

AI-Assisted Alternate Nostril Breathing System

Enhancing traditional pranayama with modern AI-powered monitoring for an integrated mindfulness experience.

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The Challenge with Traditional Practice

Alternate nostril breathing, or Nadi Shodhana Pranayama, is a powerful mindfulness technique known for its calming and balancing effects. However, mastering the correct rhythm, duration, and precise alternation between nostrils can be challenging for practitioners, especially beginners. Without real-time guidance, individuals often struggle to maintain consistency and optimize their technique, leading to frustration and potentially diminishing the full therapeutic benefits.

Our AI-Assisted Solution

Our AI-Assisted Alternate Nostril Breathing System leverages cutting-edge technology to transform this ancient practice. Through intelligent monitoring and real-time feedback, the system guides users to achieve optimal breathing patterns. It detects nuances in breath flow, duration, and ensures correct nostril alternation, providing immediate, personalized adjustments. This innovative approach makes pranayama accessible, effective, and deeply enriching for everyone.

System Overview: Pranayama Assistant

The Pranayama Assistant is a web application that uses MediaPipe's computer vision for real-time guidance during alternate nostril breathing. It integrates breathing instruction, posture monitoring, eye tracking, and audio feedback to address all specified requirements.



Core Feature: Breathing Guidance

1

Classical Sequence

Follows Nadi Shodhanam: right exhale, left inhale, left exhale, right inhale.

2

Visual Guide

Animated circular interface expands and contracts with breath rhythm.

3

Nostri Indicators

Clear visual cues show which nostril should be active.

4

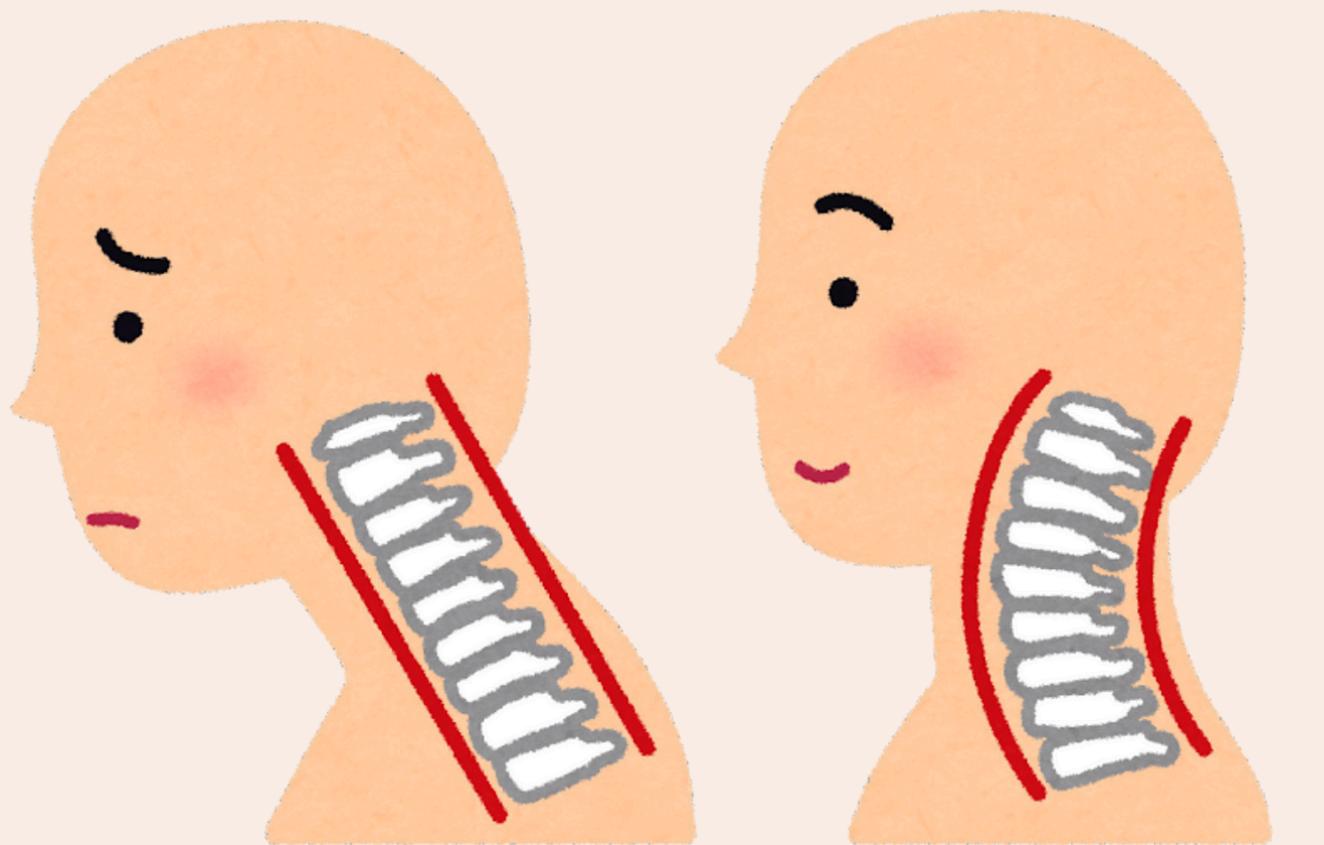
Custom Timing

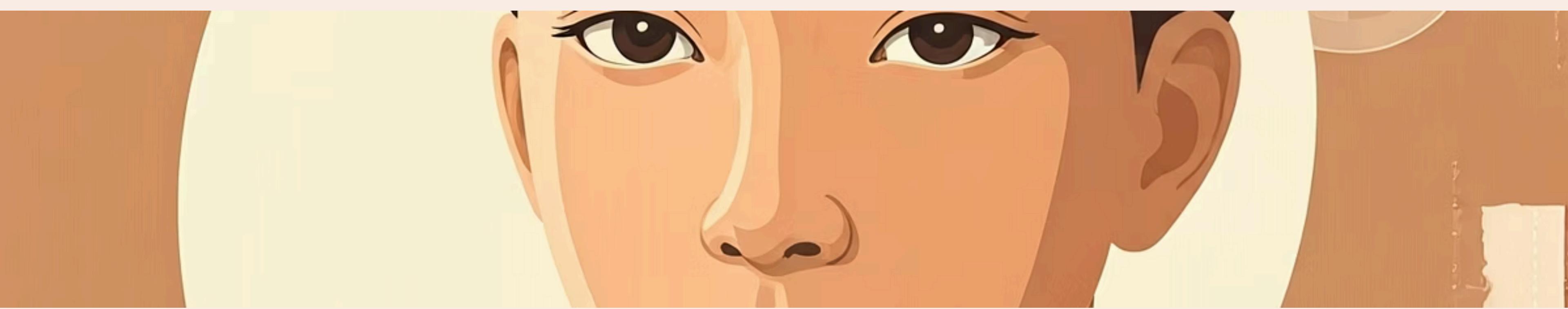
Offers customizable 4-5 second inhale/exhale options.

Core Feature: Posture Monitoring

MediaPipe Pose detection monitors spinal alignment and sitting posture in real-time.

- Shoulder Alignment: Tracks level and symmetry.
- Spine Position: Monitors vertical alignment, prevents slouching.
- Neck Angle: Detects forward head posture.





Core Feature: Eye & Head Tracking

Eye Detection

- Real-Time Eye Tracking: Monitors eye aspect ratio (EAR).
- Immediate Audio Alerts: Gentle sounds when eyes are open.
- Blink Detection: Uses EAR threshold (0.25) with consecutive frame validation.

Head & Neck Correction

- Head Tilt Detection: Monitors lateral movements.
- Forward Head Position: Alerts for excessive forward movement.
- Neck Alignment: Tracks cervical spine position.

Comprehensive Audio System

A multi-layered audio feedback system using the Web Audio API provides cues and alerts.



Breathing Cues

Soft chimes for inhale/exhale timing.



Posture Alerts

Voice prompts for spinal alignment corrections.



Eye Opening Alerts

Immediate notifications when eyes are open.



Nostril Switching

Gentle audio cues for transitions.



Technical Foundation

Computer Vision Models

- MediaPipe Pose: 33 body landmarks for posture analysis.
- MediaPipe Face Mesh: 468 facial landmarks for precise eye tracking.
- Optimized for browser-based, real-time inference.

Detection Algorithms

- Posture: Calculates angles between shoulder landmarks, monitors neck inclination and torso angle.
- Eye: Eye Aspect Ratio (EAR) with threshold-based detection and frame validation.

UI Design & Traditional Adherence

User Interface Design

- Calming Color Palette: Deep blues, teals, earth tones.
- Minimal Distractions: Clean, uncluttered interface.
- Large Visual Elements: Easy-to-read displays.
- Responsive Design: Works across devices.

Traditional Technique Adherence

- Proper Sitting Position: Encourages erect spine.
- Nasika Mudra: Visual guidance for correct hand position.
- Breath Awareness: Focus on smooth, even breathing.
- Energy Balance: Follows traditional sequences.

Modern Enhancements & Safety

Modern Enhancements

- Precision Timing: Exact breath duration control.
- Progress Tracking: Session statistics and metrics.
- Safety Monitoring: Prevents strain.
- Accessibility: Guidance for beginners.

Health & Safety Considerations

- Breath Rate Monitoring: Prevents hyperventilation.
- Posture Protection: Reduces back strain.
- Eye Strain Prevention: Encourages proper eye closure.
- Beginner Guidance: Clear instructions for safe practice.

Getting Started & Future Vision

The application is designed for immediate use with minimal setup, transforming traditional practice into a technology-enhanced experience.



Camera Access

Grant webcam permission.



Position Setup

Sit comfortably facing the camera.



Calibration

Brief baseline setup.



Practice

Begin guided session.

Future enhancements could include HRV integration, advanced breath patterns, and personalized analytics.

Impact

Making Yoga and Pranayama Accessible

- Provides opportunities for practicing yoga and pranayama without the guidance of a teacher. Encourages self-paced learning with valuable AI feedback.
- Capable of scaling to various settings, including schools, wellness centers, and even virtual reality headsets.

Market potential: Yoga and meditation apps, which are in high global demand.



Thank You