Stretch: Scales deviations from the local mean by a factor greater than 1, amplifying intra‑window variability while preserving overall shape and timing. This challenges models to generalize across larger amplitude variations.

Objective: Augment data by stretching variations within the window (stretch), useful to make the model more robust to variability.

# Time series augmentation - stretch  
  
# Installing the package (if needed)  
#install.packages("tspredit")

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

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

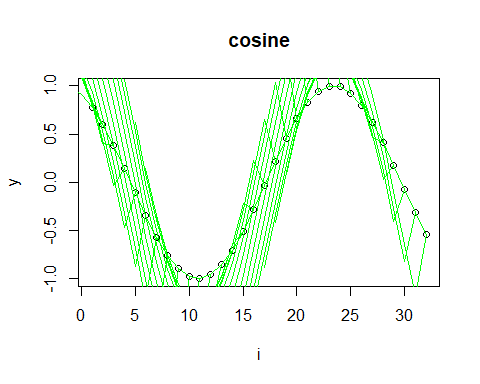


# Sliding windows  
  
sw\_size <- 10  
xw <- ts\_data(tsd$y, sw\_size)

# Augmentation (stretch)  
  
augment <- ts\_aug\_stretch()  
augment <- fit(augment, xw)  
xa <- transform(augment, xw)  
idx <- attr(xa, "idx")  
ts\_head(xa)

## 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  
## [4,] 0.6816388 0.8414710 0.9489846 0.9974950 0.9839859 0.9092974 0.7780732 0.5984721 0.3816610  
## [5,] 0.8414710 0.9489846 0.9974950 0.9839859 0.9092974 0.7780732 0.5984721 0.3816610 0.1411200  
## [6,] 0.9489846 0.9974950 0.9839859 0.9092974 0.7780732 0.5984721 0.3816610 0.1411200 -0.1081951  
## t0  
## [1,] 0.7780732  
## [2,] 0.5984721  
## [3,] 0.3816610  
## [4,] 0.1411200  
## [5,] -0.1081951  
## [6,] -0.3507832

# Plot (original vs augmented windows)  
  
i <- 1:nrow(xw)  
y <- xw[,sw\_size]  
plot(x = i, y = y, main = "cosine")  
lines(x = i, y = y, col="black")  
for (j in 1:nrow(xa)) {  
 lines(x = (idx[j]-sw\_size+1):idx[j], y = xa[j,1:sw\_size], col="green")  
}



References - H. I. Fawaz, G. Forestier, J. Weber, L. Idoumghar, and P.-A. Muller (2019). Deep learning for time series classification: A review. Data Mining and Knowledge Discovery, 33, 917–963.