AI-Powered Postural Data Analysis

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STORY HOOKS

- ➢ imagine Sarah, a software engineer who spends long hours at her desk, often hunching over her screen. As back pain becomes a constant issue, she worries about the long-term effects of her posture.
- ➢ What if AI could monitor her in real-time and gently remind her to sit up straight and take breaks? That's the essence of **AI-Powered Postural Data Analysis**—empowering individuals like Sarah to reclaim their health and productivity.

Introduction to AI- Powered postural Data Analysis

- Ai-powered postural data analysis uses advanced technology to track and analyze human posture
- It provides insights into health, well being, and performance
- This technology is rapidly evolving offering new possibilities for improving health outcomes and enhancing physical therapy programs.

Data Processing and Pose Detection

- **Frame Extraction:**
  Breaking down videos into individual frames.
- **Image Preprocessing:**
  Enhancing quality by adjusting brightness, contrast, and reducing noise.
- **MediaPipe Pose:**
  - Detects 33 3D body landmarks
  - Provides real-time pose estimation
- **Integration with OpenCV:**
  Facilitates video processing and frame manipulation.
- **Visuals:**
- Diagram showing frame extraction and preprocessing.

AI Model Selection

- Why MediaPipe Pose?
  - Real-Time Performance: Optimized for speed.
  - High Accuracy: Precise landmark detection.
  - Easy of Integration: Seamlessly works with OpenCV.
- Visuals:
- Comparison table of different pose detection models
- Highlighted features of MediaPipe Pose

Algorithms for Posture Classification

Machine Learning:

▸ ML algorithms are trained on small dataset of postural data to recognize patterns and classify different posture

Deep Learning:

▸ DL models, are particularly CNN,are powerful in identifying complex postural patterns and providing detailed insight in body

Statistical Analysis:

▸ Statistical Techniques are used to analyze posture data, identify trend ,and detect deviation from optimal posture, providing valuable insight for personalized recommendations.

Demonstration

- ➢ **Tools and Technologies:**
  - Python
  - OpenCV
  - MediaPipe
  - Google Colab (for development and testing)
- ➢ **System Architecture:**
  - Video Input Module
  - Preprocessing Module
  - Pose Detection Module
  - Posture Analysis Module
  - Feedback Module
  - User Interface
- **Workflow:**
  Step-by-step process from video capture to feedback display.
- **Visuals:**
- Architectural diagram of the system
- Workflow chart illustrating the data flow

Objectives

- **Automated Posture Detection**: Develop a system that can accurately detect and analyze human posture in real-time using video input.
- **Real-Time Feedback**: Provide immediate feedback to users regarding their posture, highlighting areas of improvement.
- **User-Friendly Interface**: Create an intuitive interface that displays posture analysis results in an easily understandable manner.
- **Scalability and Flexibility**: Ensure the system can be adapted for various use-cases, including office environments, educational settings, and personal health monitoring.
- **Data Privacy and Security**: Implement measures to protect user data and ensure privacy during posture analysis.

Conclusion

- ## Project Successes:
  - Achieved accurate and real-time posture detection
  - Provided effective user feedback
  - Demonstrated potential for health and productivity improvements
- ## Key Takeaways:
  - AI and computer vision can significantly enhance posture monitoring
  - Integration of OpenCV and MediaPipe is effective for such applications
- ## Impact:
  Potential applications in workplaces, educational institutions, and personal health monitoring

References

- OpenCV Documentation: https://docs.opencv.org/
- Python Official Website: https://www.python.org/
- Research_paper_posture_Analysis.pdf
- YouTube video
- Hack Veda References Video

Thank You For Your Attention

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