

Sequence, Time series and Prediction

4 | trend
| seasonality
| autocorrelation
| Noise

week 1 Sequences and Prediction

Tyler Vergen's site

univariate \rightarrow multivariate

\downarrow
correlations

\rightarrow Anything has time factors

forecasting future values

project into the past \rightarrow imputed data

fill in holes of data

detect anomalies

analyze time series to spot patterns in

\rightarrow Common patterns in time series

overall upwards trend

local peaks and troughs

• Auto-correlated time series

$x(t) = 0,99 \times x(t-1) + \text{occasional spike}$

↑ unpredictable,
innovations

- lag: auto-correlated time series with delayed copy of itself.

Forecast learned patterns

Non-stationary time series (big event)

↓
break the mold

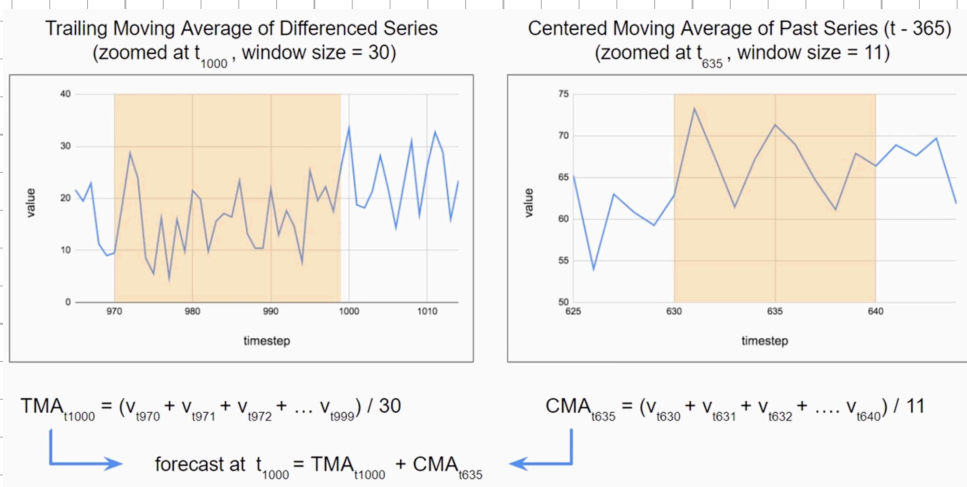
- fixed partitioning → Roll-forward partitioning

- Metrics

- Moving average and differencing

Smoothing both Past and Present Values

→ forecasts = trailing moving average of difference series
+ centered moving average of past series ($t-365$)



Week 2: Deep Neural Networks for Time Series

Preparing Features and Labels

```
dataset = tf.data.Dataset.range(10)
dataset = dataset.window(5, shift=1, drop_remainder=True)
dataset = dataset.flat_map(lambda window: window.batch(5))
dataset = dataset.map(lambda window: (window[:-1], window[-1]))
dataset = dataset.shuffle(buffer_size=10)
dataset = dataset.batch(2).prefetch(1)
for x,y in dataset:
    print("x = ", x.numpy())
    print("y = ", y.numpy())
```

```
x = [[4 5 6 7] [1 2 3 4]]
y = [[8] [5]]
x = [[3 4 5 6] [2 3 4 5]]
y = [[7] [6]]
x = [[5 6 7 8] [0 1 2 3]]
y = [[9] [4]]
```