FFT Binseg CUSUM regression anomaly detection: FFT-based filtering with a cutoff determined by applying CUSUM to the spectrum and locating a changepoint via Binary Segmentation. Low-frequency energy below the cutoff is removed; anomalies are flagged from residual magnitudes and thresholded with harutils().

This variant applies CUSUM to the spectrum to emphasize aggregated changes, then uses BinSeg to choose the cutoff before high-pass filtering.

Steps: - Load and visualize a simple anomaly dataset - Configure and run hanr\_fft\_binseg\_cusum - Inspect detections, evaluate, and plot residual magnitudes and thresholds

# Install Harbinger (if needed)  
#install.packages("harbinger")

# Load required packages  
library(daltoolbox)  
library(harbinger)

# Load example anomaly datasets  
data(examples\_anomalies)

# Select a simple anomaly dataset  
dataset <- examples\_anomalies$simple  
head(dataset)

## serie event  
## 1 1.0000000 FALSE  
## 2 0.9689124 FALSE  
## 3 0.8775826 FALSE  
## 4 0.7316889 FALSE  
## 5 0.5403023 FALSE  
## 6 0.3153224 FALSE

# Plot the raw time series  
har\_plot(harbinger(), dataset$serie)



# Configure the FFT+CUSUM+BinSeg detector  
model <- hanr\_fft\_binseg\_cusum()

# Fit the detector  
model <- fit(model, dataset$serie)

# Run detection  
detection <- detect(model, dataset$serie)

# Show detected anomaly indices  
print(detection |> dplyr::filter(event == TRUE))

## idx event type  
## 1 50 TRUE anomaly

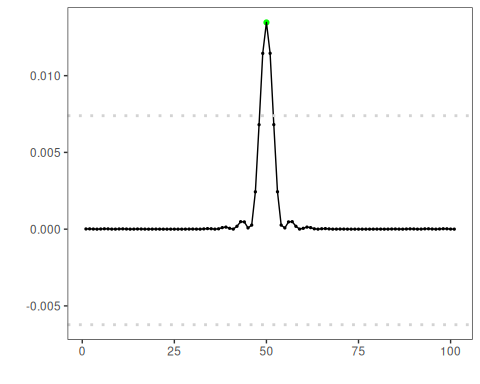
# Evaluate detections against labels  
evaluation <- evaluate(model, detection$event, dataset$event)  
print(evaluation$confMatrix)

## event   
## detection TRUE FALSE  
## TRUE 1 0   
## FALSE 0 100

# Plot detections vs. ground truth  
har\_plot(model, dataset$serie, detection, dataset$event)



# Plot residual magnitude and decision thresholds  
har\_plot(model, attr(detection, "res"), detection, dataset$event, yline = attr(detection, "threshold"))



References - Sobrinho, E. P., et al. Fine-Tuning Detection Criteria for Enhancing Anomaly Detection in Time Series. SBBD, 2025. <doi:10.5753/sbbd.2025.247063>