

understand

1. Data Packet (Input)

JSON

```
{  
  "heartRate": 85,      // BPM (Beats Per Minute)  
  "spO2": 98,          // Percentage (%)  
  "temp": 36.8,         // Celsius (°C)  
  "Sitting or Standing": 1, // 1 = Yes, 0 = No  
  "Walking or Running": 0 // 1 = Yes, 0 = No  
}
```

This combination is powerful because you have **Context** (Walking/Sitting) alongside **Vitals** (heartRate). This is the key to avoiding false alarms.

2. What are these readings?

Here is how we interpret each metric, and how Apple handles them to ensure accuracy.

A. Heart Rate (BPM)

- **The Measurement:** How many times the heart beats per minute.
- **Apple's Strategy:** Apple does not just check if HR is high. It checks "**High Heart Rate upon Resting.**"
 - *If User is Moving (Walking = 1):* High HR (120+) is **Normal** (Exercise).
 - *If User is Still (Sitting = 1):* High HR (120+) is **Abnormal** (Tachycardia/Stress).
 - *The "Apple Rule":* They typically wait for readings to stay high for **10 minutes** while inactive before sending an alert, to filter out brief spikes (like standing up quickly).

B. SpO2 (Blood Oxygen)

- **The Measurement:** How much oxygen your blood is carrying.
- **Apple's Strategy:**
 - This is less dependent on movement. Low oxygen is almost always bad.
 - However, Apple (and medical devices) struggle with "Noise" here. If the watch is loose, SpO2 drops falsely.
 - *Your Strategy:* We must check if the value drops and stays low for a few seconds, rather than trusting a single "85%" reading.

C. Body Temperature

- **The Measurement:** Skin temperature (wrist).
- **The Challenge (Important):** Your sensor is on the wrist (skin), not under the tongue (core).
 - Skin temp is usually **lower** than Core temp.
 - *Normal Core:* 36.5 - 37.5C
 - *Normal Skin (Wrist):* Often 33 - 36C depending on weather.
- **Apple's Strategy:** Apple Watch Series 8+ uses two sensors (one on back, one under display) to measure "baseline shifts" (relative change) rather than absolute temperature, because external weather affects the wrist too much.
- **Your Strategy:** You might need to calibrate your "Normal" range slightly lower than 37 C if you are reading raw skin temp, or look for *changes* (spikes) rather than exact numbers.

3.Normal Ranges

Based on medical standards and adjusted for your "Context Flags" (Sitting vs Walking), here is the logic table we will use to program your alerts.

Condition 1: The User is Resting (Sitting/Standing = 1, Walking = 0)

This is the most critical state for health alerts.

Measurement	Range	Warning Zone (Yellow)	Danger Zone (Red - Alert)	Possible Cause
Heart Rate	60-100 bpm	100-120 bpm	> 120 bpm OR < 40 bpm	Tachycardia / Bradycardia
SpO2	95% - 100%	90% - 94%	< 90%	Hypoxia (Respiratory issue)
Temp (Core)	36.5-37.5°C	37.5-38.0°C	> 38.0°C	Fever / Infection

Condition 2: The User is Active (Walking/Running = 1)

Here, we relax the limits. High HR is expected.

Measurement	Normal Range	Warning Zone	Danger Zone (Red - Alert)	Possible Cause
Heart Rate	100–160 bpm	170 bpm	> 180 – 200 bpm (Age-dependent)	Extreme Exertion / Cardiac Strain
SpO2	95% – 100%	90% – 94%	< 90%	Breathing difficulty during physical activity
Temp	Increases slightly	-	> 39.0°C	Heat Stroke

4. Apple strategy

Apple doesn't just alert instantly. They use a **Time Window**.

If we implement the ranges above strictly, your phone will buzz every time the user sneezes or the sensor slips (noise).

Logic:

1. **Context Check:** First, check Walking or Sitting. Select the correct Table (A or B).
2. **Threshold Check:** Check if values are in the "Danger Zone."
3. **Persistence Check (The Apple Way):** Only alert if the value **stays in the Danger Zone** for **X consecutive readings** (e.g., 5 seconds).