W2-Data Science Topics

April 12, 2021 12:46 AM

Learning Objectives

- Define Big Data and its distinguishing characteristics, such as, Velocity, Volume,Variety , Veracity, and Value.
- Describe how Hadoop and other big data tools, combined with distributed computing power, are triggering digital transformation.
- List some of the skills required to be a data scientist and analyze big data.
- Explain what data mining is and the steps required to mine a given a dataset.
- Explain the difference between common data science terms, including deep learning and machine learning.
- Describe regression and some of its applications

Big Data and Data Mining

Foundations of Data

- **Velocity**: speed of data accumlated
- **Volumn**: scale of data
- **Variety**: diversity of data
- **Veracity**: quality and origin of data
    - attributes: Consistency, Completeness, Integrity, Ambiguity
- **Value**: ability turn data into value

Deep Learning and Machine Learning

What is the Difference?

Big Data: dataset that is massive, quickly build and varied that defy traditional analysis method

Data Mining: process for searching and analyzing data and discovering previously unrevealed patterns

Machine Learning: a subset of AI uses computer algorithms to analyze data and make intelligent decision based on what it has learn without being explicitly programmed

- trained with large sets of data
- learn from examples
- do not follow rules-based algorithms

Deep Learning: a specilized subset of machine learnig that uses layered neural networks to simulate human decision-making

Neural Network and Deep Learning

use case: recongnzing speech, recognizing people, classifying image

W3-Data Science in Business

April 15, 2021 2:58 PM

Learning Objectives

- Describe the application of data science in healthcare.
- Explain how companies can start on their data science journey.
- Describe some of the ways in which data is generated by consumers.
- Describe how businesses such as Netflix, Amazon, UPS, Google, and Apple are using data generated by their consumers and employees.
- List some of the qualities that differentiate data scientists from other data professionals.
- Define the purpose of the final deliverable of a data science project and the role of storytelling in the final deliverable.
- Describe what the final report of a Data Science project should cover and how it should be structured for best results.
- Demonstrate your understanding of the readings to define what data science and data scientist mean.
- Demonstrate your understanding of the readings to answer a question about the final deliverable of data science project.

Data Science Tehniques and Field

Example 1: HealthCare

Techniques:

- Data Mining
    - electronic medical record for different types of medical research
    - school as NorthShore University Health System
- Data Modeling
- Statistics
- Machine Learning

Determine Procedure

1. use above technique find the best options for patients
2. use predictive analytics examine know factors for a disease
    a. gene markers
    b. associated conditions
    c. environmental factors
3. recommand test, sutiable trail and suggest treatments

Application of Data Science

Recommandation Engine

- Amazon
- Netflix
- Spotify

Career for Data Science

VIDEO_LINK: Data Scientist Soft and Technical Skills

Skill for Data Scientist.mp4

Case Study: Start Data Science for Company

April 15, 2021 3:10 PM

Require to begin with Data Science
(It is Important Start Measurement, NOW OR NEVER!)

Problem :

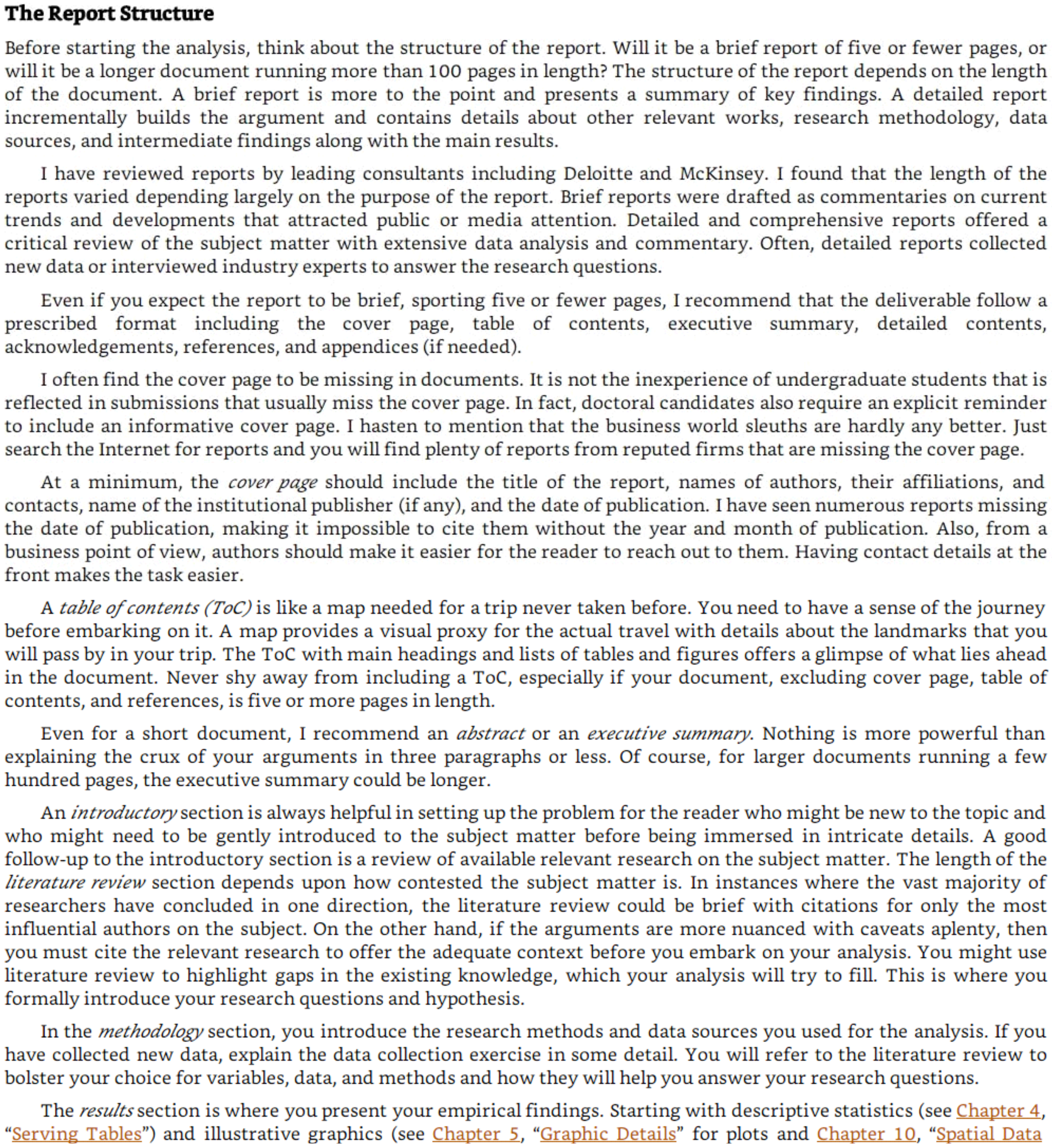
- unable to mesure cost
- unable reduce cost
- unable measure profit
- unable to increase profit

Start Task:start recording infromation and capturing data

- data about costs
- differentiable labor costs
- material cost
- how much cost to sell one product
- total cost
- revenue ?e.g. 80% revenue coming from 20% of you customers

Report Schema/Structure

April 15, 2021 4:37 PM



The Report Structure

Before starting the analysis, think about the structure of the report. Will it be a brief report of five or fewer pages, or will it be a longer document running more than 100 pages in length? The structure of the report depends on the length of the document. A brief report is more to the point and presents a summary of key findings. A detailed report incrementally builds the argument and contains details about other relevant works, research methodology, data sources, and intermediate findings along with the main results.

I have reviewed reports by leading consultants including Deloitte and McKinsey. I found that the length of the reports varied depending largely on the purpose of the report. Brief reports were drafted as commentaries on current trends and developments that attracted public or media attention. Detailed and comprehensive reports offered a critical review of the subject matter with extensive data analysis and commentary. Often, detailed reports collected new data or interviewed industry experts to answer the research questions.

Even if you expect the report to be brief, sporting five or fewer pages, I recommend that the deliverable follow a prescribed format including the cover page, table of contents, executive summary, detailed contents, acknowledgements, references, and appendices (if needed).

I often find the cover page to be missing in documents. It is not the inexperience of undergraduate students that is reflected in submissions that usually miss the cover page. In fact, doctoral candidates also require an explicit reminder to include an informative cover page. I hasten to mention that the business world sleuths are hardly any better. Just search the Internet for reports and you will find plenty of reports from reputed firms that are missing the cover page.

At a minimum, the *cover page* should include the title of the report, names of authors, their affiliations, and contacts, name of the institutional publisher (if any), and the date of publication. I have seen numerous reports missing the date of publication, making it impossible to cite them without the year and month of publication. Also, from a business point of view, authors should make it easier for the reader to reach out to them. Having contact details at the front makes the task easier.

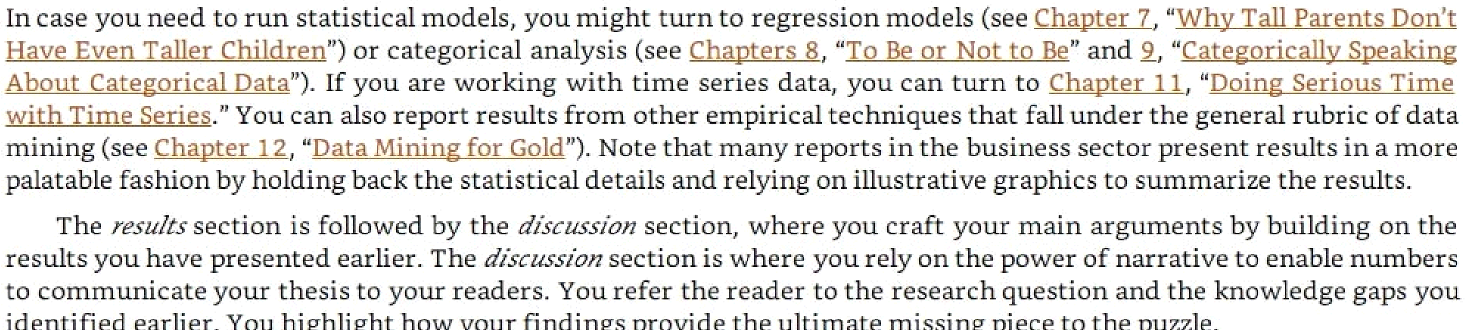
A *table of contents (ToC)* is like a map needed for a trip never taken before. You need to have a sense of the journey before embarking on it. A map provides a visual proxy for the actual travel with details about the landmarks that you will pass by in your trip. The ToC with main headings and lists of tables and figures offers a glimpse of what lies ahead in the document. Never shy away from including a ToC, especially if your document, excluding cover page, table of contents, and references, is five or more pages in length.

Even for a short document, I recommend an *abstract* or an *executive summary*. Nothing is more powerful than explaining the crux of your arguments in three paragraphs or less. Of course, for larger documents running a few hundred pages, the executive summary could be longer.

An *introductory* section is always helpful in setting up the problem for the reader who might be new to the topic and who might need to be gently introduced to the subject matter before being immersed in intricate details. A good follow-up to the introductory section is a review of available relevant research on the subject matter. The length of the *literature review* section depends upon how contested the subject matter is. In instances where the vast majority of researchers have concluded in one direction, the literature review could be brief with citations for only the most influential authors on the subject. On the other hand, if the arguments are more nuanced with caveats aplenty, then you must cite the relevant research to offer the adequate context before you embark on your analysis. You might use literature review to highlight gaps in the existing knowledge, which your analysis will try to fill. This is where you formally introduce your research questions and hypothesis.

In the *methodology* section, you introduce the research methods and data sources you used for the analysis. If you have collected new data, explain the data collection exercise in some detail. You will refer to the literature review to bolster your choice for variables, data, and methods and how they will help you answer your research questions.

The *results* section is where you present your empirical findings. Starting with descriptive statistics (see Chapter 4, "Serving Tables") and illustrative graphics (see Chapter 5, "Graphic Details" for plots and Chapter 10, "Spatial Data



In case you need to run statistical models, you might turn to regression models (see Chapter 7, "Why Tall Parents Don't Have Even Taller Children") or categorical analysis (see Chapters 8, "To Be or Not to Be" and 9, "Categorically Speaking About Categorical Data"). If you are working with time series data, you can turn to Chapter 11, "Doing Serious Time with Time Series." You can also report results from other empirical techniques that fall under the general rubric of data mining (see Chapter 12, "Data Mining for Gold"). Note that many reports in the business sector present results in a more palatable fashion by holding back the statistical details and relying on illustrative graphics to summarize the results.

The *results* section is followed by the *discussion* section, where you craft your main arguments by building on the results you have presented earlier. The *discussion* section is where you rely on the power of narrative to enable numbers to communicate your thesis to your readers. You refer the reader to the research question and the knowledge gaps you identified earlier. You highlight how your findings provide the ultimate missing piece to the puzzle.

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Of course, not all analytics return a smoking gun. At times, more frequently than I would like to acknowledge, the results provide only a partial answer to the question and that, too, with a long list of caveats.

In the *conclusion* section, you generalize your specific findings and take on a rather marketing approach to promote your findings so that the reader does not remain stuck in the caveats that you have voluntarily outlined earlier. You might also identify future possible developments in research and applications that could result from your research.

What remains is housekeeping, including a list of *references*, the *acknowledgement* section (acknowledging the support of those who have enabled your work is always good), and *appendices*, if needed.

Have You Done Your Job as a Writer?

As a data scientist, you are expected to do a thorough analysis with the appropriate data, deploying the appropriate tools. As a writer, you are responsible for communicating your findings to the readers. *Transport Policy*, a leading research publication in transportation planning, offers a checklist for authors interested in publishing with the journal. The checklist is a series of questions authors are expected to consider before submitting their manuscript to the journal. I believe the checklist is useful for budding data scientists and, therefore, I have reproduced it verbatim for their benefit.

1. Have you told readers, at the outset, what they might gain by reading your paper?
2. Have you made the aim of your work clear?
3. Have you explained the significance of your contribution?
4. Have you set your work in the appropriate context by giving sufficient background (including a complete set of relevant references) to your work?
5. Have you addressed the question of practicality and usefulness?
6. Have you identified future developments that might result from your work?
7. Have you structured your paper in a clear and logical fashion?