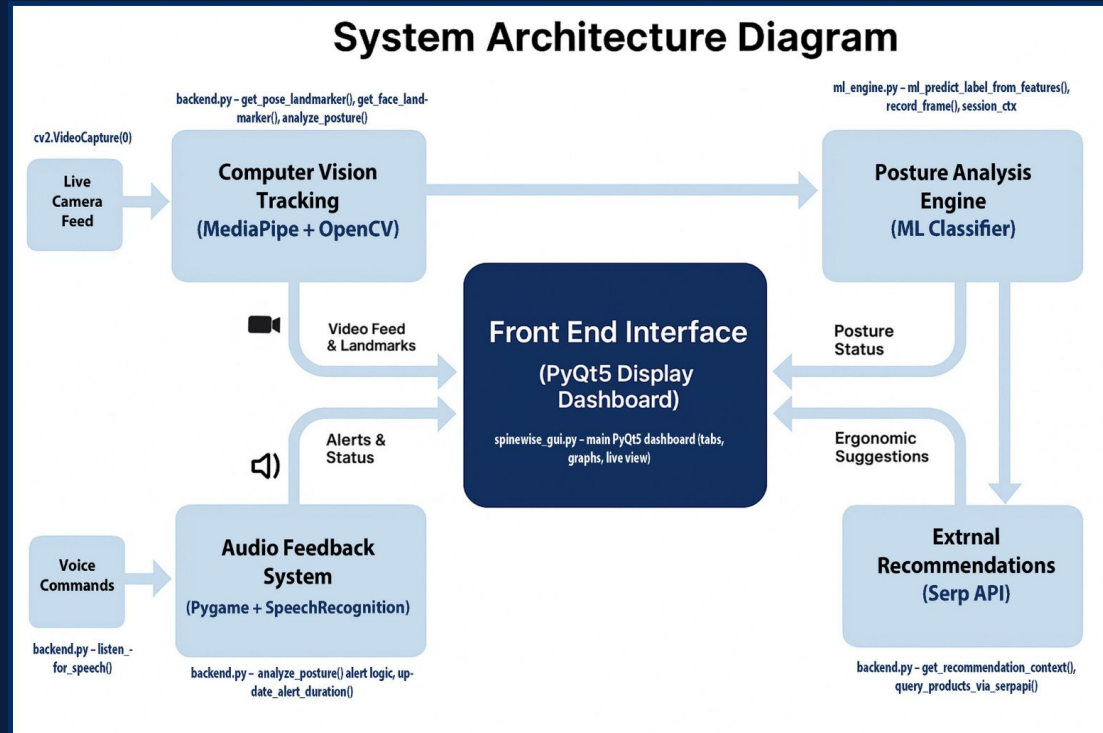
Use Cases

Target Users: Students and Workers in an office/remote setting

Use Cases:

- Real-time posture detection.
- Analytics tab for easy logging.
- Alert system for users to correct posture at a moment's notice.
- Recommendations system for **live coaching** and **product recommendation**.
- Modular settings that can be tailored for user **comfort** and **accessibility**.

System Architecture



Core Features

- **Real-time posture detection**
- **Posture types detection:**
 - Good
 - Moderate
 - Bad
- No special hardware required, works using built-in webcam.

Machine Learning Upgrade

Early system was **rule-based**

Accuracy varied with:

- Lighting
- Camera quality
- User body size

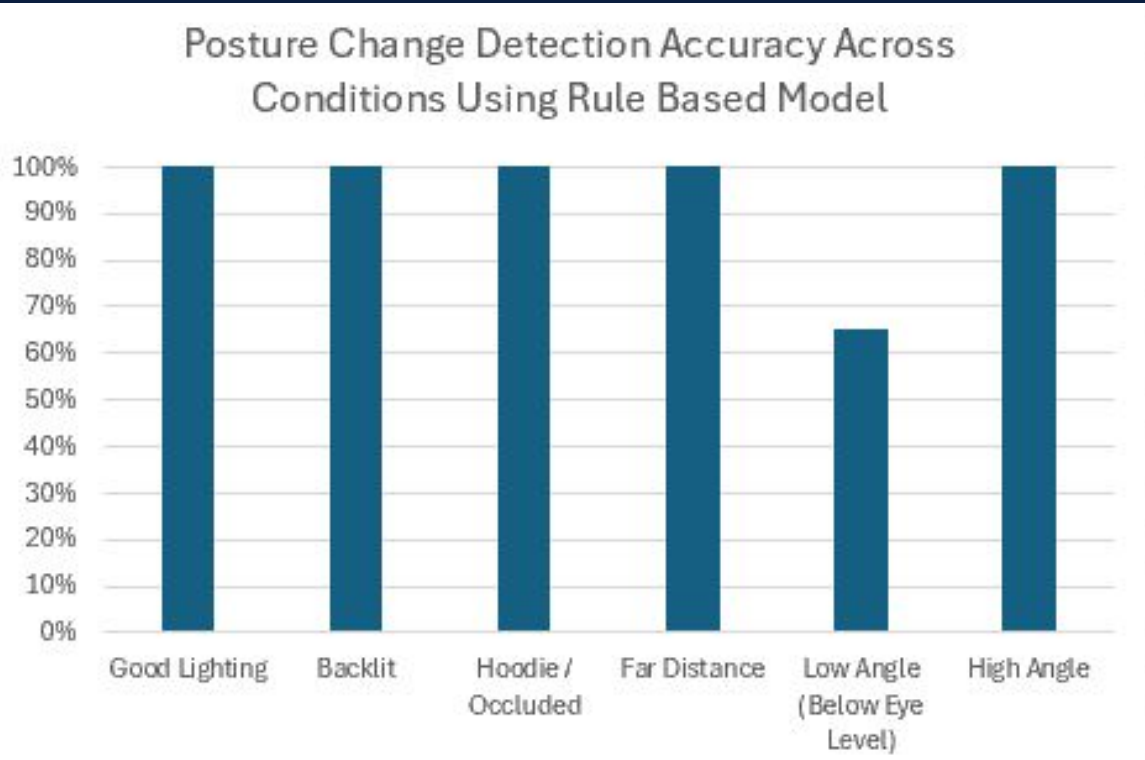
Upgraded to:

- **LightGBM Machine Learning Model**

High accuracy across different environments

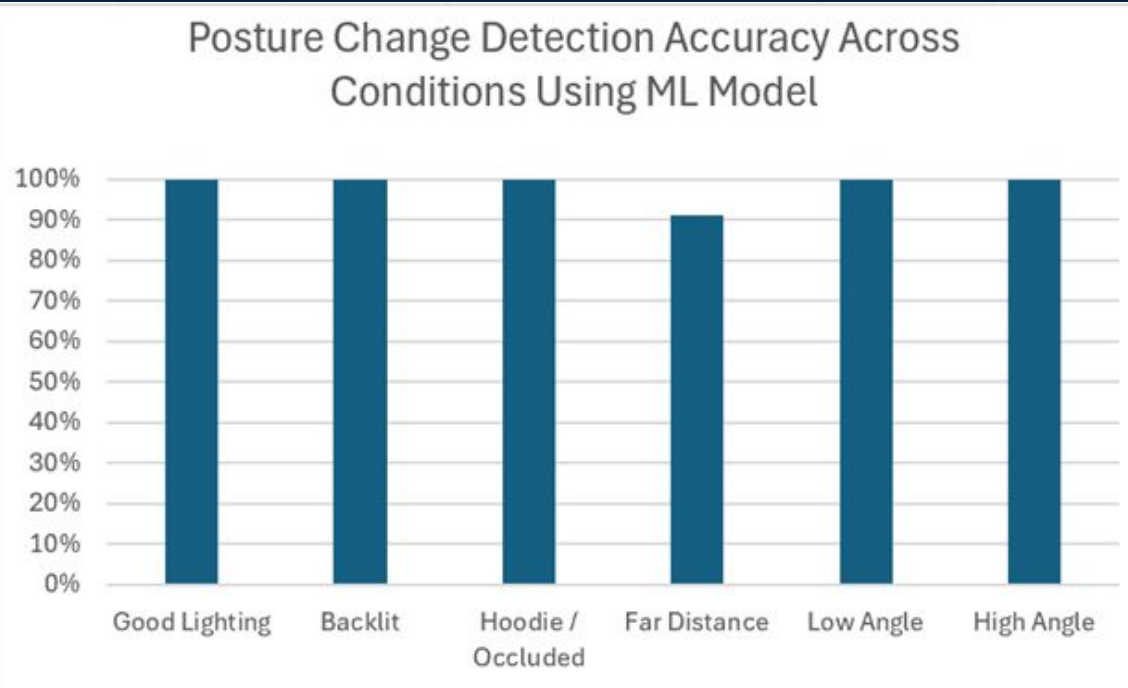
Test Cases Using Rule Based Model

- Transition-accuracy remained high across most conditions.
- Only conditions involving camera angle distortion like camera below eye level produced a drop in accuracy.



Test Cases Using ML Model

- ML model was able to more accurately predict the correct posture when purposefully pivoting.
- This model reduced angle related misclassification but introduced new misclassification to distance and scale.



Camera & Voice Controls

Camera issues solved:

- Exposure and frame rate

Privacy-focused:

- No screenshots
- No video recordings
- Only posture data is saved

Voice commands:

- “Start”, “Calibrate”, “Stop”
- Commands are **customizable**

Analytics Tab

Shows posture history:

- Green = Good
- Blue = Moderate
- Red = Bad

Tracks:

- Session length
- Weekly averages
- Monthly progress

Uses **CSV + JSON** logging

Streak System

- Tracks **daily posture streaks**
- Encourages consistency
- Streak resets after a bad day
- No public leaderboards
- Designed for **personal improvement only**

Recommendations & Live Coach

- System finds **repeated posture issues**
- Uses **SerpAPI** to:
 - Fetch helpful products from Amazon
- **Live Coach** suggests:
 - Exercises
 - Stretches
- Products shown only when problems are **consistent**

Conclusion

SpineWise promotes:

- Better health
- Better posture habits

Built with:

- OpenCV
- MediaPipe
- Machine Learning