ReDI School of Digital Integration

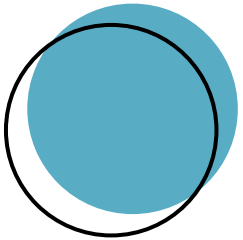
Time Series and Forecasting

Lecture 9
Mohan

We use tech to connect human potential and opportunity with dignity & humility

Learning Objectives

- Time Series for business forecasting
- Importance of understanding problem
- Forecasting - Career perspective
- Arima, Sarima models recap
- Project Goals
- Exercises



Time Series for business forecasting

Sales Forecasting

Goal - Predict customer demand for various products across its stores.

Use - To optimize inventory management and ensure popular items are adequately stocked.

Financial Forecasting

Goal - Predict stock prices and market trends.

Use - To make informed investment decisions, portfolio management, and risk assessment.

Energy Load Forecasting

Goal - Predict energy demand patterns for different regions

Use - Optimize the distribution, ensure reliable energy supply and minimize waste.

Importance of understanding the problem

Importance of understanding the Problem

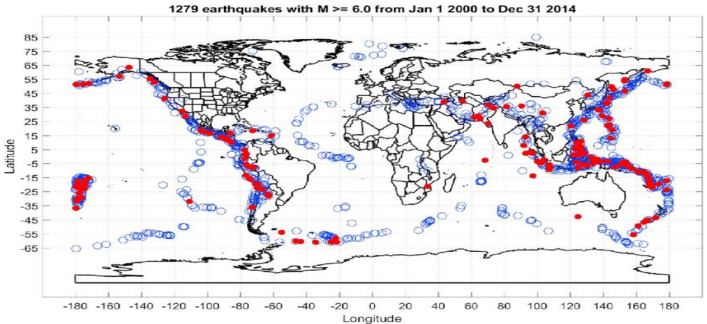
Domain Industry requirements

Physiological Monitors	IVD Devices	Assistive Devices	Wearable Devices	Medical App
Pulse rate Monitor BP Estimator Heart Rate Monitor Blood Glucose Monitor	Equipment for Blood Analysis, Breast Biopsy Device Equipment for HIV Detection	Implants Prostheses MRI/CT/ Ultrasound Scanners	Activity Tracker Pedometer Sleep Apnea Detector	Medical Application that Retrieve Individuals Electronic Health Records

Something that can't be found out of intuition

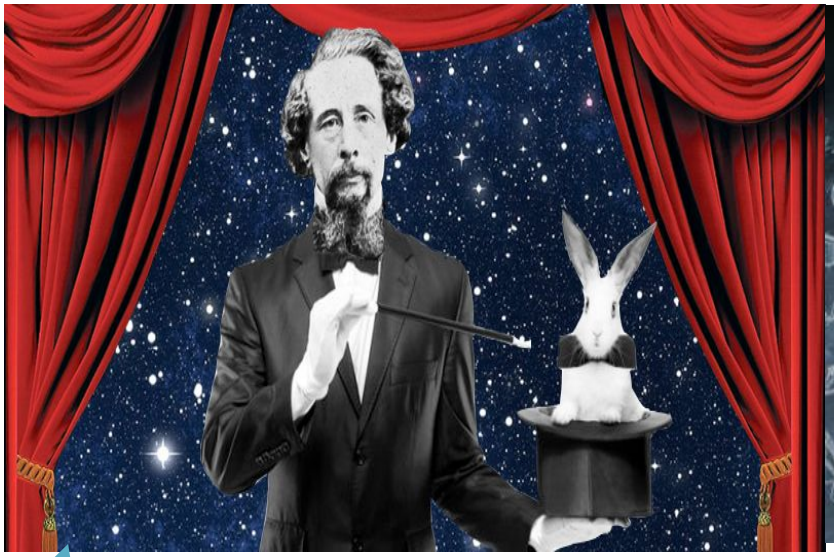
Ethical considerations

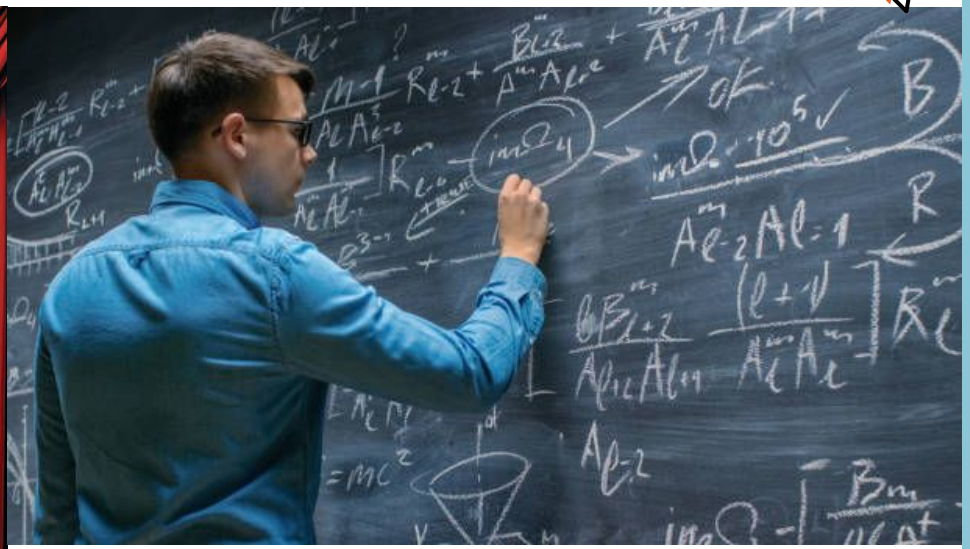
Data validation and quality assurance



Forecasting as Career

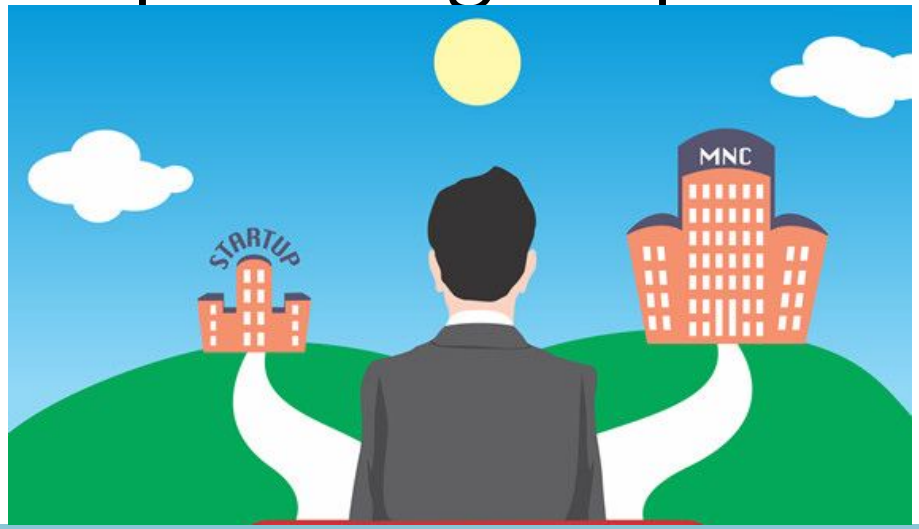
Who's a Data Analyst/ Data Engineer/ Data Scientist





Who can afford them?

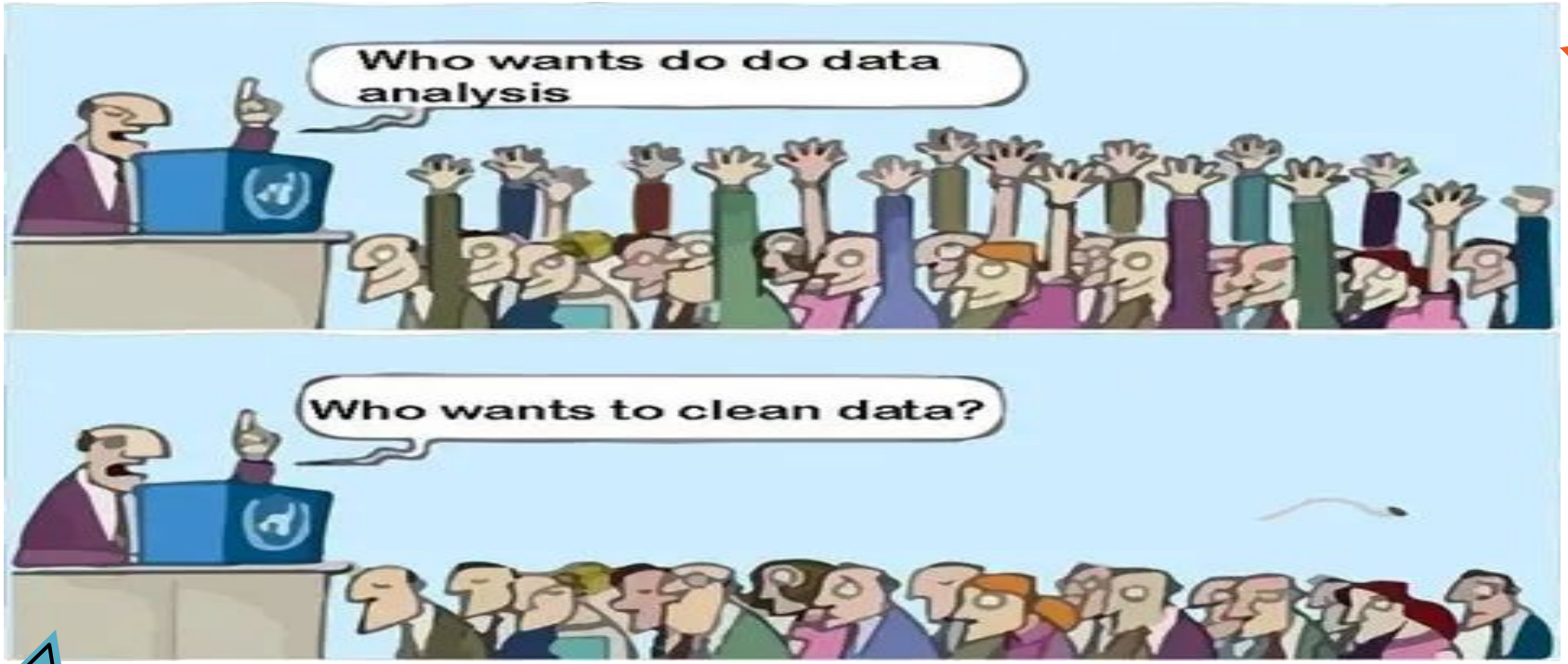
Startups vs Big Corporations



How to approach Projects

Time Series forecasting use cases

Who wants Data roles?



Quick Recap

ARIMA/SARIMA

Combines the advantages of Autoregressive (AR), Moving Average (MA), and differencing techniques(I).

- Confirm the stationarity with ADF test.
- By examining the ACF and PACF plots, identify the order of the AR and MA components, as well as the level of differencing required to make the time series stationary.
- Fit the Model.
- Validate the Model.
- Forecast values.
- Evaluate the Model.

Statistics

Evaluation Statistics: MSE, MAE, RMSE

MSE is: MSE = (1/n) * Σ(y_true - y_pred)^2, where n is the number of data points, y_true is the actual value, and y_pred is the predicted value

MAE is: MAE = (1/n) * Σ|y_true - y_pred|, where n is the number of data points, y_true is the actual value, and y_pred is the predicted value.

RMSE is useful for interpreting the magnitude of the errors in the same unit as the target variable. The formula for RMSE is: RMSE = √(MSE)

R2 score

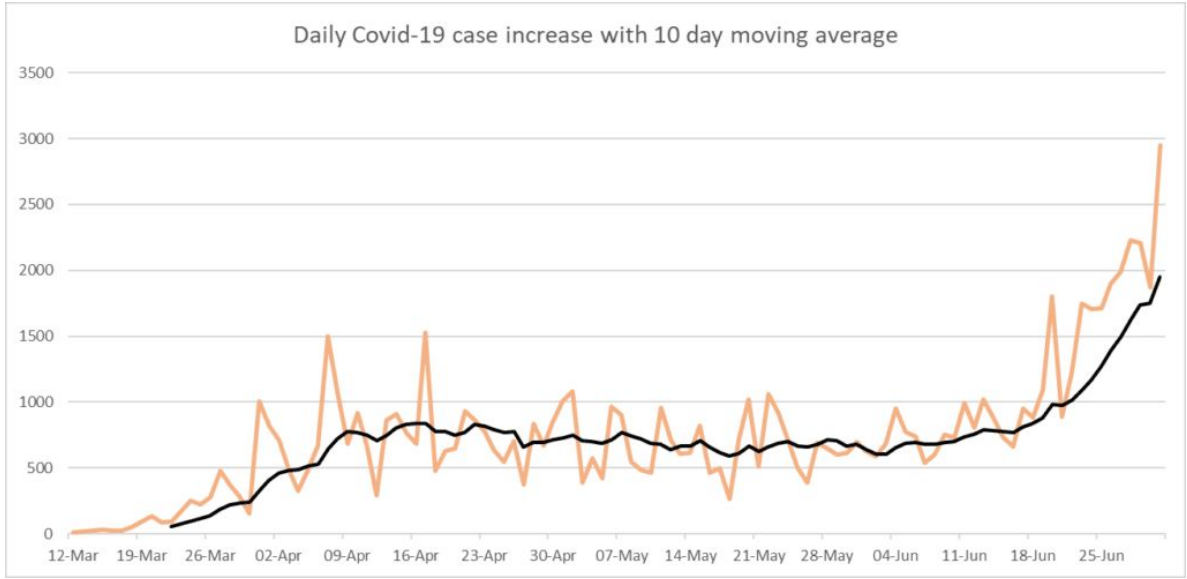
The R2 score, also known as the coefficient of determination, is a statistical measure used to evaluate the goodness-of-fit of a regression model.

- Provides an indication of how well the regression model fits the observed data. The R2 score represents the proportion of the variance in the dependent variable that can be explained by the independent variables in the model.

- It ranges from 0 to 1, where: R2 score of 0 indicates that the model does not explain any of the variance in the dependent variable. R2 score of 1 indicates that the model perfectly explains all the variance in the dependent variable.

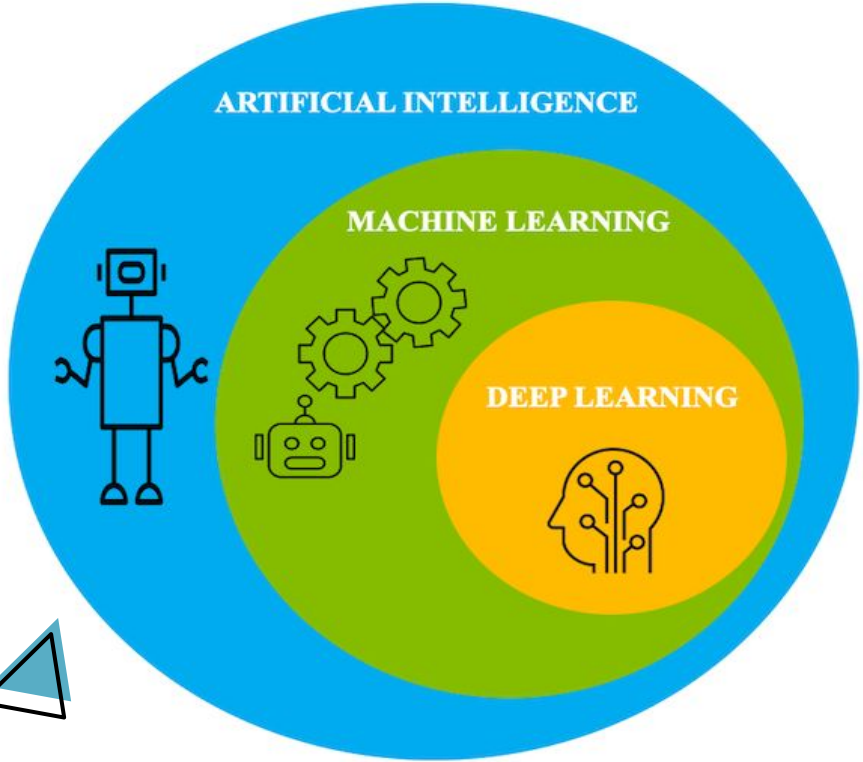
Rolling mean

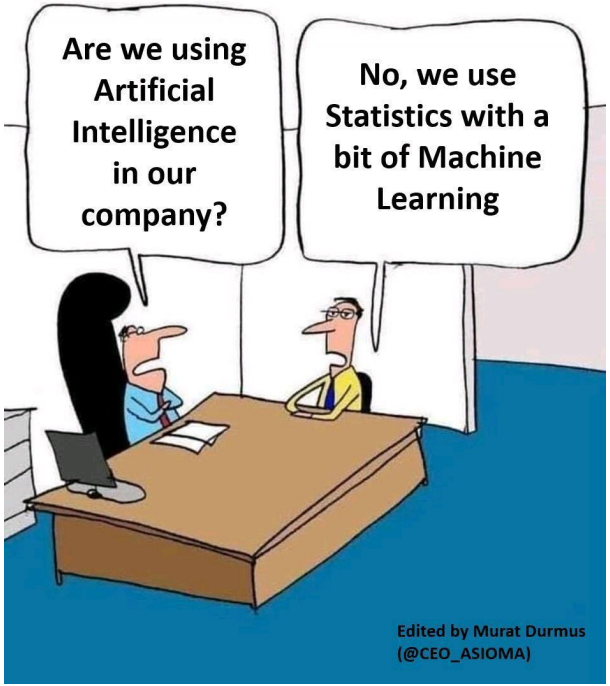
A rolling mean, also known as a moving average, is a statistical calculation that provides a smoothed representation of a time series data by averaging values over a specific window or interval. It helps to reduce short-term fluctuations and highlight long-term trends or patterns in the data.



WAY AHEAD

What lies ahead?





WE DID IT!