

# STA 3180 Statistical Modelling: Time Series

## Time Series Lecture Notes

### Introduction to Time Series:

Time series is a sequence of data points collected at successive points in time. It is used to analyze the behavior of a system over time and can be used to predict future values. Time series analysis is used in many fields such as economics, finance, engineering, and medicine.

### Key Concepts:

1. Autocorrelation: Autocorrelation is the correlation between a variable and itself at different points in time. It measures how strongly a variable is related to its past values.
2. Stationarity: Stationarity is a property of a time series where the mean, variance, and autocorrelation are constant over time.
3. Trend: A trend is a long-term increase or decrease in the value of a time series.
4. Seasonality: Seasonality is a pattern that repeats itself over a specific period of time.

### Definitions:

1. Autoregressive Model (AR): An autoregressive model is a type of time series model that uses past values of the time series to predict future values.
2. Moving Average Model (MA): A moving average model is a type of time series model that uses the average of past values to predict future values.
3. Autoregressive Moving Average Model (ARMA): An autoregressive moving average model is a type of time series model that combines an autoregressive model and a moving average model.

### Rules:

1. Autoregressive models assume that the current value of the time series is a linear combination of past values.
2. Moving average models assume that the current value of the time series is a weighted average of past values.
3. Autoregressive moving average models assume that the current value of the time series is a linear combination of past values and a weighted average of past errors.

### Examples:

1. Stock Prices: Stock prices are a type of time series that can be analyzed using time series analysis. Autoregressive models can be used to predict future stock prices based on past prices.
2. Weather Data: Weather data is a type of time series that can be analyzed using time series analysis. Moving average models can be used to predict future weather conditions based on past weather conditions.