IoT Healthcare Monitoring Datasets Report

Executive Summary

This comprehensive report provides detailed information on relevant datasets for IoT-based healthcare monitoring systems. Based on the analysis of your BTP (Bachelor's Thesis Project) roadmap, which includes IoT sensor data acquisition, physiological parameter monitoring, data analysis, and machine learning components, the following datasets have been curated to support your research and development efforts.

Primary IoT Healthcare Datasets

1. Healthcare IoT Data (Kaggle)

Dataset URL: https://www.kaggle.com/datasets/ziya07/healthcare-iot-data
Publisher: Ziya (Kaggle User)
Last Updated: December 24, 2024

Dataset Overview:
This dataset simulates sensor data collected from wearable devices in an Internet of Things (IoT)-based healthcare system for remote patient monitoring. The data includes various sensor readings that align perfectly with your project requirements.

Key Features:

- **Patient_ID**: Unique identifier for each patient

- **Timestamp**: Date and time of sensor reading

- **Sensor_ID**: Unique identifier for the sensor

- **Sensor_Type**: Type of sensor (Temperature, Blood Pressure, Heart Rate)

- **Temperature (°C)**: Body temperature measurement

- **Systolic_BP (mmHg)**: Systolic blood pressure

- **Diastolic_BP (mmHg)**: Diastolic blood pressure

- **Heart_Rate (bpm)**: Heart rate measurement

- **Device_Battery_Level (%)**: IoT device battery percentage

- **Target_Blood_Pressure**: Predefined BP target

- **Target_Heart_Rate**: Predefined HR target

- **Target_Health_Status**: Patient health status classification

Technical Specifications:

- **File Format**: CSV

- **File Size**: 17.78 kB

- **Records**: 200 sensor readings

- **Columns**: 13 features

- **Update Frequency**: Annual

Applications for Your Project:

- Data acquisition module testing

- IoT sensor data pipeline development

- Real-time monitoring system validation

- Battery level management algorithms

2. Secure Healthcare IoT Monitoring Dataset

Dataset URL: https://www.kaggle.com/datasets/programmer3/secure-healthcare-iot-monitoring
-dataset
Publisher: Programmer3 (Kaggle User)
Last Updated: May 6, 2025

Dataset Overview:
Real-time physiological and network-level data from a secure healthcare IoT monitoring system involving 2000 patients. This dataset includes both normal and anomalous activity detection capabilities.

Key Features:

- **Patient Data**: Heart rate, body temperature, blood pressure

- **Network Metadata**: Device ID, IP address, access type

- **Security Labels**: Binary classification (0=normal, 1=anomalous)

- **Temporal Data**: Real-time timestamp information

Technical Specifications:

- **File Format**: CSV

- **File Size**: 180.29 kB

- **Records**: 2000 patient records

- **Columns**: 10 features

- **Unique Values**: Various ranges for physiological parameters

Value Ranges:

- Heart Rate: 60-100 BPM

- Temperature: 36-39.5°C

- Blood Pressure: Multiple ranges

- Anomaly Detection: Binary (0/1)

Applications for Your Project:

- Large-scale system testing

- Anomaly detection algorithm development

- Security considerations implementation

- Network-level data analysis

3. IoMT Dataset for ML-Based Health Monitoring

Dataset URL: https://www.kaggle.com/datasets/prokashbarmancu/iomt-alert
Publisher: Prokash Barman (Kaggle User)
Last Updated: February 29, 2024

Dataset Overview:
Comprehensive Internet of Medical Things (IoMT) dataset designed specifically for machine learning-based health monitoring applications.

Key Features:

- **Vital Signs**: Heart rate, SpO2, blood pressure, temperature

- **Fall Detection**: Binary classification for patient safety

- **Patient Scale**: 50,000 patient records

- **ML Ready**: Pre-processed for machine learning applications

Applications for Your Project:

- Machine learning model training (MLP, CNN)

- Time series analysis (TSA) implementation

- Large-scale validation testing

- Fall detection integration

Specialized Component Datasets

4. WESAD (Wearable Stress and Affect Detection)

Dataset URL: https://archive.ics.uci.edu/ml/datasets/WESAD+(Wearable+Stress+and+Affect+Detection)
Publisher: UCI Machine Learning Repository
DOI: https://doi.org/10.24432/C57K5T

Dataset Overview:
Multimodal dataset featuring physiological and motion data from wrist and chest-worn devices across 15 subjects during controlled lab studies.

Sensor Specifications:

RespiBAN Device (Chest-worn):

- **ECG**: Electrocardiogram data
- **EDA**: Electrodermal activity
- **EMG**: Electromyogram
- **Respiration**: Breathing patterns
- **Temperature**: Body temperature
- **Acceleration**: 3-axis accelerometer
- **Sampling Rate**: 700 Hz

Empatica E4 Device (Wrist-worn):

- **BVP**: Blood volume pulse (64 Hz)
- **EDA**: Electrodermal activity (4 Hz)
- **Temperature**: Skin temperature (4 Hz)
- **Acceleration**: 3-axis accelerometer (32 Hz)

Access Instructions:

```
pip install ucimlrepo
from ucimlrepo import fetch_ucirepo

# Fetch dataset
wesad = fetch_ucirepo(id=465)
X = wesad.data.features
y = wesad.data.targets
```

Applications for Your Project:

- Multi-sensor data fusion
- Stress detection algorithms
- Wearable device integration
- Physiological signal processing

5. Wearable Device Dataset from Induced Stress

Dataset URL: https://physionet.org/content/wearable-device-dataset/
Publisher: PhysioNet
Last Updated: June 23, 2025

Dataset Overview:
Physiological signals collected during structured acute stress induction and exercise sessions using Empatica E4 wearable devices.

Data Categories:

- **STRESS**: Acute stress induction protocols
- **AEROBIC**: Aerobic exercise sessions

- **ANAEROBIC:** Anaerobic exercise sessions

Sensor Data Files:

- **TEMP.csv:** Temperature sensor data (°C)

- **EDA.csv:** Electrodermal activity (μS)

- **BVP.csv:** Photoplethysmograph data

- **ACC.csv:** 3-axis accelerometer (1/64g units)

- **IBI.csv:** Inter-beat interval timing

- **HR.csv:** Heart rate data (BPM)

- **tags.csv:** Event timestamps

Technical Specifications:

- **Total Size:** 247.4 MB (uncompressed)

- **Compressed:** 69.7 MB ZIP file

- **Participants:** 36 volunteers

- **Data Format:** CSV files with UTC timestamps

Download Methods:

```
# Terminal download
wget -r -N -c -np https://physionet.org/files/wearable-device-dataset/1.0.1/

# AWS CLI download
aws s3 sync --no-sign-request s3://physionet-open/wearable-device-dataset/1.0.1/ DESTINAT
```

Applications for Your Project:

- Real-time physiological monitoring

- Exercise-based validation

- Stress response analysis

- Multi-parameter sensor integration

6. Posture Detection Datasets

Head Posture Detection Dataset

Dataset URL: https://www.kaggle.com/datasets/ionutcristianseverin/head-posture-detection-based-on-3-inertial-sensors
Publisher: Ionut Cristian Severin
Last Updated: March 3, 2023

Features:

- **Sensors:** 3 inertial measurement units (IMUs)

- **Data Type**: Time series sensor readings
- **Labels**: Posture classification categories
- **Applications**: Head posture monitoring integration

Activity Recognition with Physiological Measurements

Dataset URL: https://archive.ics.uci.edu/ml/datasets/Activity+recognition+using+wearable+physiological+measurements
Publisher: UCI Machine Learning Repository
Last Updated: December 3, 2019

Features:

- **ECG Features**: 174 statistical attributes
- **TEB Features**: 151 thoracic electrical bioimpedance attributes
- **EDA Features**: 208 electrodermal activity measurements (arm + hand)
- **Activities**: Neutral, emotional, mental, physical states

Access Instructions:

```
from ucimlrepo import fetch_ucirepo
activity_dataset = fetch_ucirepo(id=552)
```

SpO2 and Respiratory Datasets

7. High Altitude Respiration and SpO2 Dataset (Harespod)

Research Context: Published in Nature Scientific Data (February 26, 2024)
Applications: SpO2 monitoring validation at various altitudes

Technical Specifications:

- **Sampling Rate**: 100 Hz for real-time monitoring
- **Parameters**: SpO2 levels and respiratory patterns
- **Environment**: High altitude conditions
- **Use Case**: Validating SpO2 sensor accuracy

8. Pulse Transit Time PPG Dataset

Dataset URL: https://physionet.org/content/pulse-transit-time-ppg/
Version: 1.1.0
Publisher: PhysioNet
Last Updated: March 17, 2022

Features:

- **PPG Data**: Multi-site photoplethysmography
- **Pulse Timing**: Transit time measurements
- **Applications**: Heart rate and blood pressure correlation

Implementation Guidelines

Getting Started Sequence

Phase 1: Basic Implementation

1. Download Healthcare IoT Data (Kaggle) for initial system testing
2. Implement basic data acquisition and processing pipeline
3. Validate sensor data formats and structures

Phase 2: Advanced Development

1. Integrate Secure Healthcare IoT Monitoring Dataset for anomaly detection
2. Implement machine learning models using IoMT dataset
3. Add multi-sensor fusion capabilities using WESAD dataset

Phase 3: Specialized Components

1. Integrate posture detection using specialized posture datasets
2. Implement SpO2 monitoring with Harespod dataset
3. Add stress detection and exercise monitoring capabilities

Technical Integration Recommendations

Data Acquisition Module:

- Use Healthcare IoT Data format as template
- Implement timestamp synchronization across sensors
- Handle battery level monitoring and alerts

Parameter Monitoring:

- **Temperature**: Validate using WESAD temperature data (4 Hz sampling)
- **Blood Pressure**: Cross-validate with multiple datasets
- **SpO2**: Implement using Harespod 100 Hz sampling methodology
- **Posture**: Use IMU-based detection from posture datasets

Data Analysis Pipeline:

- Implement time series analysis using physiological datasets
- Use WESAD for multi-sensor data fusion techniques
- Apply anomaly detection using labeled security dataset

Machine Learning Components:

- **MLP Implementation**: Train on IoMT 50k patient dataset

- **CNN Development**: Use WESAD multi-channel sensor data

- **TSA Integration**: Apply to all temporal datasets for pattern recognition

Data Access and Licensing

Open Access Datasets:

- UCI Repository: Academic use permitted with citation

- PhysioNet: Open access with registration required

- Kaggle: Various licenses, check individual dataset terms

Citation Requirements:

- WESAD: Schmidt, Philip and Reiss, Attila (2018)

- UCI Datasets: Follow repository citation guidelines

- PhysioNet: Include appropriate attribution in publications

Quality Assurance

Data Validation:

- Cross-reference physiological ranges across datasets

- Validate sensor specifications against project requirements

- Test data integrity and completeness

Performance Benchmarking:

- Use established datasets for algorithm validation

- Compare results with published research outcomes

- Implement standard evaluation metrics

Conclusion

This curated collection of datasets provides comprehensive coverage for your IoT healthcare monitoring BTP project. The datasets range from basic sensor simulation to complex multi-modal physiological monitoring, supporting all components outlined in your project roadmap including data acquisition, parameter monitoring, analysis, and machine learning implementation.

The combination of real-time IoT data, physiological monitoring datasets, and specialized component datasets ensures robust development and validation of your healthcare monitoring system. Each dataset includes specific access instructions, technical specifications, and integration recommendations aligned with your project architecture.
[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23]

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1. https://www.kaggle.com/datasets/ziya07/healthcare-iot-data

2. https://www.kaggle.com/datasets/faisalmalik/iot-healthcare-security-dataset

3. https://archive.ics.uci.edu/datasets

4. https://physionet.org/about/database/

5. https://www.kaggle.com/datasets?search=iot

6. https://archive.ics.uci.edu/datasets?skip=0&take=10&sort=desc&orderBy=NumHits&search=&Types=Time-Series

7. https://physionet.org/content/?topic=wearable+sensors

8. https://www.kaggle.com/datasets?search=IOT+based+healthcare+data

9. https://www.kaggle.com/datasets/mohamedasem318/wesad-full-dataset/code

10. https://physionet.org/content/?topic=stress

11. https://www.kaggle.com/datasets/prasad22/healthcare-dataset

12. https://archive.ics.uci.edu/ml/datasets/WESAD+(Wearable+Stress+and+Affect+Detection)

13. https://ubicomp.eti.uni-siegen.de/home/datasets/icmi18/

14. https://www.kaggle.com/datasets/programmer3/secure-healthcare-iot-monitoring-dataset

15. https://www.kaggle.com/datasets/nasirayub2/human-vital-sign-dataset

16. https://www.kaggle.com/datasets/ziya07/healthcare-iot-data

17. https://physionet.org/content/wearable-device-dataset/

18. https://www.kaggle.com/datasets/programmer3/digital-twin-ehr-imaging-and-iot-data

19. https://github.com/WJMatthew/WESAD

20. https://physionet.org/content/wearable-device-dataset/1.0.0/Data_Dictionary.csv

21. https://www.kaggle.com/datasets/programmer3/secure-healthcare-iot-monitoring-dataset

22. https://archive.ics.uci.edu/ml/datasets/Activity+recognition+using+wearable+physiological+measurements

23. https://physionet.org/content/?topic=wearable+devices