# Time series Analysis

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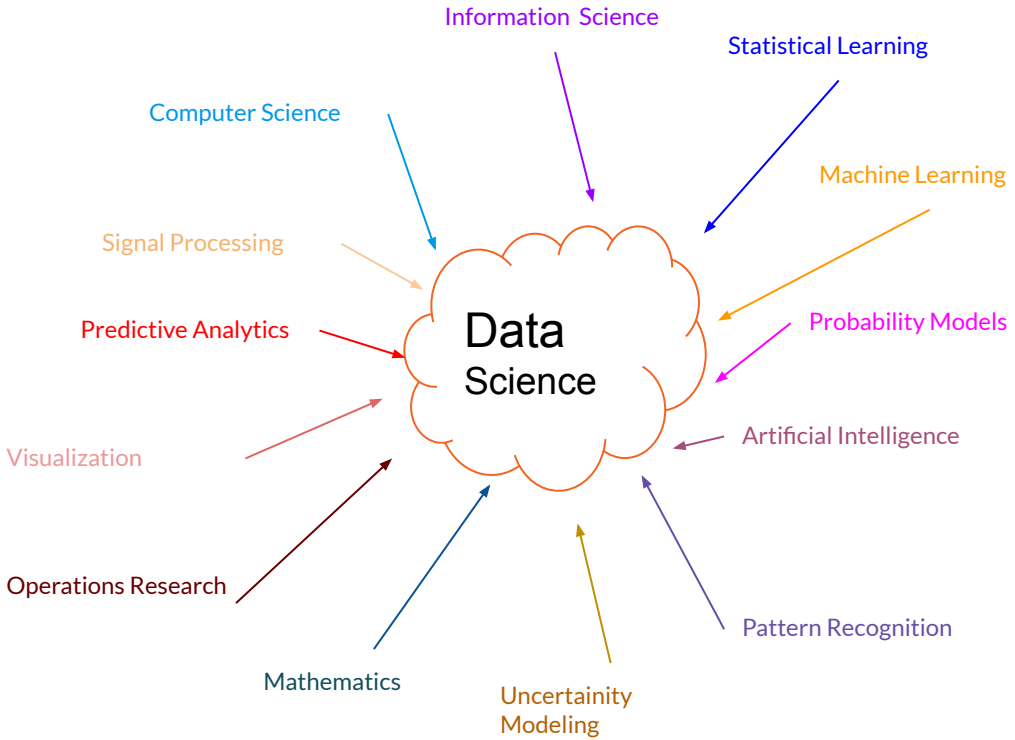
# What's Data science ?

- Interdisciplinary field about processes and system that facilitate extraction of knowledge or insights from data
- Techniques and theories are drawn from a wide range of disciplines



# Predictive Analytics


## Descriptive Models

- Describe or summarize raw data e.g  determine min, max, mean, median etc
- Useful: learn from past history and understand how this might influence future outcome
- Examples: Reports on company's sales, finance, operations,inventory and customers
- Models: clustering, association rules & network analysis

## Predictive Models

- Predict what might happen in the future
- Common use case understand how sales might close at end of the year, predicting what items customers  will purchase together, forecasting revenue etc
- Models: Classification, regression and neural network

# Why Predictive Analytics ?

## SALES & MARKETING

- Churn Reduction
- Customer Acquisition
- Lead Scoring
- Product Recommendation
- Campaign Optimization
- Customer Segmentation
- Next Best Offer/Action

## OPERATIONS

- Predictive Maintenance
- Load Forecasting
- Inventory/Demand Optimization
- Product Recommendation
- Price Optimization
- Manufacturing Process Optimization
- Quality Management
- Yield Management

## FRAUD & RISK

- Fraud and Abuse Detection
- Claims Analysis
- Collection and Delinquency
- Credit Scoring
- Operational Risk Modeling
- Crime Threat
- Revenue and Loss Analysis

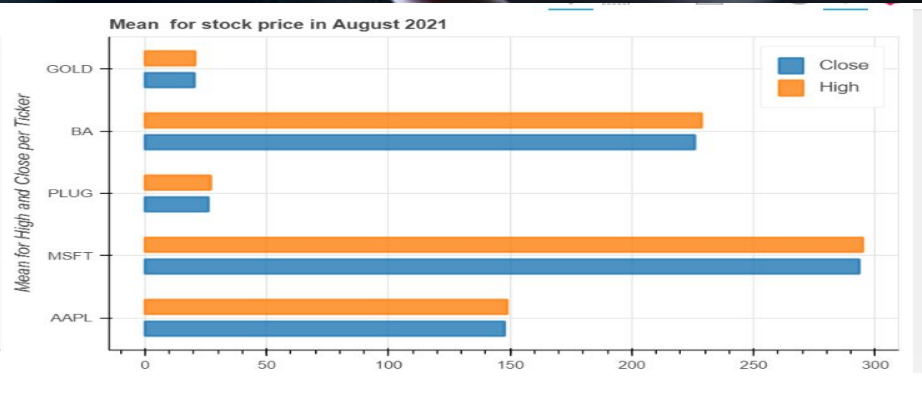
## FINANACE & HR

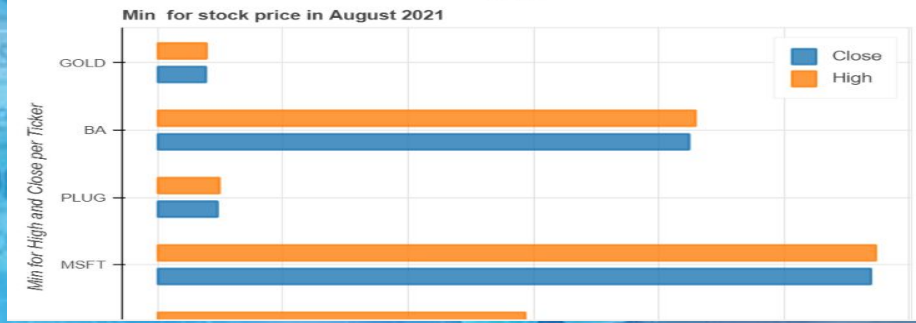
- Cash Flow and Forecasting
- Budgeting Simulation
- Profitability and Margin Analysis
- Financial Risk Modeling
- Employee Retention Modeling
- Succession Planning

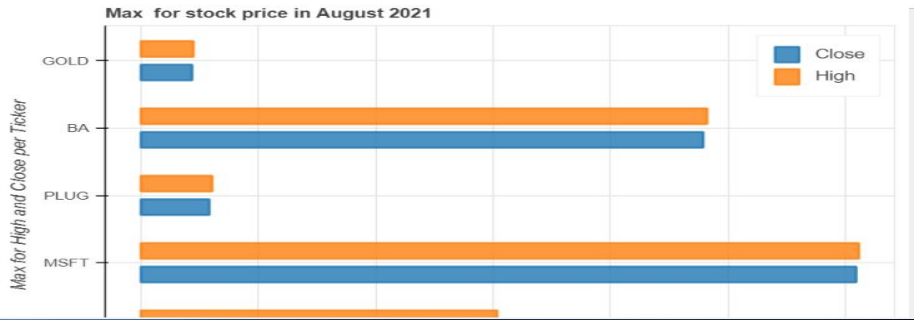
## OTHER SECTORS

- Life Sciences
- Healthcare
- Media
- Higher Education
- Public Sector / Social Sciences
- Construction and Mining
- Travel and Hospitality
- Big Data and IoT

# Example for Descriptive Models

# Predictive Analytics

Example for Predictive Models

# Predictive models

## Classification

- Who will ( buy or fraud, or churn ..) next ( week or month or year ...) ?
- Action make offers , or reject credit offer
- Models: Randomforest etc

## Regression

- What will the revenue or number of churners be next week , month etc ?
- Action: Minimise expenditure, stop hiring etc

## Link analysis

- Analyze interactions to identity (communities or influencers ..)

## Clustering

- What are the groups of customers with similar( behavior or profile..)
- Action Market Campaign
- K-Means

## Forecasting (Time Series Analysis )

- What will the revenue or number of sales be over next year on a monthly or yearly basis ?

## Association or Recommendation Engines

- basket analysis - provide recommendations to retailers or on web sites etc.

# Time Series Analysis

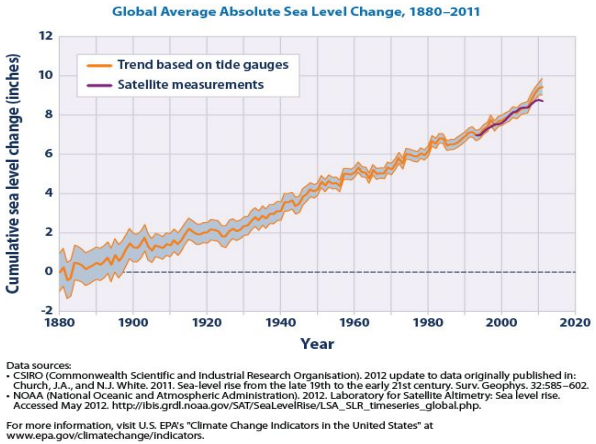
Input data samples

Machine Learning
- recognise muster
- dependency
- hidden structures
- Relationships

Algorithms and methods

Ouput model optimised

How does Time series works ?




## Classic models

- VAR / VECM
- TBATS
- Fbprophet
- SARIMAX
- ARIMA
- AUTOARIMA
- REGRESSION
- Theory Background
- VECM Theory

## Deep Learning Models

- LSTM
- CNN
- LSTM Example

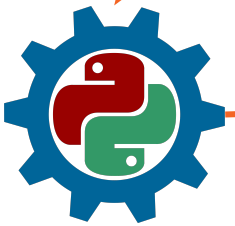
# What is the goal ?

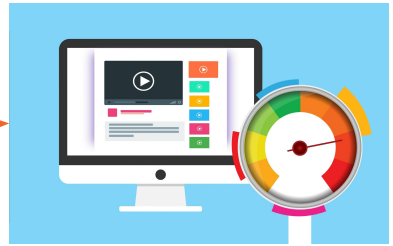
- Know the Architecture
- Build End to End Scenario
- Acquire new skills

Architecture

Google Drive

Yahoo Finance





Visualisation with Bokeh - Static HTML

- Data processing
- Feature Engineering
- Forecasting with VECM

# Let's get practical !!

Requirements

- Gmail Account
- Drive  create new Folder called DATABASE
- Motivation & Curiosity
- Colab Notebook

Who is the appropriate audience ?

- Everyone with a basic  knowledge in Statistics

Skills covered

- Cloud Computing
- Python
- Machine Learning - Forecasting
- Data Visualisation
- Bokeh
- Basic HTML