Types of Data Analysis

Kaustubh Kulkarni

- Different types of data analysis:
  - Descriptive analysis,
  - Diagnostics analysis,
  - Predictive analysis,
  - Prescriptive analysis

4 Questions

- **Descriptive analysis:** What happened?
- **Diagnostic analysis:** Why did this happen?
- **Predictive analysis:** What could happen? (based on past data)
- **Prescriptive analysis:** What can we do about it? (best course of action based on the results from the above three analyses)

What Does Descriptive analysis Tell Us?

- It gives businesses essential information about how it's doing, where it's going, and how it's stacking up against the competition.
- **The company's current performance**: Descriptive analysis helps businesses keep track of critical metrics involving individuals, groups and teams, and the company as a whole.
- For instance, descriptive analysis can show how a specific sales representative is doing this quarter or which of their products sells the most.

Read Yourself Slide

- **The business's historical trends**: Descriptive analysis gathers information over long periods, and that accumulated information can be used to track the company's progress by comparing the metrics for different periods.
- For example, the corporate bean counters can track sales or expenses by comparing the results of various quarters, calculating revenue growth by percentages, and rendering the results on easy-to-read charts.

- **The company's strong and weak points**: Descriptive analysis gives professionals the tools to compare the performances of various business groups using metrics like employee-generated revenue or expenses as a percentage of revenue.
- It will also compare these results with known industry averages or published results from other businesses.
- These comparisons help companies see where they're doing well and where they need to improve.

Bonus Reading

- The data is stored in a particular way so that it can be analysed faster.
- Refer to the slides on data warehousing, data lakes and OLAP shared along with the module1 material.

Steps in descriptive analysis

Descriptive analysis breaks down into five steps, including:

1. State the Business Metrics
2. Identify the Data Required
3. Extract and Prepare the Data
4. Analyze the Data
5. Present the Data

Advantages of Descriptive analysis

- **It’s easy to do**: Descriptive analysis doesn’t require great expertise or experience in statistical methods or analysis.
- **There are a lot of tools available**: There is a cornucopia of analysis tools available to choose from, products that do most of the heavy lifting. Come to think of it, that helps explain why it’s easy to perform descriptive analysis!
- **It answers the most common business performance questions**: Most stakeholders and salespeople want to know things like "How are we doing?" or "What should we be doing differently?" Descriptive analysis provides the data needed to answer those questions efficiently, no matter when or how often they're asked

Drawbacks

- **It's limited to simple analysis**: Descriptive analysis examines the relationship between a handful of variables, and that's all.
- **It tells you what, but not why**: Descriptive analysis reports events as they happened, not why they happened or what could possibly happen next.

Diagnostics analysis

- Involves drilling deeper into data to identify not only what has occurred, but why.
- This focus on cause and effect is why diagnostic analysis is sometimes known as **root cause analysis**.
- Diagnostic analysis is similar to descriptive analysis in that it also uses historical data.
- However, its unique feature is that it aims to identify and explain anomalies and outliers.

- For instance, perhaps a fashion brand sees an unexpected surge in profits. By applying diagnostic analysis, the company can develop and test various hypotheses about why that has happened.
- Perhaps one of their clothing ranges has been promoted by a celebrity influencer, or maybe it has appeared on a Netflix series.
- By sourcing and analysing additional data, they can identify the most likely cause for the profit surge, in turn, informing their future strategy (for instance, by actively pursuing product placement deals with Netflix).

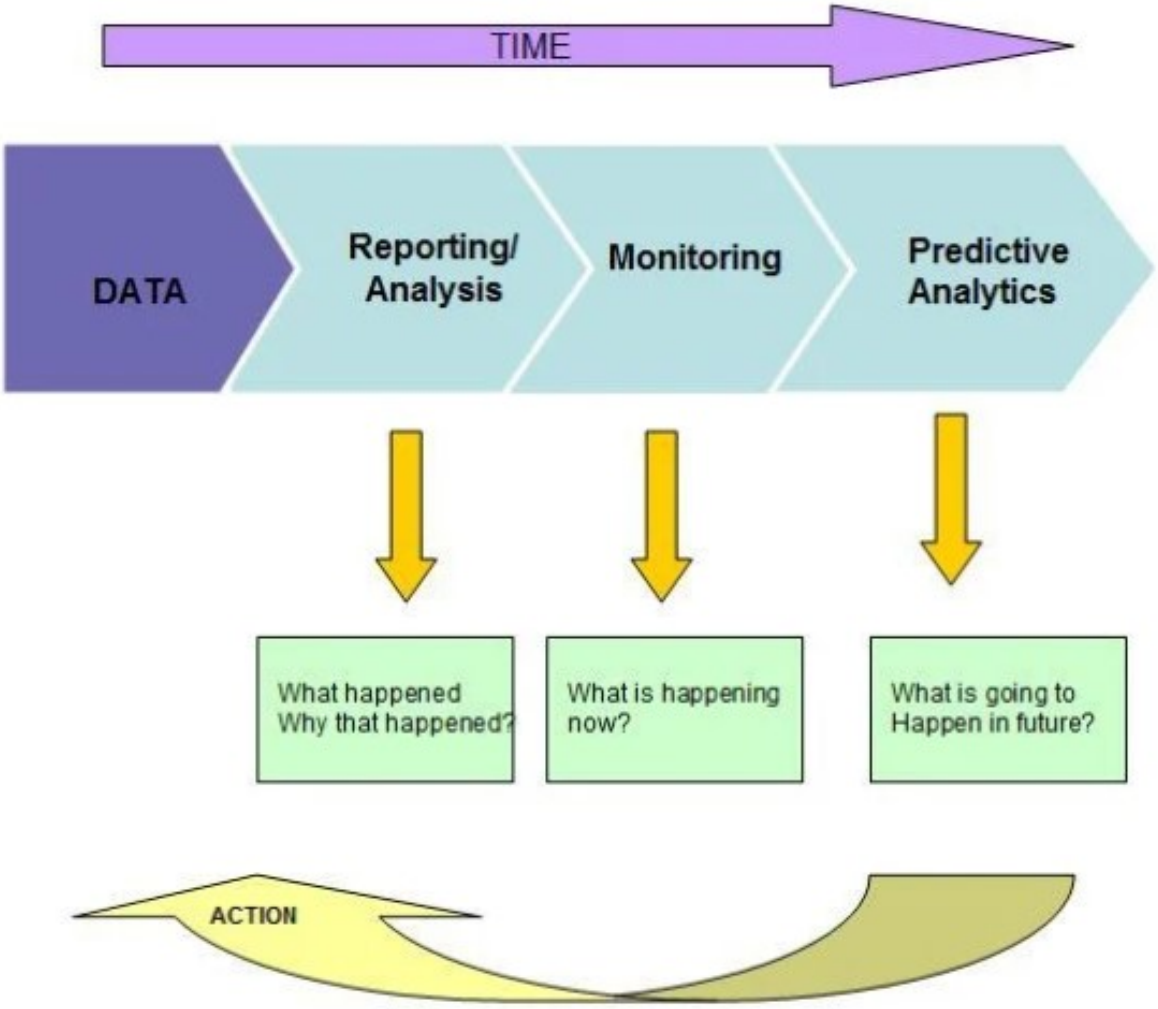
- Diagnostic analysis employs various techniques, ranging from probability theory to regression analysis, clustering analysis, filtering, time-series analysis, and more.

How is diagnostic analysis used by different stakeholders?

- **Sales teams**—to determine why a company's profits are dropping or growing.
- **Marketing teams**—to figure out why a website has seen a traffic increase.
- **IT**—to diagnose technical problems within a company's digital infrastructure.
- **HR**—to understand the factors contributing to why employees may leave a company.
- **Big pharma**—to evaluate the effectiveness of different drugs.
- **Hospitals**—to understand why patients are admitted for particular ailments.

Diagnostic Analysis

Predictive Analysis



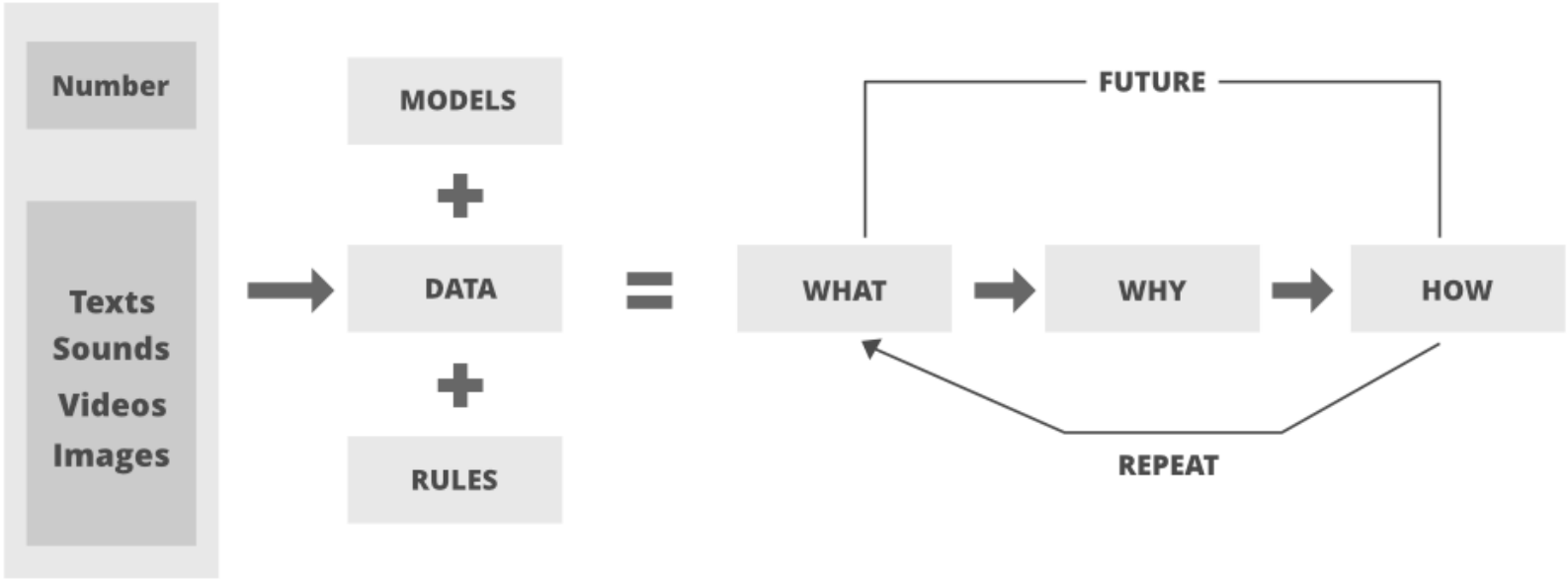
How to develop a predictive analysis process

- **Define the requirements.** Understand the business problem you're trying to solve. Is it managing inventory? Reducing fraud? Predicting sales? A business user or subject matter expert generally takes charge of this first step.
- **Explore the data.** Identify the data that informs the problem you're trying to solve.

How to develop a predictive analysis process

- **Develop the model.** A data scientist can help figure out which predictive models are best suited to solving the problem.
- **Deploy the model.** Once the model is approved by the data scientist, a data engineer determines how best to retrieve, clean and transform the required raw data.
- **Validate the results.**

Predictive Analysis



A COMPLETE EXAMPLE

Descriptive analysis

- Descriptive analysis answers the question, “What happened?”
- For example, imagine you’re analyzing your company’s data and find there’s a seasonal surge in sales for one of your products: a video game console.
- Here, descriptive analysis can tell you, “This video game console experiences an increase in sales in October, November, and early December each year.”

Diagnostic analysis

- Diagnostic analysis addresses the next logical question, “Why did this happen?”
- Taking the analysis a step further, this type includes comparing coexisting trends or movement, uncovering correlations between variables, and determining causal relationships where possible.
- Continuing the example, you may dig into video game console users’ demographic data and find that they’re between the ages of eight and 18.
- The customers, however, tend to be between the ages of 35 and 55.
- Analysis of customer survey data reveals that one primary motivator for customers to purchase the video game console is to gift it to their children.
- The spike in sales in the fall and early winter months may be due to the holidays that include gift-giving.

Predictive analysis

- Predictive analysis is used to make predictions about future trends or events and answers the question, “What might happen in the future?”
- By analyzing historical data in tandem with industry trends, you can make informed predictions about what the future could hold for your company.
- For instance, knowing that video game console sales have spiked in October, November, and early December every year for the past decade provides you with ample data to predict that the same trend will occur next year.
- Backed by upward trends in the video game industry as a whole, this is a reasonable prediction to make.

Prescriptive analysis

- Finally, prescriptive analysis answers the question, “What should we do next?”
- What should your team decide to do given the predicted trend in seasonality due to winter gift-giving?
- Perhaps you decide to run an A/B test with two ads: one that caters to product end-users (children) and one targeted to customers (their parents).
- The data from that test can inform how to capitalize on the seasonal spike and its supposed cause even further.
- Or, maybe you decide to increase marketing efforts in September with holiday-themed messaging to try to extend the spike into another month.
- While manual prescriptive analysis is doable and accessible, machine-learning algorithms are often employed to help parse through large volumes of data to recommend the optimal next step.

Descriptive vs. Predictive vs. Prescriptive analysis

	Descriptive Analysis	Predictive Analysis	Prescriptive Analysis
Summary	What happened?	What's going to happen?	What should happen?
Function	It uses data mining and data aggregation to discover historical data.	It looks at historical data and analyzes past data trends to predict what could happen.	It takes the conclusions gleaned from descriptive and predictive analysis and recommends the best future course of action.

	Descriptive Analysis	Predictive Analysis	Prescriptive Analysis
Pros	It’s easy to employ in daily operations. Little experience is needed.	It’s a valuable forecasting tool.	It offers critical insights into making the best, most informed decisions.
Cons	It offers a limited view, and doesn't go beyond the data’s surface.	It needs lots of historical data to work. It will never be 100% accurate.	It requires a lot of past data and often cannot account for all possible variables.

Questions ?