UNIT 1
REGRESSION MODELING

SIMPLE REGRESSION

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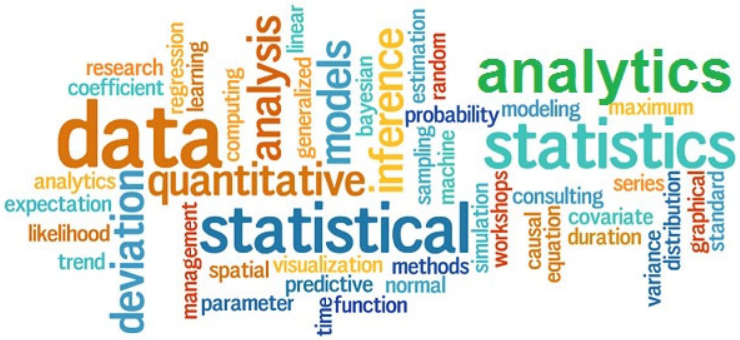
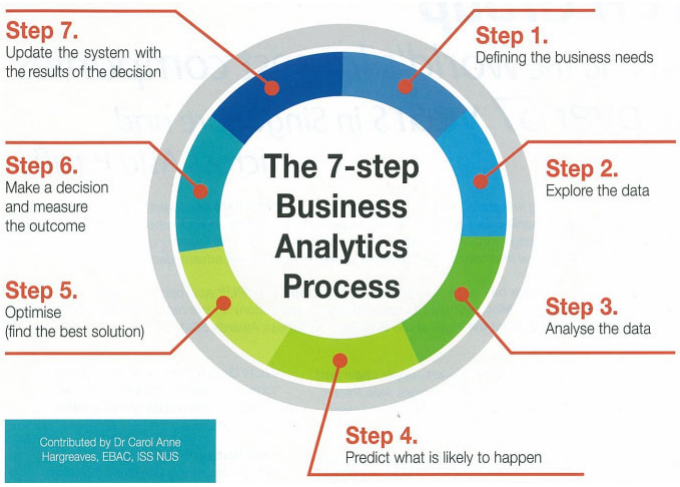
AUBURN UNIVERSITY
Raymond J. Harbert College of Business

What is Business Analytics?



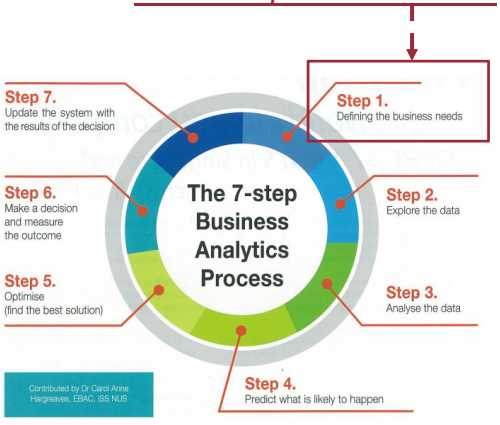
Business analytics simply refers to the use of tools and techniques to turn data into meaningful business insights

What is Business Analytics?



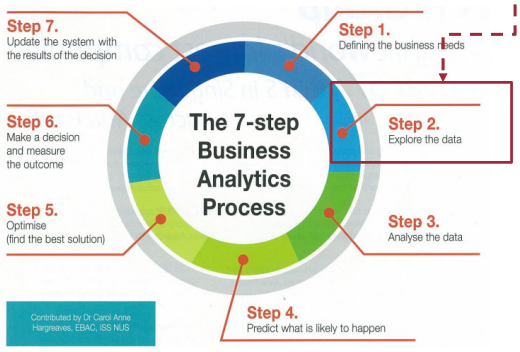
Motivation

Suppose that we are business analytics consultants hired by a client to provide advice on *how to improve sales of a particular product*.

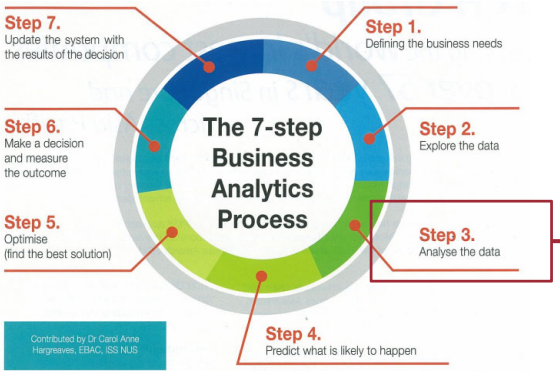


Motivation

The Advertising data set consists of the sales of that product in 200 different markets, along with advertising budgets for the product in each of those markets for three different media: TV, radio, and newspaper.



Motivation



How to achieve the solution?

Simple Linear Regression

- It is a very straight forward approach for predicting a quantitative response outcome,Y, on the bases of a single predictor variable, X.
- In this setting, one may be interested in answering the following questions:
  - ✓ Which predictors are associated with the response?
  - ✓ What is the relationship between the response and each predictor?
  - ✓ Can the relationship between Y and X be adequately summarized using a linear equation?

Simple Linear Regression

X may represent “TV advertising” and Y may represent “Sales”. Then we can regress sales (Y) onto TV(X) by fitting model;

$$Sales \approx \beta_0 + \beta_1 \times TV$$

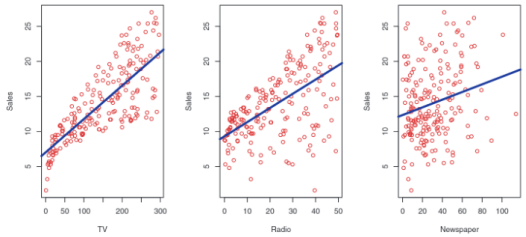
- Considering Advertising data, one may be interested in answering the following questions:
  - ✓ Which media contribute to sales?
  - ✓ Which media generate the biggest boost in sales? Or
  - ✓ How much increase in sales is associated with a given increase in TV advertising?

Steps of Simple Linear Regression

STEP 1

Exploring Data set (Descriptive Statistics)

- Numbers
  - Summary Statistics
  - Correlation coefficients
- Graphs
  - Histogram
  - Scatter plot



Steps of Simple Linear Regression

STEP 2

Fitting models

$$Y \approx \beta_0 + \beta_1 \times X$$

or

$$Y \approx \beta_0 + \beta_1 \times X + e$$

Steps of Simple Linear Regression

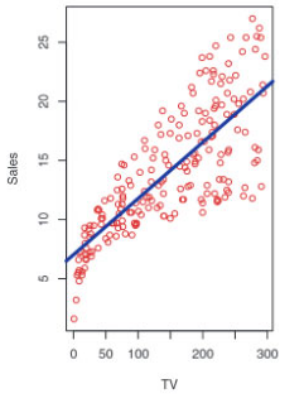
STEP 3

Estimating the Coefficients

Steps of Simple Linear Regression

STEP 3

Estimating the Coefficients



Steps of Simple Linear Regression

STEP 4

Significance (Hypothesis) test

Steps of Simple Linear Regression

STEP 5

Evaluate model and find the best model

Steps of Simple Linear Regression

STEP 6

Inference Statistics

STEP 7

Conclusion