ChangeFinder with ETS: ChangeFinder with ETS models residual deviations and applies a second-stage smoothing/thresholding to highlight structural changes. Implementation wraps ETS from forecast and uses harutils() for thresholds.

ChangeFinder-ETS detects change points by modeling residual deviations with an ETS model and smoothing over a sliding window. We will:

* Load and visualize a simple change-point dataset
* Configure the ChangeFinder-ETS detector (sw\_size controls smoothing)
* Inspect detections, evaluate, and plot residuals with thresholds

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

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

# Load example change-point datasets  
data(examples\_changepoints)

# Select the simple dataset  
dataset <- examples\_changepoints$simple  
head(dataset)

## serie event  
## 1 0.00 FALSE  
## 2 0.25 FALSE  
## 3 0.50 FALSE  
## 4 0.75 FALSE  
## 5 1.00 FALSE  
## 6 1.25 FALSE

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



# Configure ChangeFinder-ETS  
model <- hcp\_cf\_ets(sw\_size = 10)

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

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

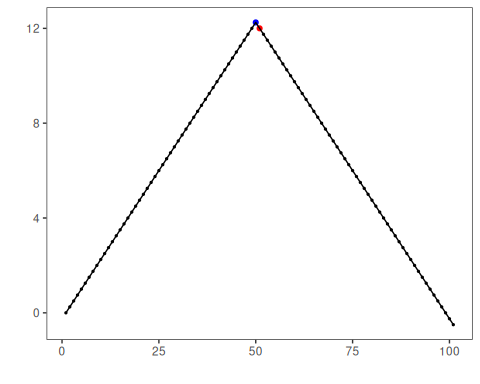
# Show detected change points  
print(detection |> dplyr::filter(event == TRUE))

## idx event type  
## 1 51 TRUE anomaly

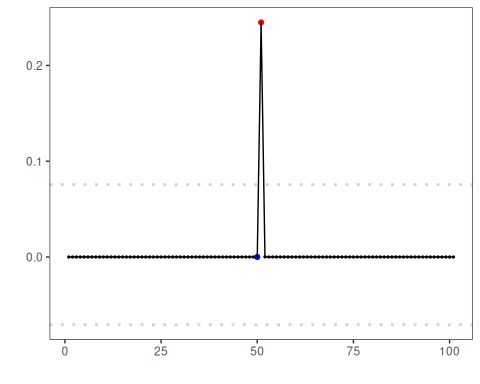
# Evaluate detections against labels  
evaluation <- evaluate(model, detection$event, dataset$event)  
print(evaluation$confMatrix)

## event   
## detection TRUE FALSE  
## TRUE 0 1   
## FALSE 1 99

# 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

* Takeuchi, J., Yamanishi, K. (2006). A unifying framework for detecting outliers and change points from time series. IEEE TKDE. <doi:10.1109/TKDE.2006.1599387>