WristSense

WristSense is a comprehensive framework designed to systematically extract, analyze, and visualize health-related data from wrist-worn devices. This tool is particularly valuable for digital forensic investigations, providing insights into various health metrics such as sleep patterns, heart rate, blood oxygen saturation, activities, and stress levels.

Key Features

- **Health Data Extraction**: WristSense systematically extracts health data from diverse sources of wrist-worn devices, ensuring compatibility with various vendors including Huawei, Amazfit, and Xiaomi
- **Comprehensive Analysis**: The tool analyzes health data to provide insights that can be used to reconstruct detailed timelines of events and individuals involved in a given scenario.
- **Forensic Soundness**: Ensures that the extracted data is forensically sound and suitable for legal proceedings.
- **Reproducibility**: Supports reproducibility for any wrist-devices with any timeframe, allowing users to reproduce the same results consistently.

Considered Vendors

1. **Huawei**
2. **Amazfit**
3. **Redmi**

List of Files and Descriptions

This section provides a summary of the scripts included in the repository, along with their purposes and usage.

- `Huawei_extracting.ipynb`

    - **Purpose**: Extract health data from Huawei wrist-worn devices.
    - **Usage**: Use this script to connect the Huawei device to a mobile application and extract data such as heart rate, sleep patterns, and activity logs.
    - **Output**: Generates a raw dataset in CSV format for further analysis.

- `Huawei_analyzing.ipynb`

    - **Purpose**: Analyze the extracted Huawei dataset.
    - **Usage**: Run this script to process and visualize the data, including generating time-series plots, heatmaps, and sleep distribution charts.
    - **Output**: Provides insights into the health data, such as trends in heart rate or activity patterns.

- **`Amazfit_Extracting_Analyzing.ipynb`**

  - **Purpose**: Combined script for data extraction and analysis for Amazfit devices.
  - **Usage**: Use this notebook to extract data directly from Amazfit wrist-worn devices and perform data analysis in one streamlined process.
  - **Output**: Produces raw datasets and visualizations, such as sleep analysis, stress patterns, and activity levels.

- **`Redmi_extracting_analyzing.ipynb`**

  - **Purpose**: Combined script for data extraction and analysis for Redmi devices.
  - **Usage**: This script handles both data extraction and subsequent analysis, offering a single workflow for Redmi wrist-worn devices.
  - **Output**: Generates datasets and visualizations highlighting health metrics like sleep and activity tracking.

Usage

The **WristSense** framework offers a systematic approach for extracting, analyzing, and visualizing health-related data from wrist-worn devices. Below are the key steps to use the framework effectively:

1- Choose Data Source

Option A: Use the existing dataset available at [WristSense-VendorData](#).

Option B: Generate your own dataset by collecting data from wrist-worn devices. Follow the WristSense framework to synchronize device data with mobile applications.

2- **Mount Required Resources:** Mount your preferred cloud storage (e.g., Google Drive) or local directories to access and store data files.

3- Extract Data: Use the provided data extraction scripts (e.g., scripts containing "extracting") to extract raw data from the connected wrist-worn device databases (e.g., SQLite). The framework supports multiple vendors, ensuring compatibility.

4- Analyze Data: Run the analysis scripts (e.g., scripts containing "analyzing") to process, analyze, and visualize the extracted data. These scripts generate insights such as sleep patterns, heart rate trends, stress indicators, and activity levels, which are presented through various interactive and static visualizations.

5- **Visualize and Interpret Data:** Utilize visualization functions to generate detailed graphs, charts, and heatmaps to explore the collected data over time. Examples include:

  - **Time-series trends** for heart rate and activity data.
  - **Sleep time distributions** across different components like deep sleep and REM sleep.
  - **Heatmaps** to examine monthly or yearly trends.

- ○

6. Reproducibility

The framework allows for reproducibility with any dataset and timeframe, enabling users to validate results and extend their analyses.

Contributions

Contributions to WristSense are welcome. Please fork the repository, make your changes, and submit a pull request. Ensure that your code follows the established coding standards and is well-documented.

Contact

For any questions or support, please contact the primary investigator: **Norah Ahmed Almubairik**

- ○ Department of Information and Computer Science, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia
- ○ Email: naalmubairik@outlook.com - g201902170@kfupm.edu.sa