AGENDA

- Business Flow of Data Science
- Some use cases
- Data and Analytics Landscape
- Classification of Analytics Solutions
- Problem Definition in Analytics
- What kind of problems Data Science can solve?
- High Potential DS Applications
- Example use cases
- Popular Data Science Tools and Techniques

BUSINESS FLOW

CAPABILITIES that help us solve business problems and drive growth:

- **Data**
- **Analytics**

Data

Analytics

Insights

Decisions

Results

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ANALYTICS HAS BEEN AROUND FOR A WHILE NOW

<1950

Government Agencies

- Decoding messages using Turing machine
- Simulating nuclear reactions – Manhattan Project

1950-1970

Corporations and Research Institutes

- Forecasting temperature and precipitation
- Identifying shortest paths in aircraft traffic and distribution logistics
- Enabling credit risk decisions - FICO

1970-2000

Mid Size Business and Tech Startups

- Predicting optimal price of stock options – Black Scholes model
- Enabling credit card fraud using real time analytics – FICO
- Personalizing customer experiences on Amazon and EBay

2001-Present

Small Business and Analytic Experts

- Recommending customized shopping and movie events and dynamic flight ticket pricing
- Enabling faster web search with neural networks and big data infrastructure
- Segmenting customer and employee using advanced techniques
- Generating insights in Sports

Future

Anyone and Everyone

- Solving unsolvable problems using affordable tools for individuals to use everyday in education, healthcare etc.
- Consuming anticipatory analytics making risks in products obsolete
- Personalizing every event/offer and using autonomous agents and things

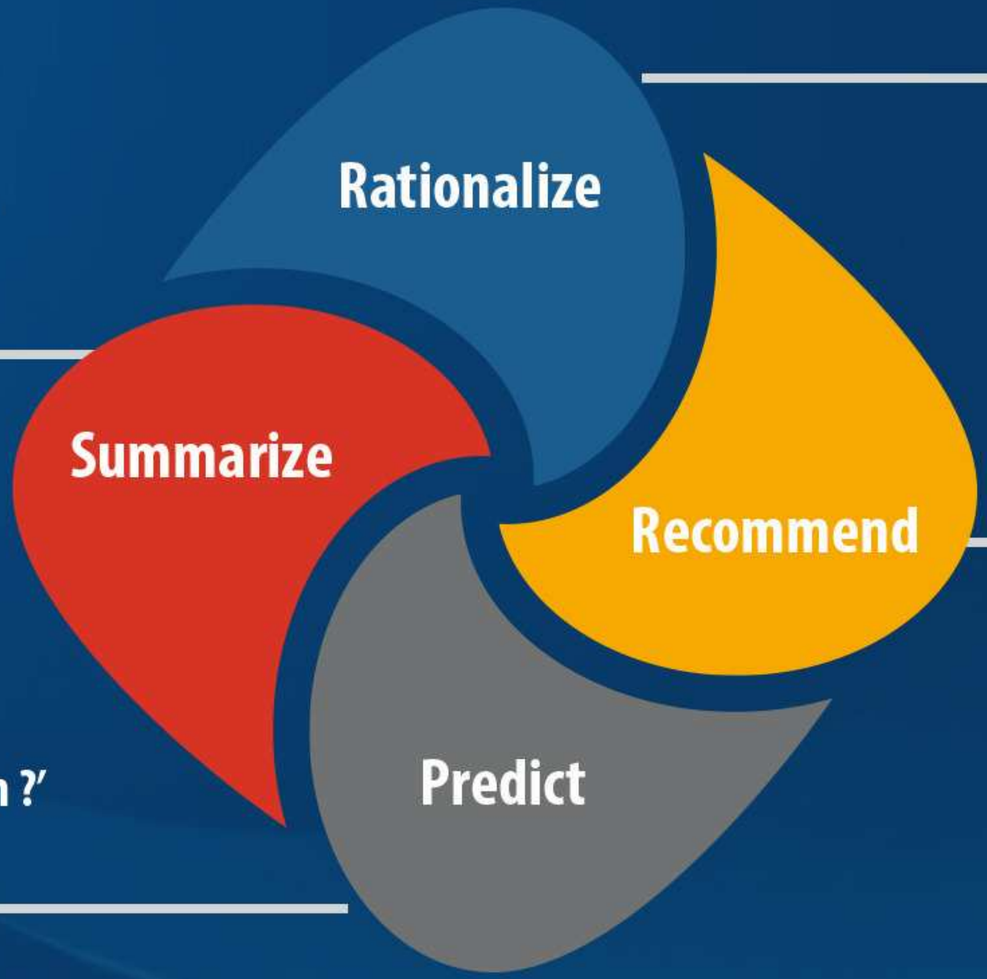
CLASSIFICATION OF ANALYTICAL SOLUTIONS

Descriptive

Provide insights into the past & answers 'What has happened ?'

Diagnostic

Delves into reason for a behavior & answers 'Why something happened ?'



Predictive

Apply past patterns to predict future & answers 'What could happen ?'

Prescriptive

Advice on possible outcomes & answers 'What should we do ?'

DESCRIPTIVE

- Used to describe or summarize what happened in the past
- Allows us to learn past behaviour, course correct them if needed and understand how they might influence future outcomes

Examples:

- Total stock in inventory and its variance over time
- Cost to serve a customer for different customer segments
- Volume trend of beverages sold in a day
- WoW sales changes

What does it entail?

- Requires data aggregation and data mining to arrive at insights
- Primarily involves arithmetic like sum, average, percentage change
- Zoom-in or Zoom-out of data to summarize your results at required levels
- Define scope of analysis by applying filters such as geography, characteristics, range, etc.,

DIAGNOSTIC

- Used for providing supporting argument to a claim made through descriptive
- Allows actionability since the root cause of a problem is determined and validated

Examples:

- Reasons for decline in company sales performance
- Drivers of customer bad experience on website
- Rationale for non-adoption of a newly introduced product

What does it entail?

- Involves drill-down, correlation assessment and other means to ascertain 'why'
- Data discovery and data mining are critical elements to consider
- Usually driven by a trigger change in metric and followed by corrective action
- Inputs of diagnostics can feed into predictive analytical problem solving

PREDICTIVE

- Used to probabilistically determine what might happen in the future based on historic patterns
- Not limited to the time domain alone – behavioural, sentiment, influence, etc., can also be predicted

Examples:

- Forecast sales for the next 3 quarters
- Predict customer purchase propensity in the next visit
- Pre-empt customer churn in the subsequent months
- Assess possible sentiment change after a future product update

What does it entail?

- Identifies patterns in historical data and applies statistical models to capture relationship between data points
- The patterns are extrapolated to the future to arrive at best possible estimates
- Always associated with a certainty (or probability score) of the future event (No prediction can be 100% accurate)

PRESCRIPTIVE

- Recommends one or more courses of action and shows the likely outcome of each decision
- Predicts not one but "multiple futures" based on the decision-maker's actions

Examples:

- Optimal price prescription for a product in a particular location
- Cost-effective route for delivering parcels from warehouse to several destinations
- Guided self-serve issue resolution for a laptop problem
- Scheduling power production based on demand / consumption

What does it entail?

- Assesses several prediction outcomes to suggest ideal action for a particular scenario
- Has 2 components
  - Actionability - User must be able to take action on predicted outcome
  - Feedback - A system that tracks adjusted outcome based on action taken

PROBLEM DEFINITION IN ANALYTICS

Questions to help you get started with defining

What problem you are trying to solve? What answers you are seeking?

Which part of your organization needs improving? What improvement is needed?

What decisions need to be made? How are these decisions going to influence your larger programs?

What is the goal of your analytics journey? How does it align with your group's goals/ org vision?

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PROBLEM DEFINITION IN ANALYTICS

Business groups should identify the following as part of problem definition phase:

Need / Trigger

What is the business problem?
Why are we solving it?

Goal

What do we intend to achieve with solving this problem (end outcome) ?
What prevents us from reaching the goal now?

Scope

What is the scope of the problem?
What does the business group have control over?

Environment

What are the market conditions and constraints that are applicable and we should be aware of before starting to solve problem?

WHAT KIND OF PROBLEMS CAN DATA SCIENCE SOLVE?

Supervised Learning

Binary Classification

Is this A or B?

Targeted Marketing of Customers

Legal: Case outcome modelling

Multiclass Classification

Is this A or B or C or D?

Risk Classification of Customers

HR: Candidate success analysis

Anomaly Detection

Is something wrong here?

Finance: Fraud detection and prediction

IT: Intrusion/ misuse detection

Regression

How much? or How many?

Finance: Sales forecasting and planning

Legal: Case duration prediction

Unsupervised Learning

How is my data organized?

Customer Segmentation

HR: Employee sentiment analysis & attrition drivers

Reinforcement Learning

What should I do now?

Real time Traffic Control

Recommendation systems

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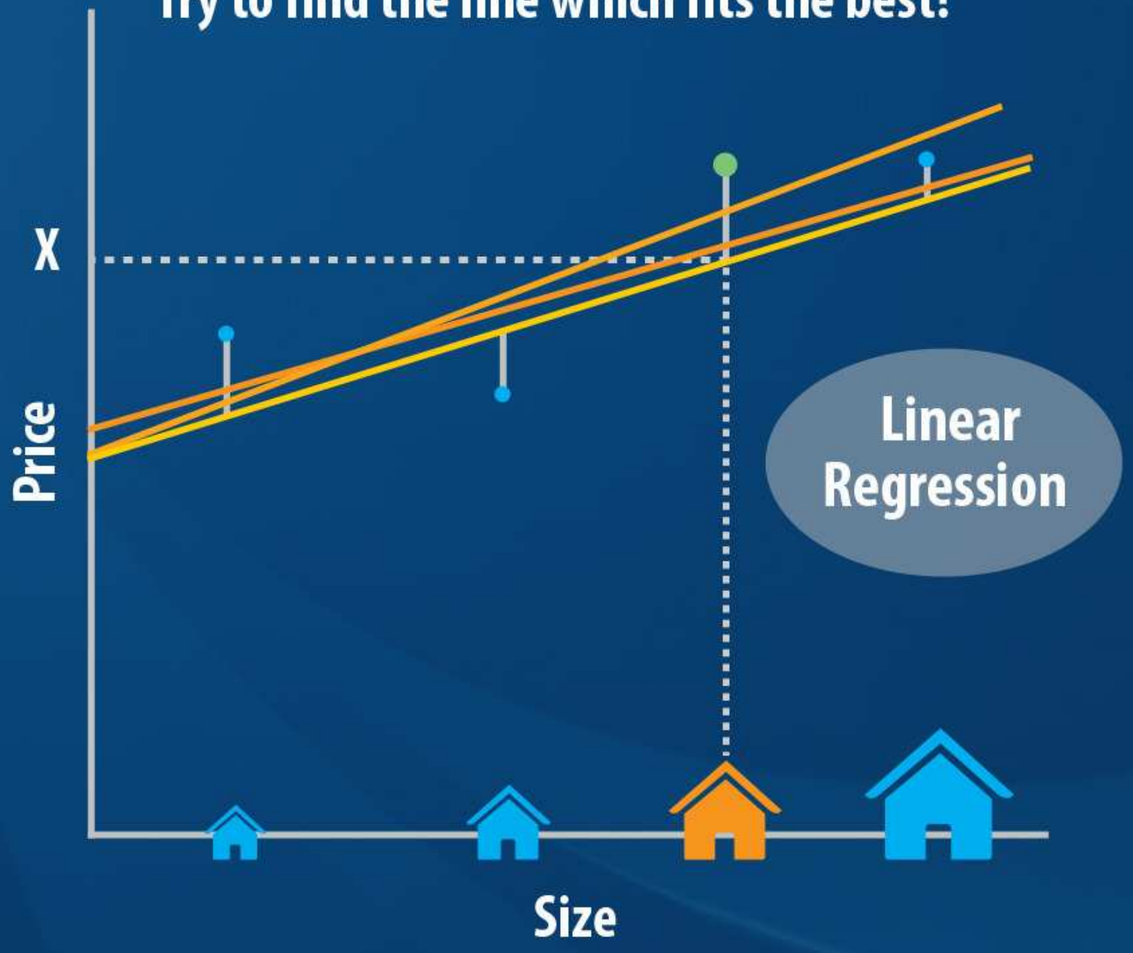
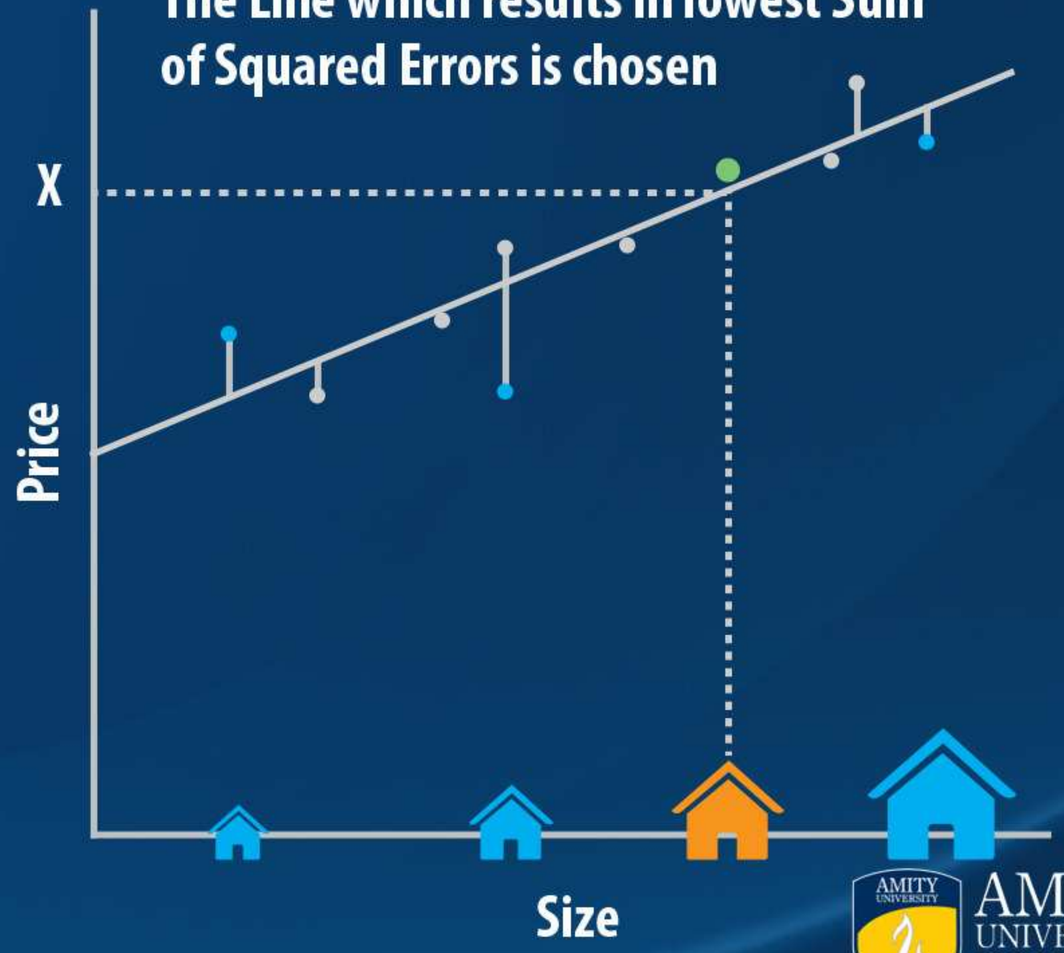
USE CASE - 1

How to estimate the price of a house?

Try to find the line which fits the best!



The Line which results in lowest Sum of Squared Errors is chosen



USE CASE - 2

Social media App recommendation

Gender	Age	Application
F	15	
M	25	
F	32	
F	40	

POPULAR DATA SCIENCES TOOLS AND TECHNOLOGIES

Frameworks

Programming Languages

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