

Annexure3b- Complete filing

INVENTION DISCLOSURE FORM

Details of Invention for better understanding:

1. TITLE: AI-Based Sleep Detox Optimizer Using Multi-Sensor Wearable and Lifestyle Intelligence

2. INTERNAL INVENTOR(S)/ STUDENT(S):

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3. DESCRIPTION OF THE INVENTION:

I. Purpose: To develop a novel AI-powered system that non-invasively tracks and enhances the body's natural detox process during sleep. The invention utilizes data collected through wearable multi-sensor devices and lifestyle input to calculate personalized Detox Efficiency Scores (DES) and push actionable suggestions, supporting organ recovery and holistic health.

II. Technical Workings:

- **Wearable Sensor Input:** A smartwatch or similar wearable records biometric signals like sleep stage transitions, HRV, heart rate, body temperature, SpO2, respiratory rate, and movement.
- **Lifestyle Tracking:** A mobile app records hydration, food intake, stress levels, daily screen exposure, and physical activity.
- **AI Fusion Engine:** A cloud-hosted machine learning model processes these datasets to compute daily Detox Efficiency Scores (DES) for organs (brain, heart, liver) based on recovery patterns and behavioural markers.
- **Feedback Mechanism:** Based on DES, the system recommends daily changes like adjusting bedtime, screen cutoff alerts, water reminders, and stress-reducing techniques to optimize sleep-based detox.
- **Personalization Loop:** The model adapts its suggestions over time based on the user's behavioural history, trends, and longitudinal changes in organ recovery metrics.
- **Error Calibration:** Uses error-checking and confidence thresholding to avoid false recommendations based on insufficient or inconsistent data.

III. Unique Attributes:

- **Organ-Specific Focus:** Unlike generic wellness metrics, our system offers targeted detox scores for brain, heart, and liver.
- **Lifestyle-Linked AI Engine:** Combines passive sensor data with active behaviour tracking to drive contextual decisions.
- **Personalized Micro-Interventions:** Tailored advice such as “reduce screen time after 10 PM” or “increase water intake post-5 PM.”
- **Hardware-Agnostic Platform:** Compatible across multiple wearables using API integration.
- **Dynamic Learning System:** Adapts to unique health trajectories of individuals with continuous feedback.

Conclusion: A preventive healthcare tool that enables the user to take daily corrective action for better long-term organ health using an intelligent detox-monitoring system.

A. PROBLEM ADDRESSED BY THE INVENTION:

1. **Lack of Organ-Specific Detox Monitoring:** Most current wearables provide a general wellness or sleep score but fail to determine the detox status of specific organs like the brain, heart, and liver.
2. **Disconnection Between Lifestyle and Sleep Recovery:** Sleep quality is influenced by pre-sleep activities such as diet, screen time, and hydration, yet existing devices overlook these factors in sleep analysis.

3. **No Actionable Feedback Loop:** Existing health trackers rarely provide actionable, day-wise corrective measures based on detox analytics.
4. **Low Preventive Capability:** Users are often informed only after signs of health decline occur. Our system takes a proactive approach by identifying detox inefficiencies in advance.
5. **Lack of Personalization in Recovery Insights:** Most systems offer broad advice without taking into account a user's lifestyle history, behavioural trends, or organ-specific needs.

Conclusion: The invention addresses the missing link between biometric data and behavioural influence on organ-specific detox. By providing customized feedback and early risk markers, it opens a new dimension in preventive and personalized health optimization.

B. OBJECTIVE OF THE INVENTION:

1. **To Create an AI Model that Quantifies Organ-Specific Detox Efficiency:** Focus on the brain, heart, and liver, offering a unique metric unavailable in current commercial wearables.
2. **To Integrate Lifestyle Intelligence into Sleep-Based Recovery Models:** Sync behavioural data like water intake, diet, and stress levels with physiological metrics to enhance recovery analysis.
3. **To Deliver Personalized, Actionable Insights Daily:** Provide users with real-time suggestions that are customized to their sleep history, organ recovery patterns, and lifestyle data.
4. **To Build Scalable System Compatible with Existing Wearables:** Ensure wide usability by developing a platform that connects seamlessly to third-party devices through open APIs.

C. STATE OF THE ART/ RESEARCH GAP/NOVELTY:

Sr. No.	Study	Abstract	Research Gap	Novelty
1	Fitbit Sense 2, Apple Watch	These devices offer sleep and stress tracking using advanced sensors but do not evaluate specific organ detox or recovery metrics.	Lack of organ-specific detox tracking.	Detox Efficiency Score (DES) system tailored for brain, heart, and liver recovery.
2	WHOOP, Oura Ring	These wearables emphasize readiness scores based on HRV and recovery but ignore user behaviour patterns and their impact on recovery.	Absence of behaviour integration in health feedback.	AI-powered lifestyle-linked detox scoring mechanism.
3	Academic Sleep Studies	Research confirms processes like glymphatic clearance and liver detoxification occur during sleep. However, they have not been commercialized or adapted into a consumer product.	No consumer-level, real-time implementation of organ detox.	Machine learning-based engine that translates sleep and lifestyle data into actionable feedback.

Conclusion: While many wearable devices offer health insights, none currently assess internal detoxification on an organ-specific level with behavioural linkage. This invention bridges that research-to-product gap with novel AI integration and real-time personalization.

D. DETAILED DESCRIPTION:

The AI-Based Sleep Detox Optimizer is a holistic health monitoring system that integrates biometric and behavioural inputs to guide organ-level recovery during sleep. It operates on the principle that sleep detoxification is a function of both internal biology and external habits.

I. System Components

- **Multi-Sensor Wearable Device:** A smartwatch capable of tracking key vitals like HRV, SpO2, temperature, motion, and respiratory rate. It serves as the primary physiological data source.
- **Mobile App Interface:** A companion app where users input lifestyle data (hydration, food, stress) and view insights, DES scores, and progress reports. It also delivers feedback.
- **Cloud-Based AI Engine:** Processes fused data using ML algorithms to compute Detox Efficiency Scores. Continuously improves through user data and feedback loops.
- **Data Storage & Analytics Layer:** Secures raw and processed data, allowing longitudinal analysis and generating personalized trends over time.

II. Technical Functionality

- All inputs are synced and timestamped for nightly evaluation to the backend.
- Data is cleaned using signal filtering and normalized for inter-user comparison.
- ML model trained on sleep medicine datasets identifies correlations between inputs and detox success indicators.
- Generates Detox Efficiency Scores (DES) from 0 to 100 for each organ.
- Interprets low scores as signs of insufficient detox, prompting corrective recommendations.

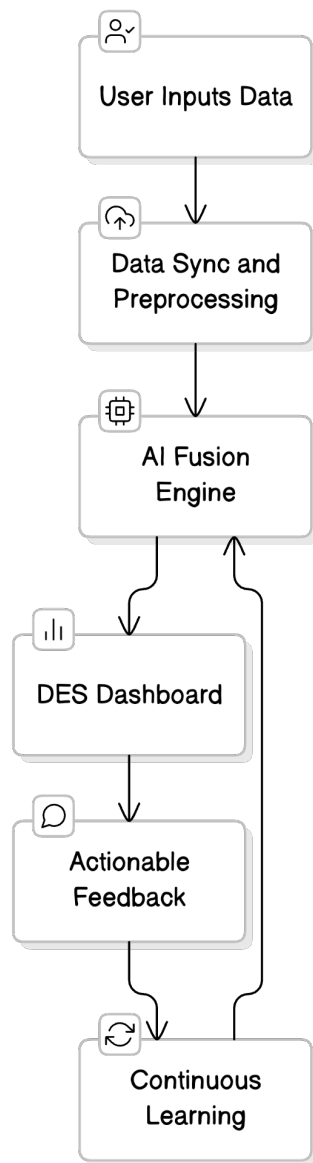
III. Unique Features

- **Organ-Specific Sleep Detox Intelligence:** World's first consumer-facing system that interprets sleep and lifestyle data to generate organ-wise detox health scores—bridging everyday habits with internal wellness.
- **Adaptive Habit Nudging Engine:** Continuously analyses real-time behavioural patterns to deliver precise nudges and alerts, preventing actions that compromise organ detox efficiency and recovery.
- **Dynamic Daily Health Dashboard (DES):** A visually engaging and intuitive dashboard that provides holistic, organ-wise wellness insights, habit scores, and detox progress at a glance—designed for daily engagement.
- **Self-Learning Personalization Core:** Employs a retraining machine learning model that evolves with user data, refining habit suggestions and detox recommendations for increasingly accurate and tailored health guidance.

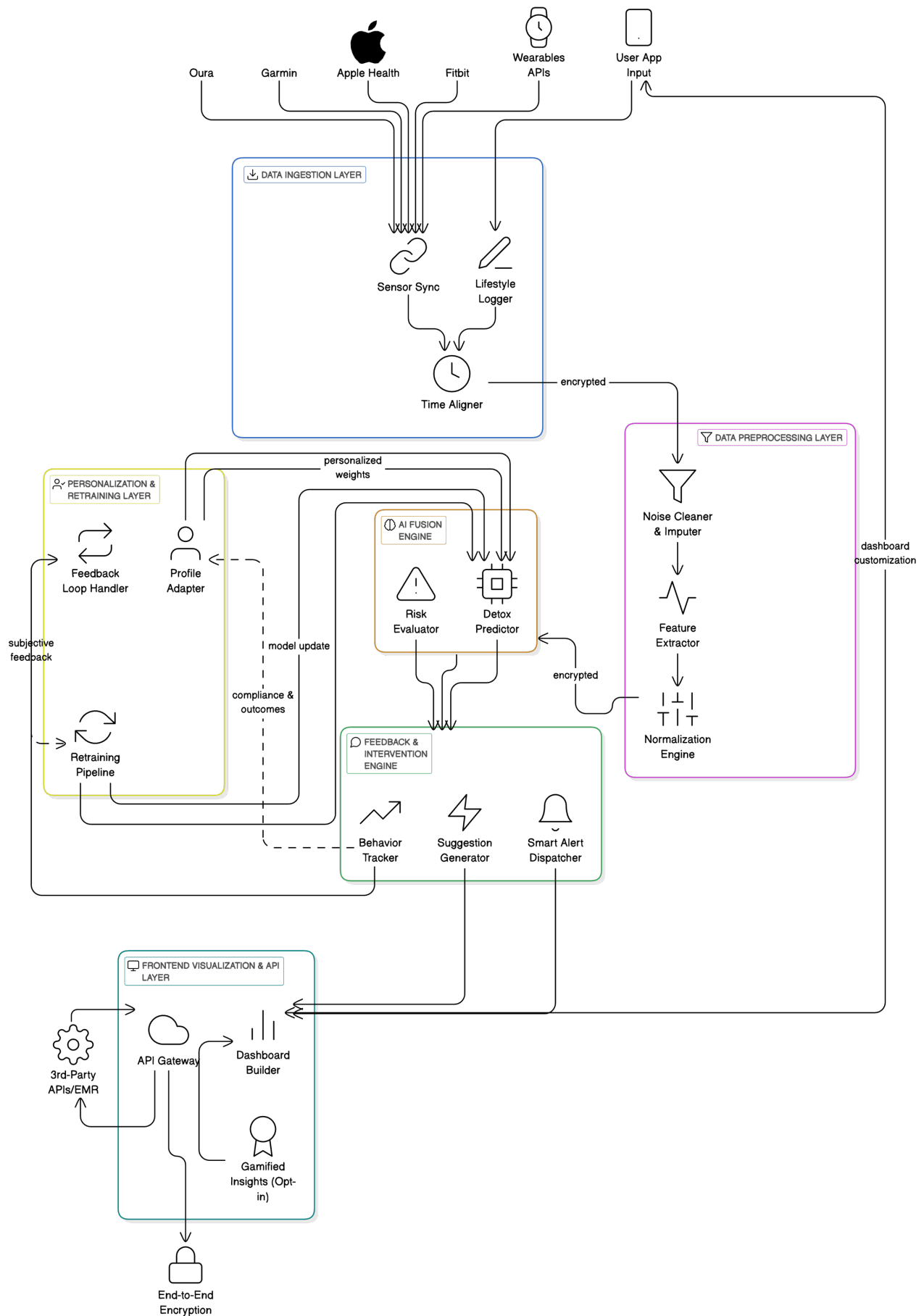
Conclusion: The proposed system intelligently decodes detox health using AI to promote holistic well-being without requiring clinical intervention.

Process Workflow:

AI-Based Sleep Detox Optimizer – Workflow



End-to-End Health Data Flow & AI Personalization Architecture



E. RESULTS AND ADVANTAGES:

This section highlights the core benefits delivered by the AI-based Sleep Detox Optimizer system. Unlike traditional health and sleep-tracking tools that focus on general wellness indicators, this invention provides deeper insights into internal organ recovery and detox processes. The following are the specific results and advantages:

- **Detection of Hidden Inefficiencies:** Many individuals may clock adequate hours of sleep but still suffer from fatigue, brain fog, or internal strain. This system excels in identifying detox inefficiencies that aren't visible through standard sleep duration tracking. It highlights organ-specific stress markers that are often masked by seemingly "normal" rest.
- **Minimization of Long-Term Organ Strain:**
By using micro-corrections—such as altering bedtime, reducing screen time before sleep, or improving hydration—the system reduces the cumulative impact of poor detoxification. Over time, these corrections prevent conditions like cognitive decline, cardiovascular strain, and liver inefficiency.
- **Non-Invasive Approach:**
Traditional diagnostics require blood tests, imaging, or other invasive techniques to monitor internal recovery. This invention eliminates the need for invasive procedures by relying solely on behavioural and sensor-based input, making it accessible and user-friendly.
- **Cross-Platform Compatibility:**
The system is designed to work with any modern wearable device that exposes biometric APIs, such as Apple Watch, Fitbit, or Garmin. This flexibility increases adoption and eliminates the need for proprietary hardware.
- **Promotes Healthy Behaviour Cycles:**
By offering daily personalized feedback, the system nudges the user toward healthier routines. Over time, this leads to improved circadian rhythm alignment, better hydration habits, reduced screen addiction, and conscious stress management.

Conclusion: This invention offers a breakthrough in preventive healthcare by shifting the focus from superficial sleep tracking to internal organ recovery, enabling holistic wellness with minimal user burden.

F. EXPANSION:

The invention is built with modularity and long-term scalability in mind. While the initial focus is on personal wellness and organ detox optimization, there are various future paths for medical, institutional, and commercial growth. Possible expansions are as follows:

- **Integration with Electronic Medical Records (EMRs):**
Future versions may incorporate EMR data to offer medical context while making suggestions, enhancing accuracy for users with chronic conditions.
- **Clinical Certification for Medical Use:**
The system may pursue FDA/CE approval for clinical deployment, allowing it to be used in sleep clinics or for remote patient monitoring by physicians.
- **Creation of Organ Detox Index (ODI):**
A proprietary scoring index may be developed to quantify detox efficiency across organs. This score can be integrated into health insurance wellness programs, providing discounts or incentives for healthy behaviour.
- **Broadening Organ Coverage:**
Current focus is on the brain, heart, and liver. Future modules could expand to kidney

detox, pancreas stress detection (linked to insulin regulation), and hormonal recovery metrics (e.g., cortisol balance), ensuring a more comprehensive picture of health.

Conclusion: The invention holds scalable potential, evolving from a personal wellness tool to a medically validated diagnostic support system with applications in clinics, insurance, and population health monitoring.

G. WORKING PROTOTYPE/ FORMULATION/ DESIGN/COMPOSITION:

1. Is the working prototype ready? No.
2. Estimated time to complete: 3-4 months.
3. Images/Data: To be provided upon prototype development.

H. EXISTING DATA:

A strong foundation of scientific research and market trends supports the invention's technical direction and societal relevance. This section outlines key sources of existing data that validate the system's concept and commercial viability.

- **Brain Detox Research:**
Recent studies confirm that the **glymphatic system** clears toxins from the brain primarily during deep sleep. This mechanism supports the core assumption that poor-quality sleep can reduce brain detox efficiency, leading to cognitive fatigue and early neurodegeneration.
- **Liver Function During Sleep:**
Medical literature shows the liver performs critical detoxification, particularly between 1 AM to 3 AM, in sync with circadian rhythms. Inadequate or interrupted sleep hampers this process, potentially impacting metabolic balance and liver health.
- **Behavioural Impact Studies:**
The **World Health Organization (WHO)** and **National Institutes of Health (NIH)** have reported strong links between lifestyle factors—like late-night screen use, hydration status, and psychological stress—and disrupted sleep quality. These findings validate the need for behaviour-coupled detox analysis.
- **Wearable Market Insights:**
Consumer trends show a rising demand for smart health solutions. Wearables with sleep-tracking capabilities are becoming more common, and users are increasingly open to preventive health tools that provide insights beyond simple step counts or calories.

Conclusion: The invention stands on a solid scientific foundation and meets a clearly identified market demand. Existing data from healthcare research and consumer behaviour ensures its **credibility, relevance, and high adoption potential**.

4. USE AND DISCLOSURE (IMPORTANT):

A. Have you described or shown your invention/ design to anyone or in any conference?	YES()	NO (X)
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B. Have you made any attempts to commercialize your invention (for example, have you approached any companies about purchasing or manufacturing your invention)?	YES()	NO (X)
C. Has your invention been described in any printed publication, or any other form of media, such as the Internet?	YES()	NO (X)
D. Do you have any collaboration with any other institute or organization on the same? Provide name and other details.	YES()	NO (X)
E. Name of Regulatory body or any other approvals if required.	YES()	NO (X)

- **Links and dates for public disclosures:** NA
- **Terms and conditions of MOU for collaboration:** NA
- **Potential chances of commercialization:** Yes
- **List of companies for commercialization:** To be identified.
- **Any patents requiring royalty payments?** NA

5. FILING OPTIONS: Please indicate the level of your work which can be considered for provisional/ complete/ PCT filings - **(Provisional)**

6. KEYWORDS:

1. Sleep Detox Optimizer
2. Detox Efficiency Score (DES)
3. Organ-Specific Sleep Detox
4. AI Sleep Recovery System
5. Non-Invasive Sleep Detox Monitoring
6. Wearable-Based Sleep Detox Tracking
7. Brain Detox During Sleep
8. Liver Detox Sleep Analysis
9. Heart Recovery Sleep Cycle
10. Sleep-Behaviour Fusion Model
11. Lifestyle-Linked Sleep Detox AI
12. Sleep-Based Organ Recovery Estimation
13. Deep Sleep Detox Scoring
14. Sleep Wellness Feedback System
15. Personalized Detox Suggestions
16. Real-Time Detox Monitoring During Sleep
17. AI Sleep Health Feedback Loop
18. Daily Sleep Detox Assessment
19. Behaviour-Integrated Sleep Analysis
20. Sleep Detox Insights Engine

(Letter Head of the external organization)

NO OBJECTION CERTIFICATE

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