BinSeg: Binary Segmentation recursively partitions the series around the largest detected change until a maximum number of change points or a stopping criterion is met. It is a fast heuristic widely used in practice. Harbinger wraps the changepoint implementation and returns detected indices with plotting and evaluation utilities.

Binary Segmentation (BinSeg) recursively identifies multiple change points by splitting the series at the strongest change and repeating. In this tutorial we will:

* Load a dataset with change points and visualize it
* Configure and run the BinSeg detector (hcp\_binseg)
* Inspect detections and evaluate against ground truth
* Plot the detections on the series

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

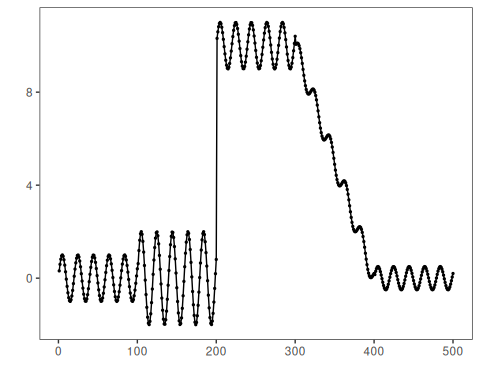
# Load required packages  
library(daltoolbox)  
library(harbinger)

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

# Select a dataset ("complex" contains multiple regimes)  
dataset <- examples\_changepoints$complex  
head(dataset)

## serie event  
## 1 0.3129618 FALSE  
## 2 0.5944808 FALSE  
## 3 0.8162731 FALSE  
## 4 0.9560557 FALSE  
## 5 0.9997847 FALSE  
## 6 0.9430667 FALSE

# Plot the time series to visualize regimes  
har\_plot(harbinger(), dataset$serie)



# Configure BinSeg; Q is the max number of change points to search  
model <- hcp\_binseg(Q = 10)

# Fit the detector (keeps parameters on object)  
model <- fit(model, dataset$serie)

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

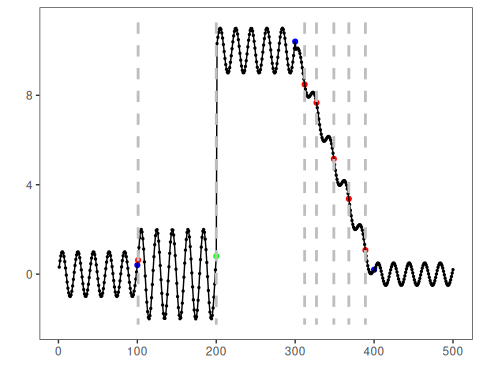
# Show detected change-point indices  
print(detection |> dplyr::filter(event == TRUE))

## idx event type  
## 1 101 TRUE changepoint  
## 2 200 TRUE changepoint  
## 3 312 TRUE changepoint  
## 4 327 TRUE changepoint  
## 5 349 TRUE changepoint  
## 6 368 TRUE changepoint  
## 7 389 TRUE changepoint

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

## event   
## detection TRUE FALSE  
## TRUE 1 6   
## FALSE 3 490

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



References - Vostrikova, L. (1981). Detecting “disorder” in multidimensional random processes. Soviet Mathematics Doklady, 24, 55–59. - Killick, R., Fearnhead, P., Eckley, I. A. (2012). Optimal detection of changepoints with a linear computational cost. Journal of the American Statistical Association, 107(500), 1590–1598.