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NETWORK ANALYTICS WITH MACHINE LEARNING & DATA SCIENCE

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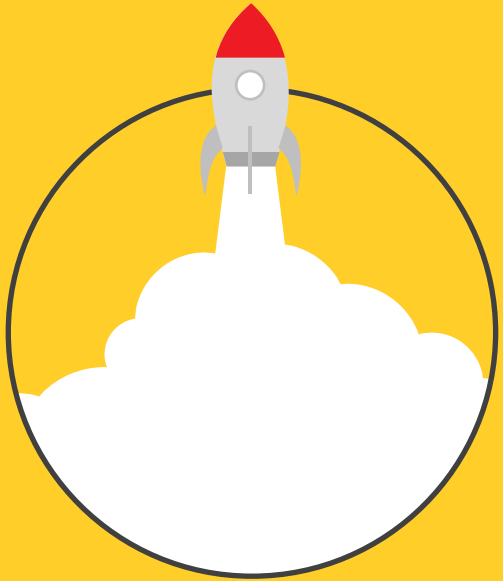
Machine Learning & Data Science

01 Data Analytics

02 Data Analysis Applications

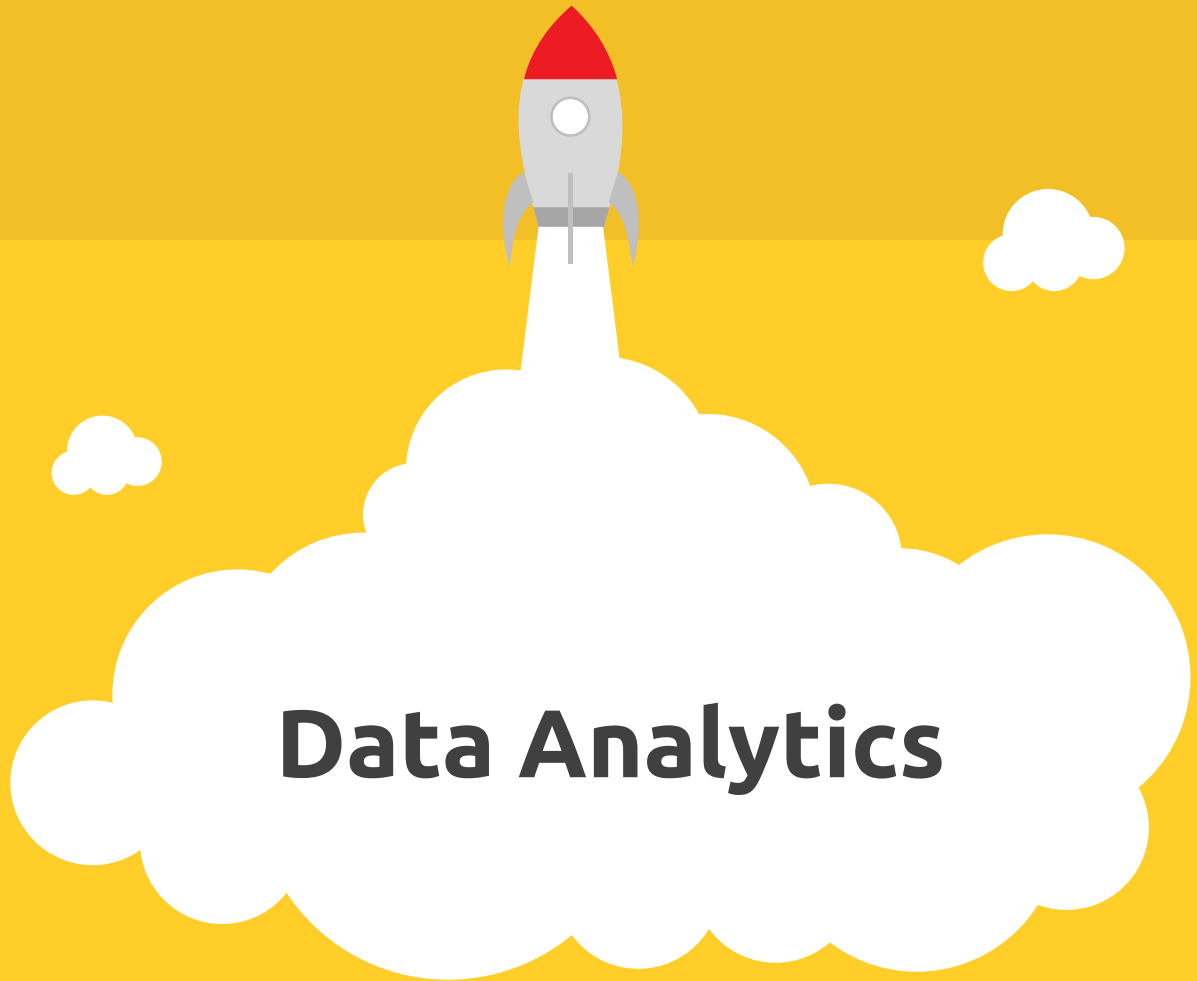
03 Machine Learning

04 Implementation of ML Algorithms

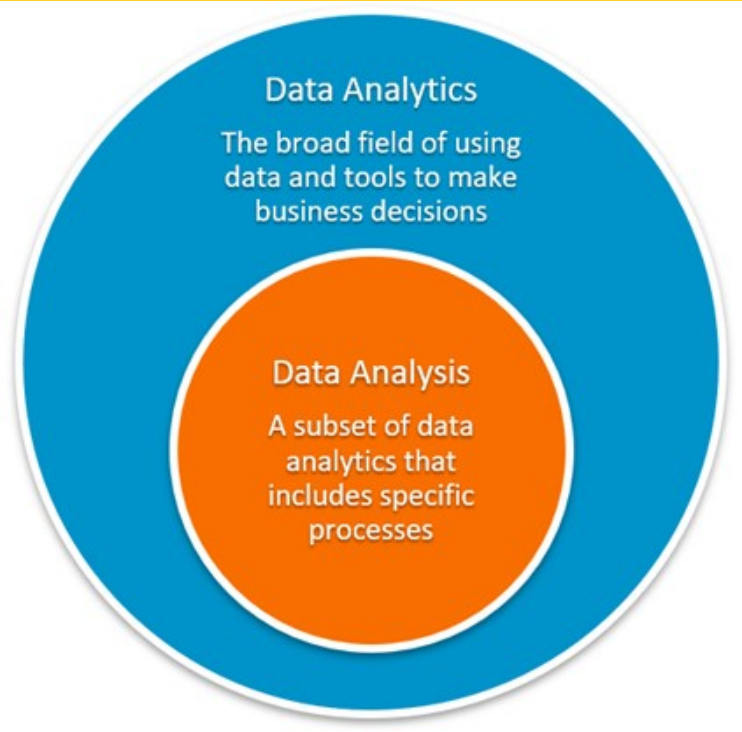


Pre-requisites

- Basic Coding Knowledge
- Python Programming
- Basic Mathematical Statistics


Data Analytics

Data Analytics Vs. Data Analysis



Data Analysis

Why Do We Need Data Analysis?

- Data analysis is important in business to understand problems facing an organization, and to explore data in meaningful ways.

- Data in itself is merely facts and figures.

- Data analysis organizes, interprets, structures and presents the data into useful information that provides context for the data.

Ways of Thinking About Data

What is data?

The 1973 Webster's New Collegiate Dictionary defines data as "factual information (as measurements or statistics) used as a basis for reasoning, discussion, or calculation." The 1996 Webster's II New Riverside Dictionary Revised Edition defines data as "information, especially information organized for analysis." Merriam Webster Online Dictionary defines data" as the following (http://www.m-w.com):

> 1 : factual information (as measurements or statistics) used as a basis for reasoning, discussion, or calculation. E.g., the data is plentiful and easily available -- H. A. Gleason, Jr., e.g., comprehensive data on economic growth have been published -- N. H. Jacoby.
>
> 2 : information output by a sensing device or organ that includes both useful and irrelevant or redundant information and must be processed to be meaningful.
>
> 3 : information in numerical form that can be digitally transmitted or processed.

Ways of Thinking About Data

What is data?

- Data is numbers, characters, images, or other method of recording, in a form which can be assessed to make a determination or decision about a specific action.

- Data on its own has no meaning, only when interpreted does it take on meaning and become information.

- By closely examining data we can find patterns to perceive information, and then information can be used to enhance knowledge

Ways of Thinking About Data

Types of Data

Qualitative data:

- Data that is represented either in a verbal or narrative format is qualitative data.
- These types of data are collected through focus groups, interviews, opened ended questionnaire items, and other less structured situations.
- A simple way to look at qualitative data is to think of qualitative data in the form of words.

Ways of Thinking About Data

Types of Data

Quantitative data:

- Quantitative data is data that is expressed in numerical terms, in which the numeric values could be large or small.

- Num

el.

Sample Quantitative Data from PIR

Actual Enrollment by Child

Ages of children served:

a. Under 1 year:	3,843
b. 1 Year old:	4,785
c. 2 Years old:	6,341
d. 3 Years old:	7,604
e. 4 years old:	6,988
f. 5 Years and older:	3,462

Ways of Thinking About Data

Types of Data

Qualitative Data	Family Partnership Agreements Social Service logs Advisory group minutes Policy Council minutes Newspaper articles
Quantitative	PIR Child performance tracking Health data tracking systems
Mixed Data	Enrollment info Enrollment & transition records Surveys (i.e., Parent, Teacher/Staff, Farmer)

Ways of Thinking About Data

Data Strategies for Analyses

- There are a variety of strategies for quantitative and qualitative analyses

- Different strategies provide data analysts with an organized approach to working with data; they enable the analyst to create a “logical sequence” for the use of different procedures.

Ways of Thinking About Data

Data Strategies for Analyses

Examples of strategies for quantitative analysis

- Visualizing Data
- Exploratory Analyses
- Trend Analysis
- Estimation

Ways of Thinking About Data

Data Strategies for Analyses

Visualizing Data

- Visualizing data is to literally create and then consider a visual display of data.

- Technically, it is not analysis, nor is it a substitute for analysis. However, visualizing data can be a useful starting point prior to the analysis of data.

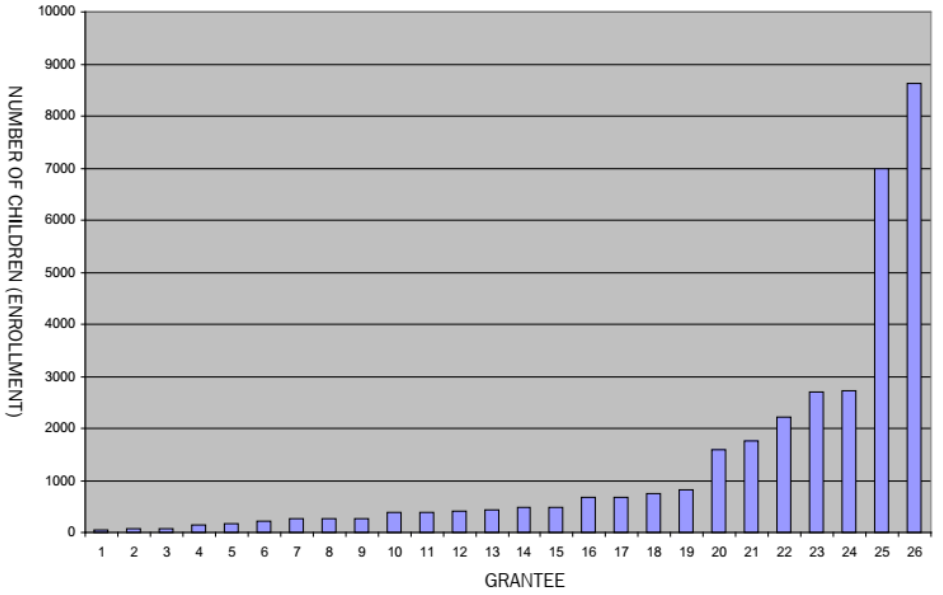
Ways of Thinking About Data

Data Strategies for Analyses

Visualizing Data

Rank Order of Funded Enrollement

50	470
70	480
75	677
133	684
171	754
217	830
259	1601
266	1762
274	2216
377	2709
391	2719
402	6984
425	8623



Ways of Thinking About Data

Data Strategies for Analyses

Exploratory Analysis

- Exploratory analysis entails looking at data when there is a low level of knowledge about a particular indicator (teacher qualifications, first and second language acquisition, etc.)

- It could also include the relationship between indicators and/or what is the cause of a particular indicator.

Ways of Thinking About Data

Data Strategies for Analyses

Trend Analysis

- The most general goal of trend analysis is to look at data over time.

- This form of trend analysis is carried out in order to assess the level of an indicator before and after an event.

- For example, to decern whether a given indicator such as the number of children with disabilities has increased or decreased over time, and if it has, how quickly or slowly the increase or decrease has occurred.

Ways of Thinking About Data

Data Strategies for Analyses

Estimation

- Estimation procedures may occur when working with either quantitative or qualitative data.

- Estimation is one of many tools used to assist planning for the future.

- Estimation is the combination of information from different data sources to project information not available in any one source by itself

Conceptualizing Data Analysis as a Process

Data Analysis

- Data analysis can refer to a variety of specific procedures and methods.

- Data analysis process that includes the following key components:
  1. Purpose
  2. Questions
  3. Data Collection
  4. Data Analysis Procedures and Methods
  5. interpretation/identification of Findings
  6. Writing, Reporting, and Dissemination; and
  7. Evaluation

Conceptualizing Data Analysis as a Process

Data Analysis

- There are many different ways of conceptualizing the data analysis process.

- It can be divided into;
  1. linear approach
  2. cyclical approach

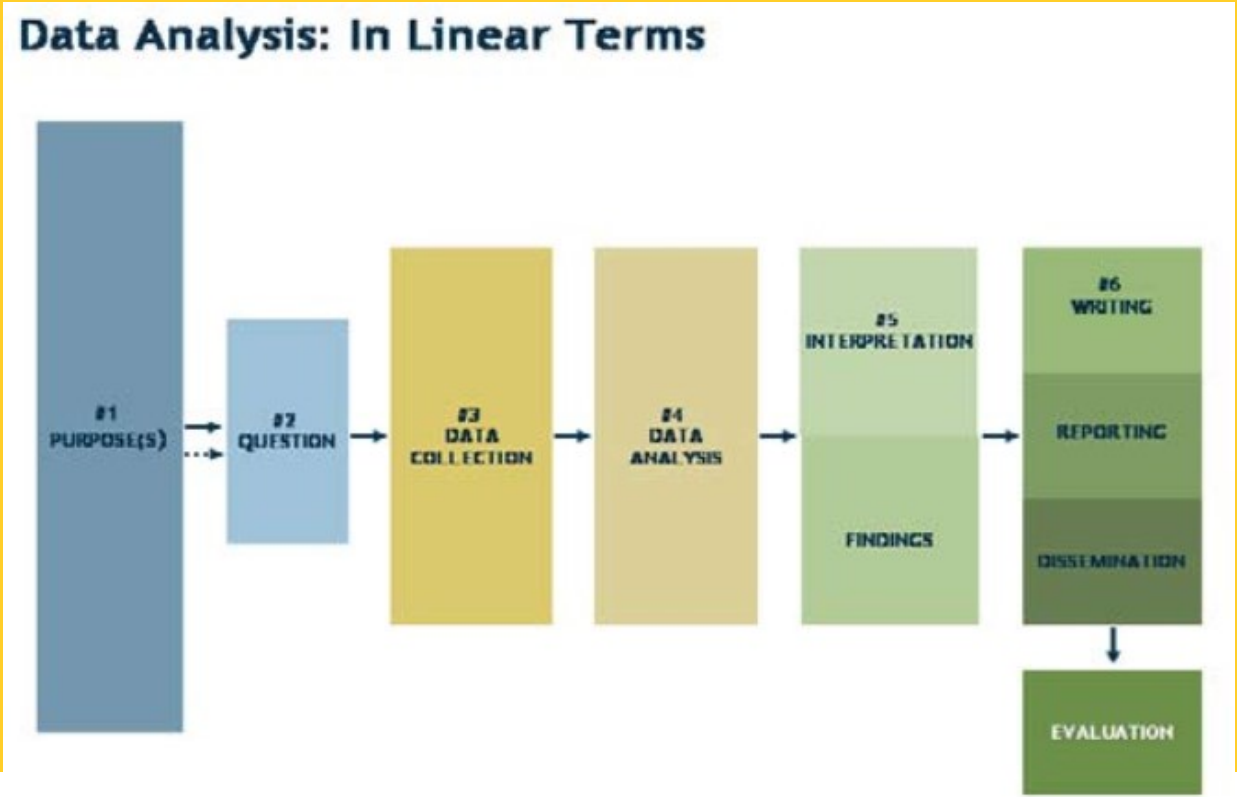
Conceptualizing Data Analysis as a Process

Data Analysis: Linear approach

- A strictly linear approach to data analysis is to work through the components in order, from beginning to end.
- A possible advantage of this approach is that it is structured and organized, as the steps of the process are arranged in a fixed order.
- In addition, this linear conceptualization of the process may make it easier to learn.
- A possible disadvantage is that the step-by-step nature of the decision making may obscure or limit the power of the analyses – in other words, the structured nature of the process limits its effectiveness.

Conceptualizing Data Analysis as a Process

Data Analysis: Linear approach



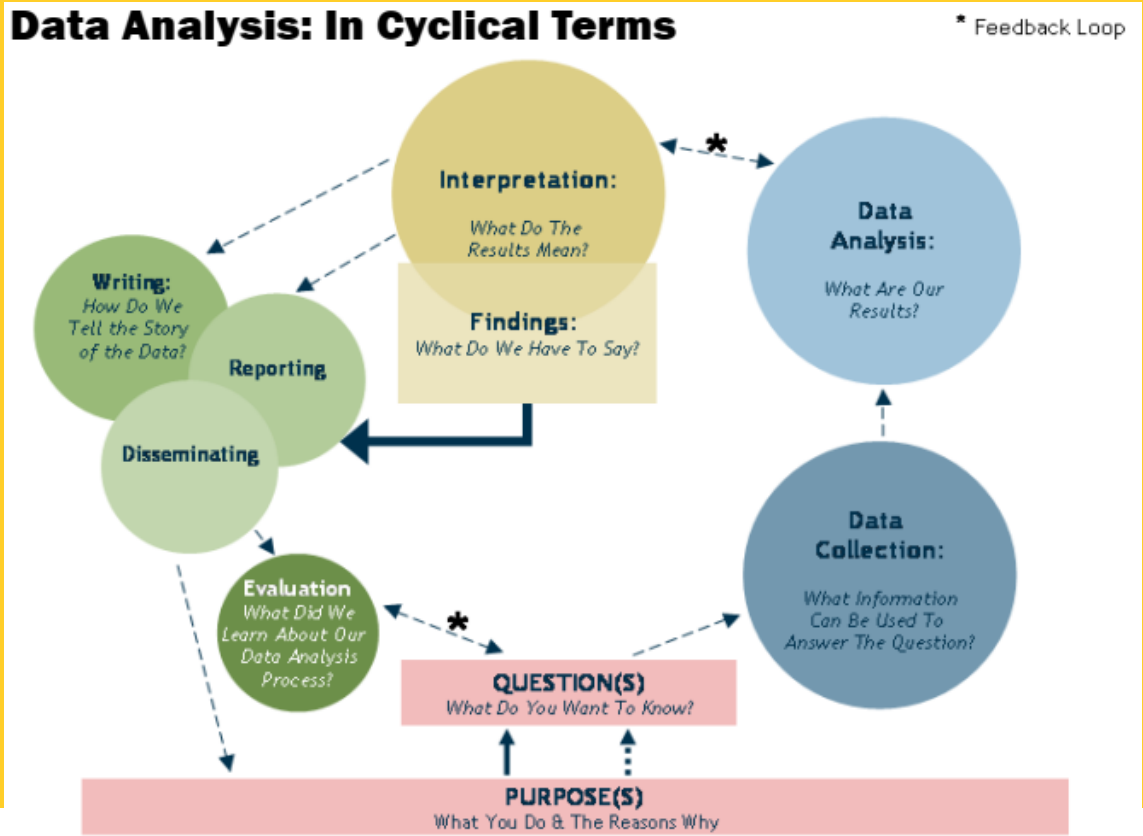
Conceptualizing Data Analysis as a Process

Data Analysis: Cyclical approach

- A cyclical approach to data analysis provides much more flexibility to the nature of the decision making and also includes more and different kinds of decisions to be made.
- In this approach, different components of the process can be worked on at different times and in different sequences – as long as everything comes “together” at the end.
- A possible advantage of this approach is that program staff are not “bound” to work on each step in order.
- The potential exists for program staff to “learn by doing” and to make improvements to the process before it is completed.

Conceptualizing Data Analysis as a Process

Data Analysis: Cyclical approach




Case Study


Thank you