

Time Series Analysis

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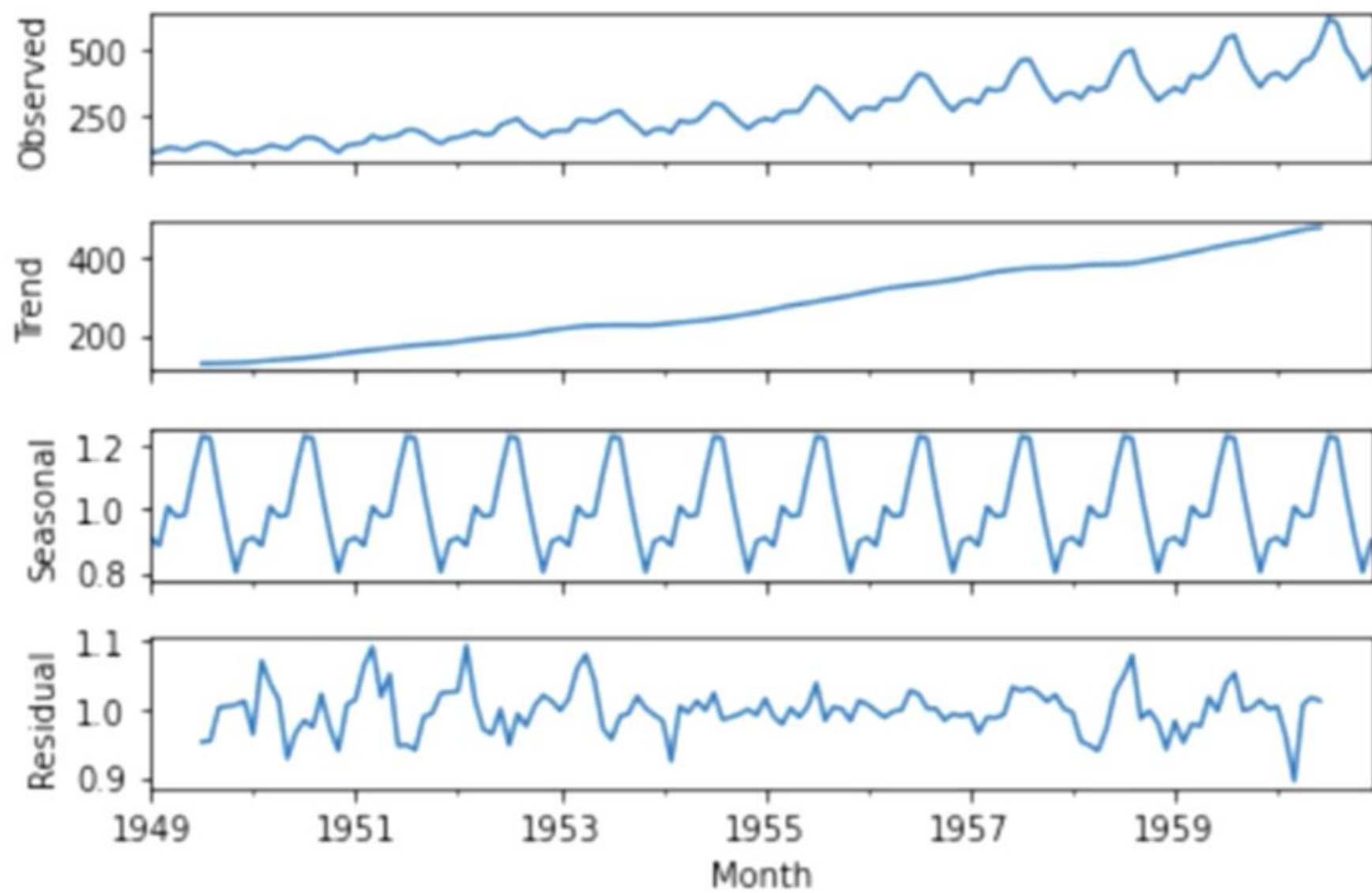
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Time Series

- A time series is a sequence of observations over a certain period.
 - Univariate : values taken by a single variable
 - Multivariate : values taken by multiple variables
- The analysis of temporal data can provide us useful insights on how a variable changes over time, or how it depends on the change in the values of other variable(s).
- The temporal relationships of a variable on its previous values can be used for time-series forecasting, which is field of many AI and machine learning applications.

Time Series Modelling

- A timeseries can be modeled as a combination of a variety of components:
- A typical model consists of four components:
 - **Level** – It is the mean value around which the series varies.
 - **Trend** – It is the increasing or decreasing behaviour of a variable with time.
 - **Seasonality/Cycles** – It is the cyclical behaviour of time series.
 - **Noise** – It is the error in observations added due to environmental factors.



Time Series Forecasting: Modelling techniques

- There are a variety of techniques to capture the components of a time series and perform series forecasting:
 - **Simple Exponential Smoothing (SES):** models the next time step as an exponentially weighted linear function of observations at prior time steps.
 - **Auto-regression (AR):** predict a future value based on the past values
 - **Moving average (MA) - ARIMA / SARIMA models:** ARIMA stands for Autoregressive Integrated Moving Average. The 'S' in SARIMA stands for seasonality.
 - **ML models:** machine learning models that learn via datasets
- We will explore this topic in Part II of the course

