EMA filter: EMA is a recursive smoother that applies exponentially decaying weights to past observations. Given a smoothing factor α in (0,1], the estimate updates as s\_t = α y\_t + (1−α) s\_{t−1}. Smaller α emphasizes longer-term history (stronger smoothing); larger α reacts faster to recent changes.

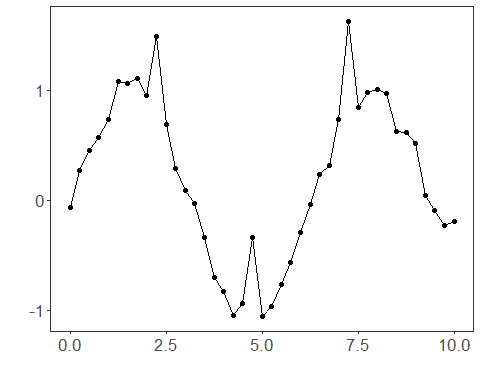
Objective: Apply Exponential Moving Average (EMA) to smooth the series, reducing fast fluctuations while keeping the trend.

# Filter - Exponential Moving Average (EMA)  
  
# Installing the package (if needed)  
#install.packages("tspredit")

# Loading the packages  
library(daltoolbox)  
library(tspredit)

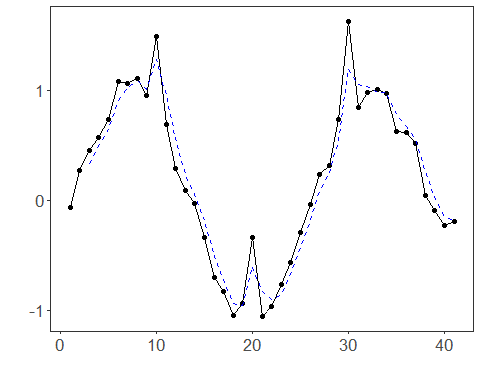
# Series for study with artificial noise and spikes  
  
data(tsd)  
y <- tsd$y  
noise <- rnorm(length(y), 0, sd(y)/10)  
spike <- rnorm(1, 0, sd(y))  
tsd$y <- tsd$y + noise  
tsd$y[10] <- tsd$y[10] + spike  
tsd$y[20] <- tsd$y[20] + spike  
tsd$y[30] <- tsd$y[30] + spike

library(ggplot2)  
# Noisy series visualization  
plot\_ts(x=tsd$x, y=tsd$y) + theme(text = element\_text(size=16))



# Applying the EMA filter  
  
filter <- ts\_fil\_ema(3)  
filter <- fit(filter, tsd$y)  
y <- transform(filter, tsd$y)  
plot\_ts\_pred(y=tsd$y, yadj=y) + theme(text = element\_text(size=16))

## Warning: Removed 2 rows containing missing values or values outside the scale range (`geom\_line()`).



References - R. G. Brown (1959). Exponential Smoothing for Predicting Demand. Addison-Wesley.