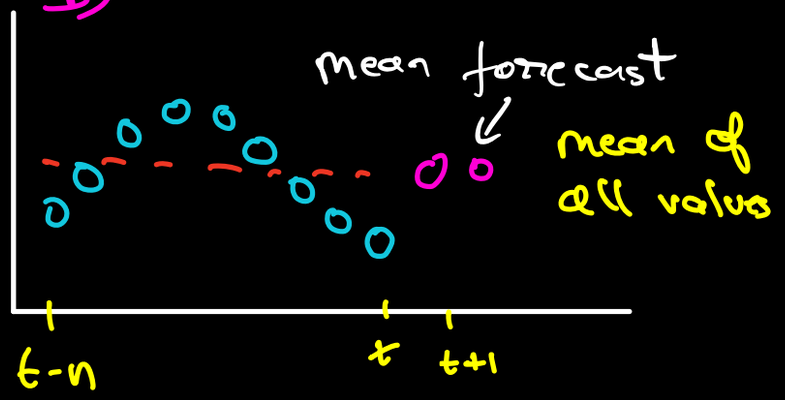
Time Series Forecasting - 2

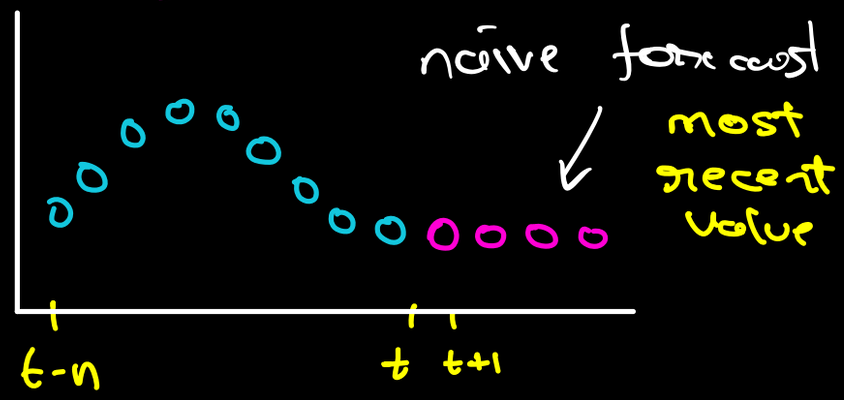
- Decomposition from scratch
- Simple Methods for forecasting
- MA for forecasting
- Smoothing Methods

Simple Forecasts

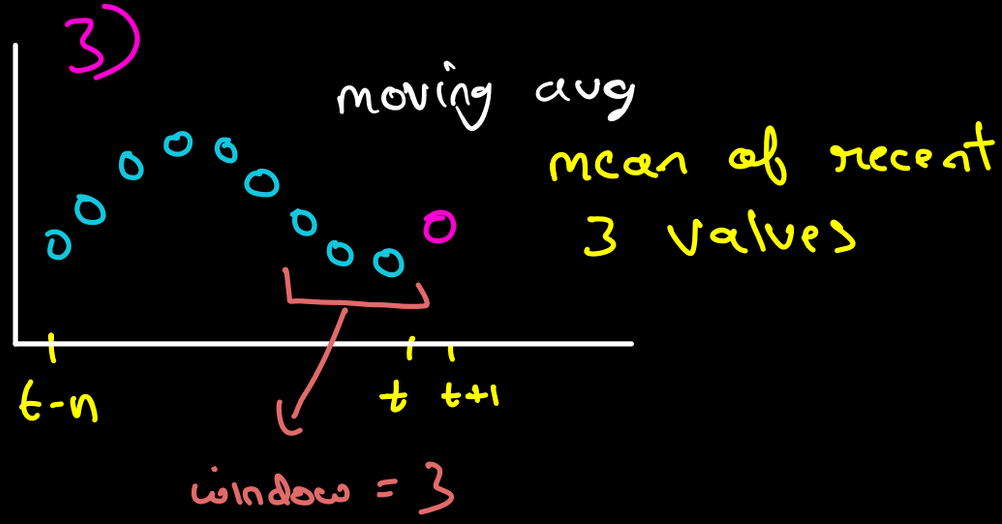
1)

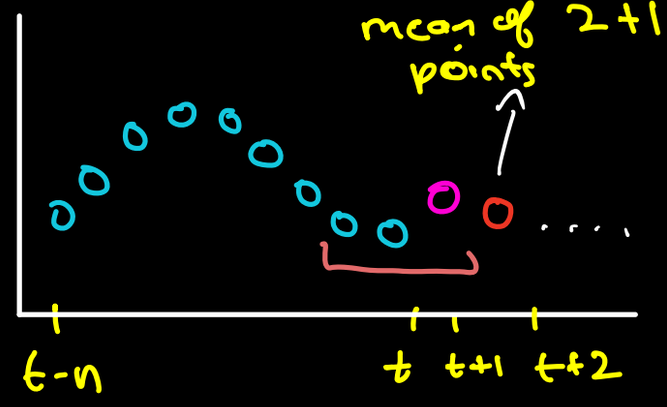


2)

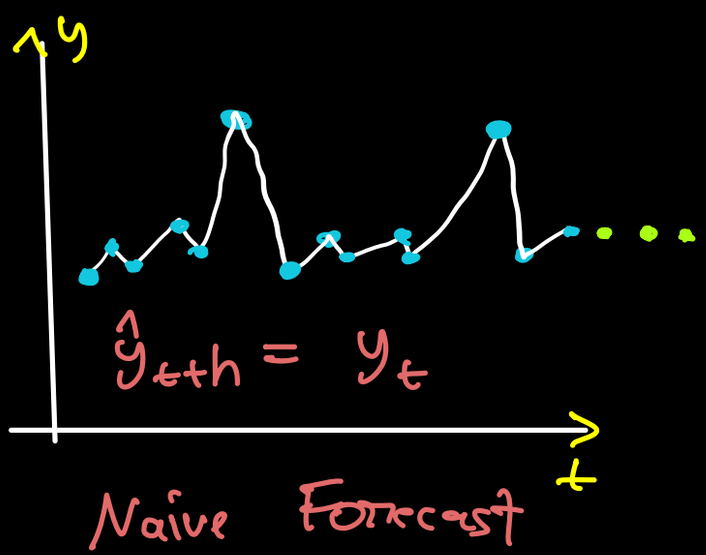


3)

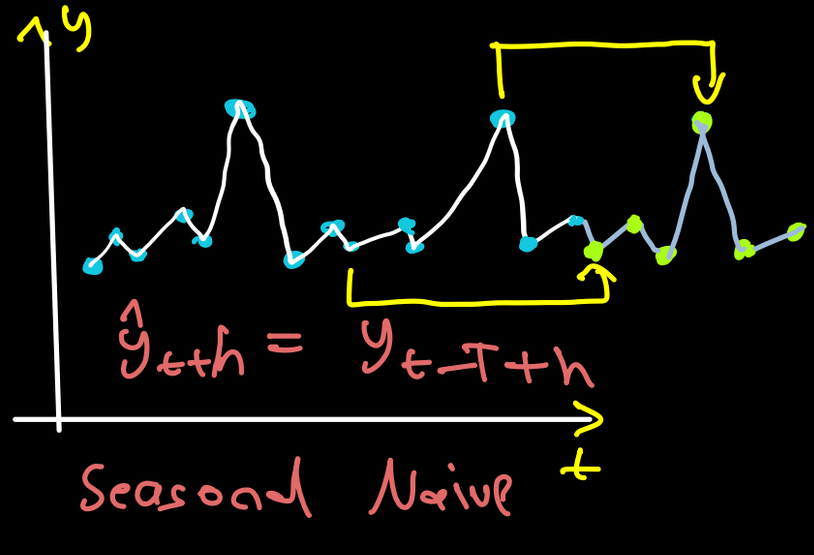




4) Seasonal Naive

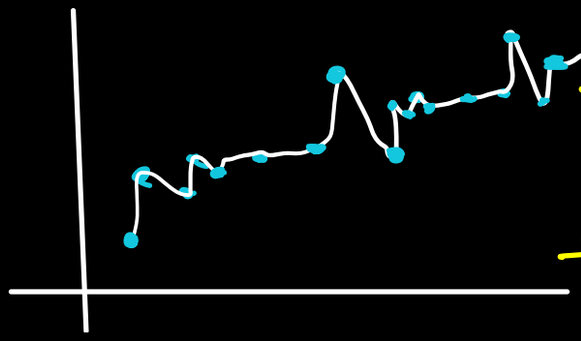


Naive Forecast



Seasonal Naive

5) Drift



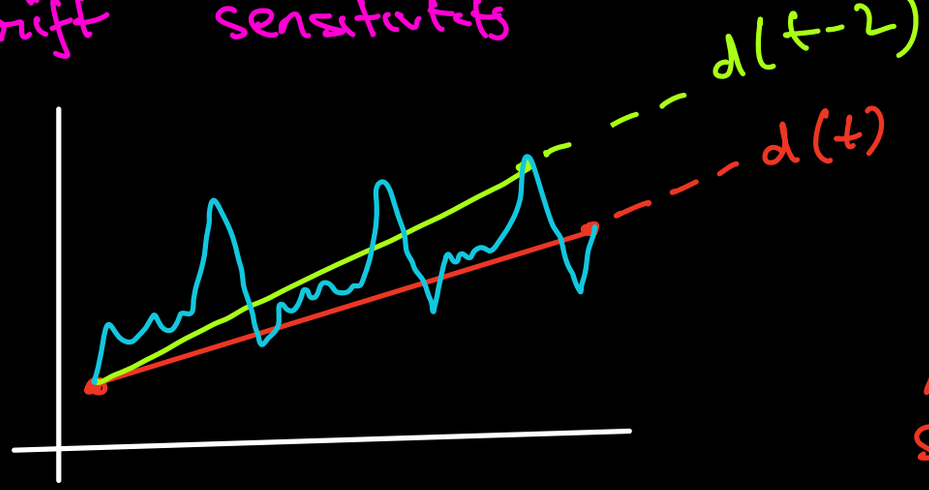
$$\hat{y}_{t+h} = y_t + h\,(\text{slope})$$

y_t → current level

h → # of in future

slope → $\frac{y_t - y_0}{t}$

drift sensitivity



Depending on what the last point is, the drift (slope) may change significantly

Not suitable for seasonal TS.

Simple exponential smoothing (SES)

h = horizon = # steps in future

assume h=1 for easy understanding

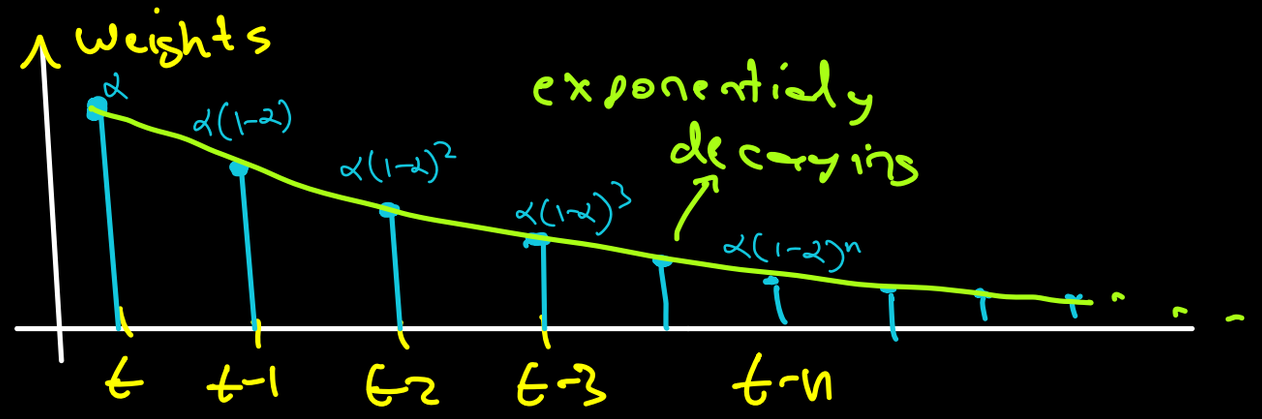
$$\hat{y}_{t+h} = \alpha y_t + (1-\alpha)\,\hat{y}_t$$

$$\hat{y}_{t+h} = \alpha y_t + (1-\alpha)\left[\alpha y_{t-1} + (1-\alpha)\hat{y}_{t-1}\right]$$

$$= \alpha y_t + (1-\alpha)\alpha\, y_{t-1} + (1-\alpha)^2\left[\alpha y_{t-i}\right]$$

- α: weigh
- y_t: last value
- $(1-\alpha)\alpha$: less weigh
- y_{t-1}: old value
- $(1-\alpha)^2$: lesser weight..
- y_{t-i}: older values

It will slowly "forget" older values



Simple way to remember:

$$\hat{y}_{t+1} = \alpha y_t + \alpha(1-\alpha) y_{t-1} + \alpha(1-\alpha)^2 y_{t-2} + \ldots + \alpha(1-\alpha)^t y_0$$

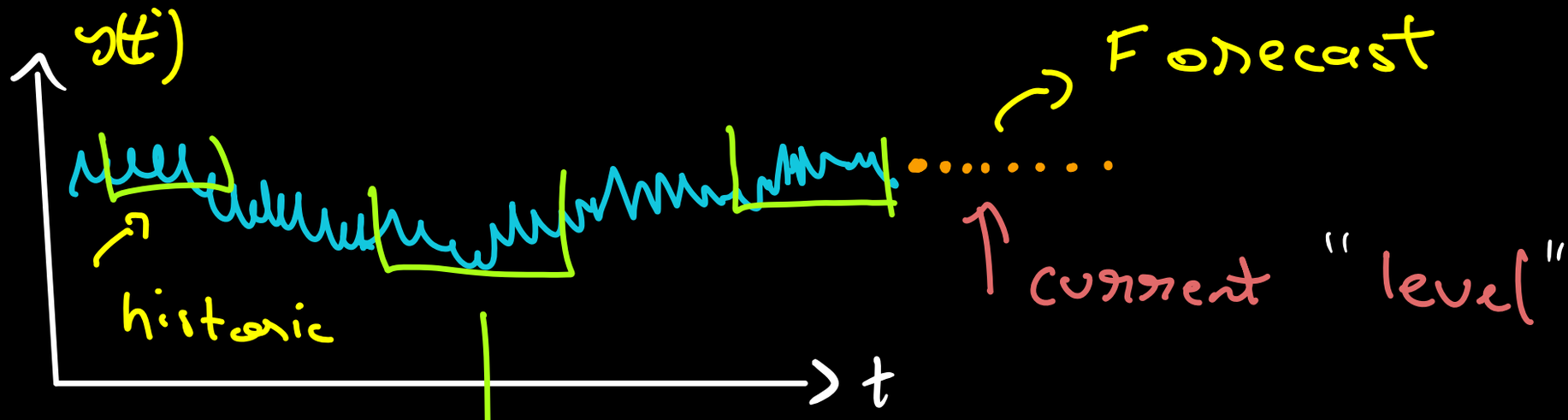
coeff is too small ~ 0

if $\alpha = 0.8$

$$\hat{y}_{t+1} = 0.8\, y_t + 0.16\, y_{t-1} + 0.032\, y_{t-2} + 0.0064\, y_{t-3} \sim 0$$

↗ weighted average!

Note : All future values have the same forecast



level of TS is different at diff t

SES is good for predicting level of TS

$\alpha \rightarrow$ low $\rightarrow$ global mean

$\alpha \rightarrow$ high $\rightarrow$ naive