Adaptive normalization: AN centers and scales each window or time point using time‑varying statistics, typically computed via moving averages or exponentially weighted averages. This mitigates slow level/scale drift so models focus on local shape rather than absolute magnitude.

Objective: Apply adaptive normalization (moving average/EMA) to handle distribution shifts over time and observe the effect on the target.

# Exponential Adaptive Normalization  
  
# Installing the package (if needed)  
#install.packages("tspredit")

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

# Series for study  
  
data(tsd)

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



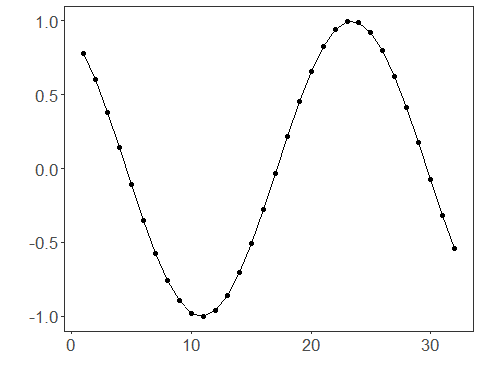
# Sliding windows  
  
sw\_size <- 10  
ts <- ts\_data(tsd$y, sw\_size)  
ts\_head(ts, 3)

## t9 t8 t7 t6 t5 t4 t3 t2 t1  
## [1,] 0.0000000 0.2474040 0.4794255 0.6816388 0.8414710 0.9489846 0.9974950 0.9839859 0.9092974  
## [2,] 0.2474040 0.4794255 0.6816388 0.8414710 0.9489846 0.9974950 0.9839859 0.9092974 0.7780732  
## [3,] 0.4794255 0.6816388 0.8414710 0.9489846 0.9974950 0.9839859 0.9092974 0.7780732 0.5984721  
## t0  
## [1,] 0.7780732  
## [2,] 0.5984721  
## [3,] 0.3816610

summary(ts[,10])

## t0   
## Min. :-0.99929   
## 1st Qu.:-0.55091   
## Median : 0.05397   
## Mean : 0.02988   
## 3rd Qu.: 0.63279   
## Max. : 0.99460

# Target (t0) visualization after windowing  
library(ggplot2)  
plot\_ts(y=ts[,10]) + theme(text = element\_text(size=16))



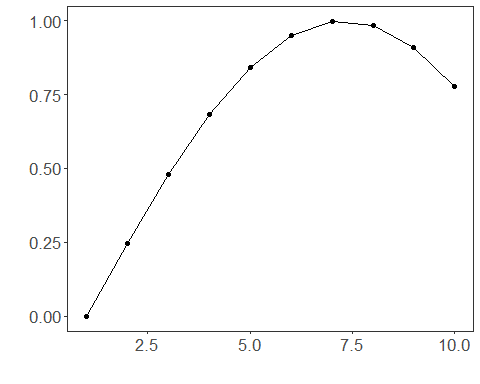
# Normalization  
  
preproc <- ts\_norm\_an()  
preproc <- fit(preproc, ts)  
tst <- transform(preproc, ts)  
ts\_head(tst, 3)

## t9 t8 t7 t6 t5 t4 t3 t2 t1  
## [1,] 0.1770086 0.2931936 0.4021548 0.4971174 0.5721773 0.6226675 0.6454487 0.6391047 0.6040297  
## [2,] 0.2650884 0.3740495 0.4690122 0.5440720 0.5945622 0.6173435 0.6109994 0.5759245 0.5142994  
## [3,] 0.3677446 0.4627073 0.5377671 0.5882573 0.6110386 0.6046945 0.5696195 0.5079945 0.4236508  
## t0  
## [1,] 0.5424046  
## [2,] 0.4299558  
## [3,] 0.3218327

summary(tst[,10])

## t0   
## Min. :0.04995   
## 1st Qu.:0.15185   
## Median :0.41183   
## Mean :0.44854   
## 3rd Qu.:0.73197   
## Max. :0.94995

plot\_ts(y=ts[1,]) + theme(text = element\_text(size=16))



References - Ogasawara, E., Martinez, L. C., De Oliveira, D., Zimbrão, G., Pappa, G. L., Mattoso, M. (2010). Adaptive Normalization: A novel data normalization approach for non-stationary time series. Proceedings of the International Joint Conference on Neural Networks (IJCNN). <doi:10.1109/IJCNN.2010.5596746>