Shiny application: structure and User Guide

Overview of the Shiny Application

Shiny is an R package for building interactive web apps for data analysis and visualization. It uses R code to define both the user interface (UI) and server logic. The UI displays elements like buttons and plots, while the server handles dynamic updates in response to user inputs.

A Shiny application is typically structured into the following main components: App, Modules, Functions and Global.

Application Structure

App (app.R)

The 'app.R' file contains the main UI and server logic. It calls the relevant components and modules, forming the core of the application.

Modules

The 'modules' folder contains reusable UI and server components that simplify complex apps by organizing functionality into manageable parts.

Included Modules:

DataUploadModule.R	Handles data source selection and file uploads (.RDS, .EDF, VitalDB), and allows users to input intervention times.
PPCleaningModule.R	Enables removal of preselected outliers from Pulse Pressure data.
PPManualCleaningModule.R	Supports manual cleaning of Pulse Pressure measurements.
ECGManualCleaningModule.R	Allows manual removal of R-peaks in ECG signals.
DataDownloadModule.R	Provides functionality to export the cleaned dataset.
PPPlotModule.R	Visualizes Pulse Pressure (PP) over time.
ABPPlotModule.R	Visualizes Arterial Blood Pressure (ABP) over time.
CVPPlotModule.R	Visualizes Central Venous Pressure (CVP) over time.
ABPAnimateModules.R	Animates ABP changes with cardiac and respiratory cycles.
CVPAnimateModules.R	Animates CVP changes with cardiac and respiratory cycles.
ABPAnimateTimeModules.R	Illustrates intervention effects (e.g., fluid) on ABP over time.
CVPAnimateTimeModules.R	Illustrates intervention effects (e.g., fluid) on CVP over time.

Functions

The 'functions' folder contains reusable helper functions used throughout the application.

data_prep.R	Functions to prepare raw data for visualization and analysis.
functions.R (Created by Johannes Enevolden)	Detects heartbeats in ABP Divides a vector into segments (e.g., individual beats based on diastolic values) Adds a variable indicating time since last event
helper_functions.R	Calculates beats per. minutes (BPM) Refines R-peak detection in ECG Prepares CVP data for GAM analysis Adjusts data segment start times Aligns respiratory indices so cycles start at the first minimum

Global (global.R)

The 'global.R' file loads and combines shared packages, functions, and modules, making them available throughout the application. This ensures consistency and efficient access to commonly used resources across all components.

How to Use the Example Web Application

A modified version of the app for quick demonstration is available at Demo.

How to Use the Application in R

The application is launched by opening 'app.R' and clicking the button 

. When the web application opens, the user has access to the following features:

Upload Data

Supported File Formats include:

- .rds (R format)
- .edf (waveform files)
- VitalDB data (retrieved from vitaldb.net)

Examples of file formats can be found in the 'data' folder.

Data Cleaning and Preprocessing

Users can:

- Remove outliers from Pulse Pressure data
- Manually clean R-peaks from CVP data
- Download the cleaned dataset

Visualization and Analysis

Users can:

- View time-series plots of ABP, CVP, and PP
- Apply and visualize GAM (Generalized Additive Models)
- Animate physiological changes such as fluid infusion effects over time

User-Friendly Design

This Shiny application is designed to be intuitive and accessible, allowing clinicians and non-technical users to work with complex physiological data without any prior knowledge of R or programming.