1️⃣ What “disrupted sleep / behaviour pattern” ACTUALLY means (non-clinical)

You are **NOT detecting depression/anxiety**.
You are detecting **deviations from a user’s own baseline**.

Examples of non-clinical signals

Category	Behaviour Signal (Safe & Non-Medical)
Sleep	Sleep duration variability, bedtime drift, wake-up inconsistency
Activity	Reduced daily movement, irregular active hours
Digital habits	Late-night screen usage, app usage spikes/drops
Routine	Missed routines, inconsistent daily structure
Engagement	Reduced interaction with platform features

👉 **Important principle:**

> You never compare users to “healthy people”.
> You compare **user vs their past self**.

2️⃣ How do we get this data automatically (without spying)?

This is the most important part.

❌ What you should NOT do

- No microphone
- No camera
- No reading private messages
- No GPS tracking
- No medical records

✅ What you CAN do (privacy-first)

A. Passive, permission-based signals (web / mobile)

1. Time-based usage signals (web-safe)

Collected **only when user uses your app**:

- Login times
- Session duration
- Time of last activity
- Usage gaps

Example:

```text
User usually logs in between 9–11 PM
Now logging in at 2–4 AM consistently → sleep disruption signal
```

2. Optional device integrations (explicit opt-in)

- Google Fit / Apple Health (only aggregates)
- Screen time APIs (daily totals, not content)
- Wearables (steps, sleep duration)

> You store **numbers**, not raw logs.

B. Lightweight self-check inputs (guided, optional)

Instead of medical questionnaires:

- “How regular did your sleep feel this week?” (slider)
- “Did your routine feel predictable?” (Yes/Somewhat/No)
- “Energy level today?” (Low–Medium–High)

👉 These **calibrate the model**, not diagnose.

3️⃣ Turning raw data into “behaviour patterns”

This is where AI comes in.

Step 1: Build a personal baseline

First 2–3 weeks = **learning phase**

```text
Average sleep time
Sleep variance
Typical activity window
Normal usage frequency
```

No predictions yet.

Step 2: Extract pattern features (ML-ready)

Feature	Example
Sleep variance	Std dev of sleep hours
Circadian drift	Bedtime shift over days
Routine entropy	Daily schedule irregularity
Engagement change	% drop vs baseline
Consistency score	Stability across days

These become numbers like:

```python
sleep_variance = 1.8
routine_entropy = 0.62
usage_shift = +35%
```

4️⃣ What AI/ML model do we actually use?

⚠️ This is NOT a disease classifier

Best model choices (non-clinical & ethical)

🔹 1. Anomaly Detection (BEST choice)

- Isolation Forest
- One-Class SVM
- Autoencoders

👉 Detects **“this week looks unusual for YOU”**

```text
Output: Risk deviation score (0–1)
```

🔹 2. Trend-based ML (secondary)

- Rolling averages
- Change-point detection
- Simple regression trends

Example:

```text
Sleep consistency declining steadily over 14 days
```

❌ Avoid

- Diagnostic labels
- Binary “healthy / unhealthy”
- Medical datasets

5️⃣ How the system explains results (VERY IMPORTANT)

You must be **transparent and uncertainty-aware**.

Example output (GOOD)

> “We noticed a **moderate deviation** from your usual sleep and activity routine over the last 10 days.
> This **may indicate increased strain**, but many factors can cause this.”

❌ Bad output

> “You are at risk of depression” ❌

6️⃣ Web interface: how the UI should guide the user

Key UI sections

1. Consent & control panel

- Toggle data sources
- Pause tracking
- Delete data anytime

2. Insight dashboard

- Trend graphs (no scary numbers)
- “What changed” explanation
- Confidence level indicator

3. Action suggestions (non-medical)

- “Try stabilizing bedtime”

- “Consider short breaks from late-night screen use”
- “Would you like to reflect on your routine?”

7️⃣ Ethics, privacy & safety (you MUST mention this)

Mandatory safeguards

- Local preprocessing where possible
- Anonymized user IDs
- No raw logs stored
- Explicit consent per data source
- No diagnosis language
- Clear disclaimers

Data handling model

```text
User device → Feature extraction → Encrypted summary → AI model
```

8️⃣ Final system architecture (simple view)

```text
User Data (opt-in)
   ↓
Feature Extraction (privacy-safe)
   ↓
Baseline Modeling
   ↓
Anomaly / Trend Detection
   ↓
Risk Indicator (non-clinical)
   ↓
Transparent UI + Suggestions
```

9️⃣ Can this be built with your current skills?

YES — and this is a **strong hackathon / research / startup-level project**.

Suggested tech stack

- Frontend: React / Next.js
- Backend: Python (FastAPI)
- ML: scikit-learn / PyTorch (simple)
- DB: SQLite / PostgreSQL
- Privacy: Hashing + aggregation

🔥 If you want next steps

I can:

1. Design **exact ML features**
2. Help you write **problem** → **solution** → **innovation** section
3. Create a **step-by-step build roadmap**
4. Help you avoid **medical & legal red flags**

Just tell me what you want next 👌