Here’s a **clean table of real, measurable data** that your H7 controller could provide — even without external sensors — along with suggestions for relevant **DSP libraries or processing techniques**:

| ****Data Source (Real Signals)**** | ****Relevant DSP / Processing Libs or Techniques**** |
| --- | --- |
| **Voltage (from ADC)** | - CMSIS-DSP for filtering, FFT, RMS, envelope detection |
| **Temperature (internal sensor)** | - Simple averaging/filtering (CMSIS-DSP FIR/IIR) |
| **CPU Load (cycle counter, systick)** | - Trend analysis, moving average, basic stats |
| **RAM Usage (heap/stack monitor)** | - Low-pass filter, threshold detection |
| **Power draw (if Vref & shunt)** | - CMSIS-DSP for smoothing, RMS, transient detection |
| **MCU Core Temp** | - CMSIS-DSP for smoothing, anomaly detection if trend spikes |
| **Loop Time / Jitter / Timing** | - CMSIS-DSP for variance/standard deviation, frequency domain for periodic noise |
| **UART Traffic / Packet Rate** | - CMSIS-DSP histogram/stats; detect idle, overload, bursty behavior |
| **ADC Noise Floor (idle readings)** | - FFT (CMSIS-DSP) for spectral fingerprinting, anomaly detection |
| **Internal Clock Drift** | - Time-domain analysis, basic math (delta vs. RTC), anomaly detection on delta drift |

### 💡 Notes:

* **CMSIS-DSP**: Ideal for low-level math, filtering, and basic transforms — already hardware-accelerated on H7.
* **NanoEdge AI**: Can use these inputs for anomaly detection or hybrid failure prediction (especially if combining multiple signals).
* **If You Use FFT**: You’ll probably want to normalize and zero-pad signals — CMSIS-DSP gives you all of that.
* **No Sensor? No Problem**: CPU load, temp, timing variance — these are valuable for embedded reliability and health checks.

Want to expand this to include **synthetic data** like waveform generators or emulated EKGs too?