



PLURALSIGHT

Presenting visual Data

Welcome!



Tarek Atwan
Instructor, Pluralsight

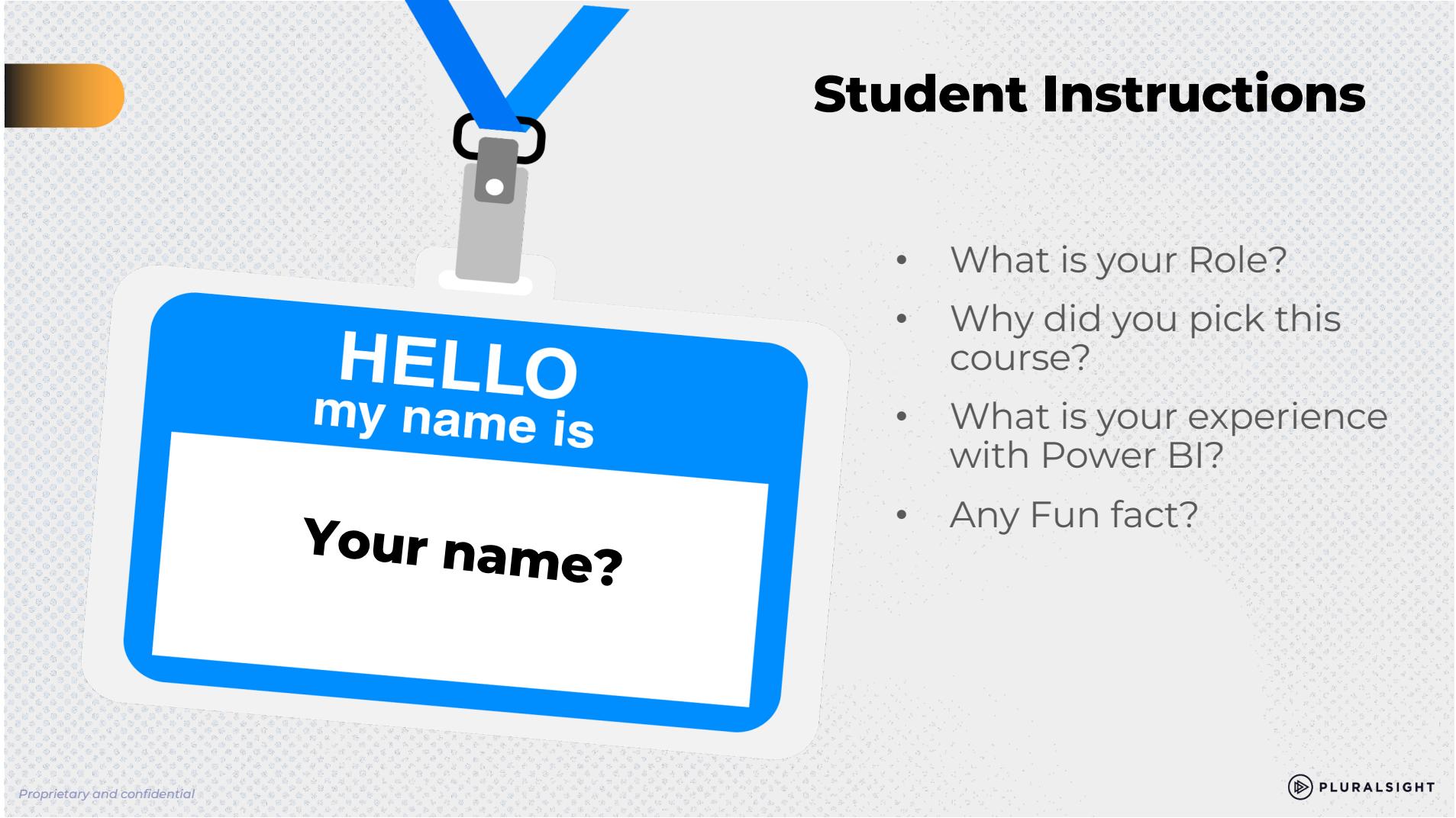
**HELLO
my name is**

Tarek Atwan

About Me:

- Book Author
- 18+ Years Consulting Services
- 5+ Years Instructor
- 2 Startups
- World Traveler

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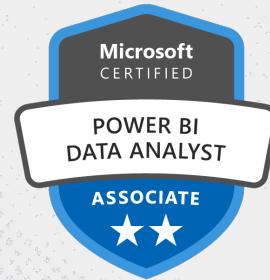
Student Instructions

- What is your Role?
- Why did you pick this course?
- What is your experience with Power BI?
- Any Fun fact?

Objectives

At the end of this course, you will be able to:

- Have a good understanding of Data Visualization Best Practices
- Ability to create visualizations in Power BI
- Be ready to continue your journey and explore taking **PL-300**
- **Microsoft Certified: Power BI Data Analyst Associate**

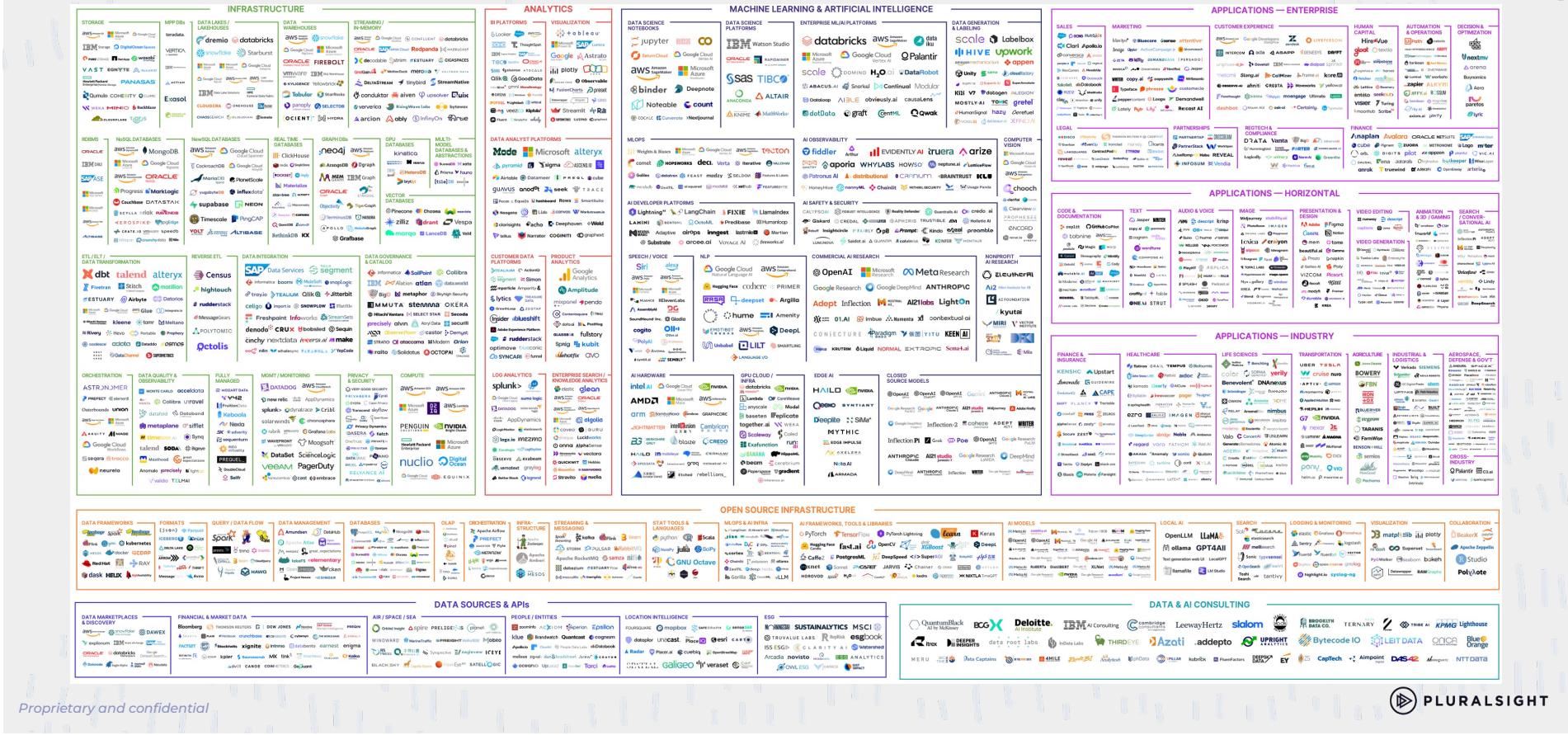


Analytics Landscape

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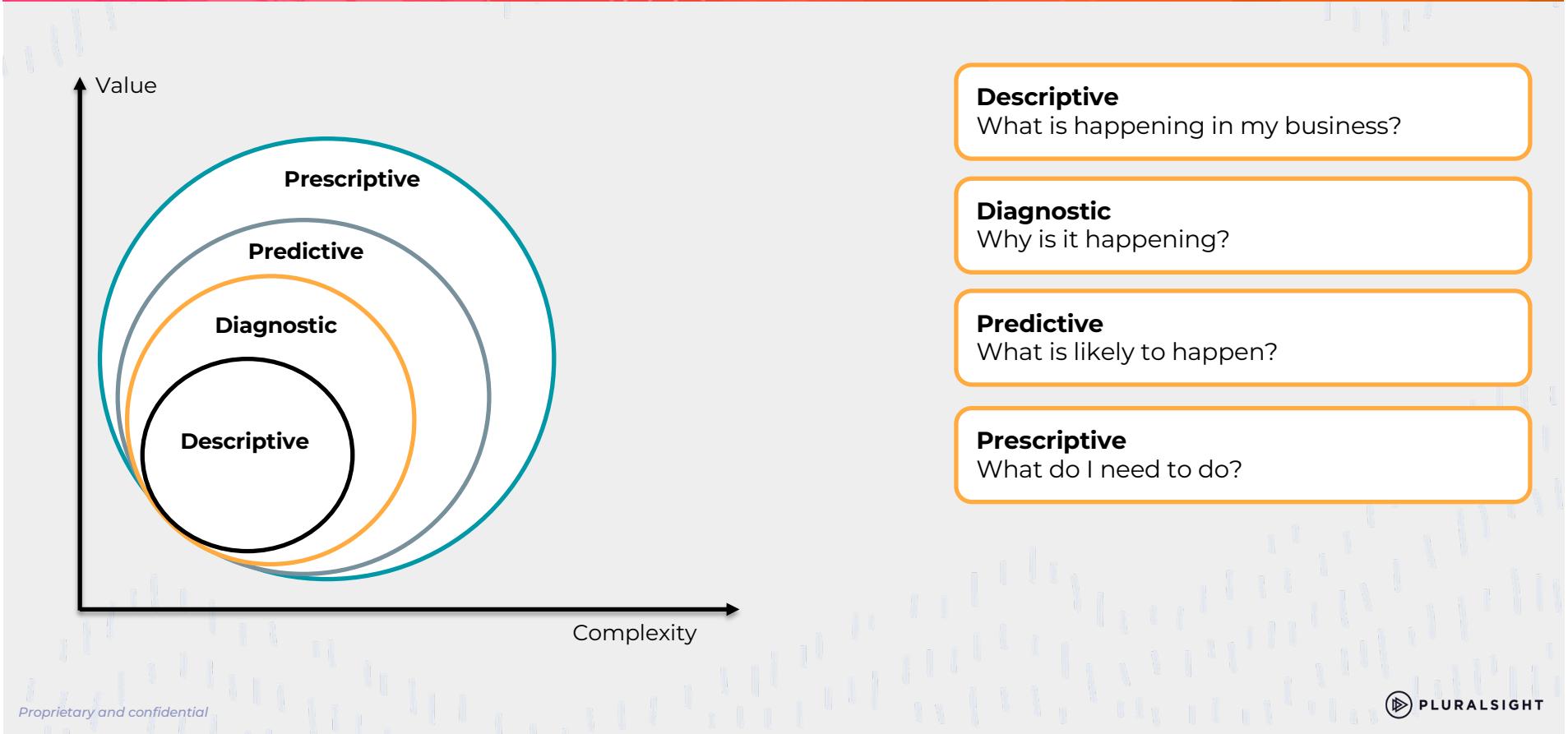
The Landscape AI and Data Analytics



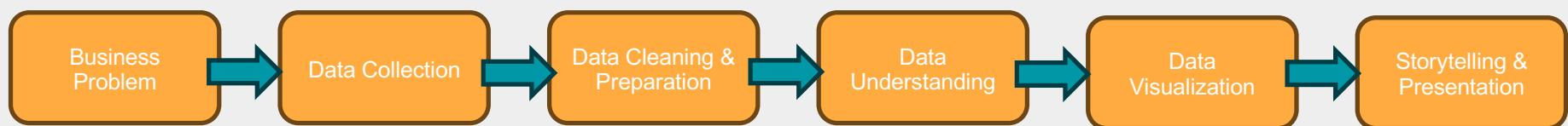
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PLURALSIGHT

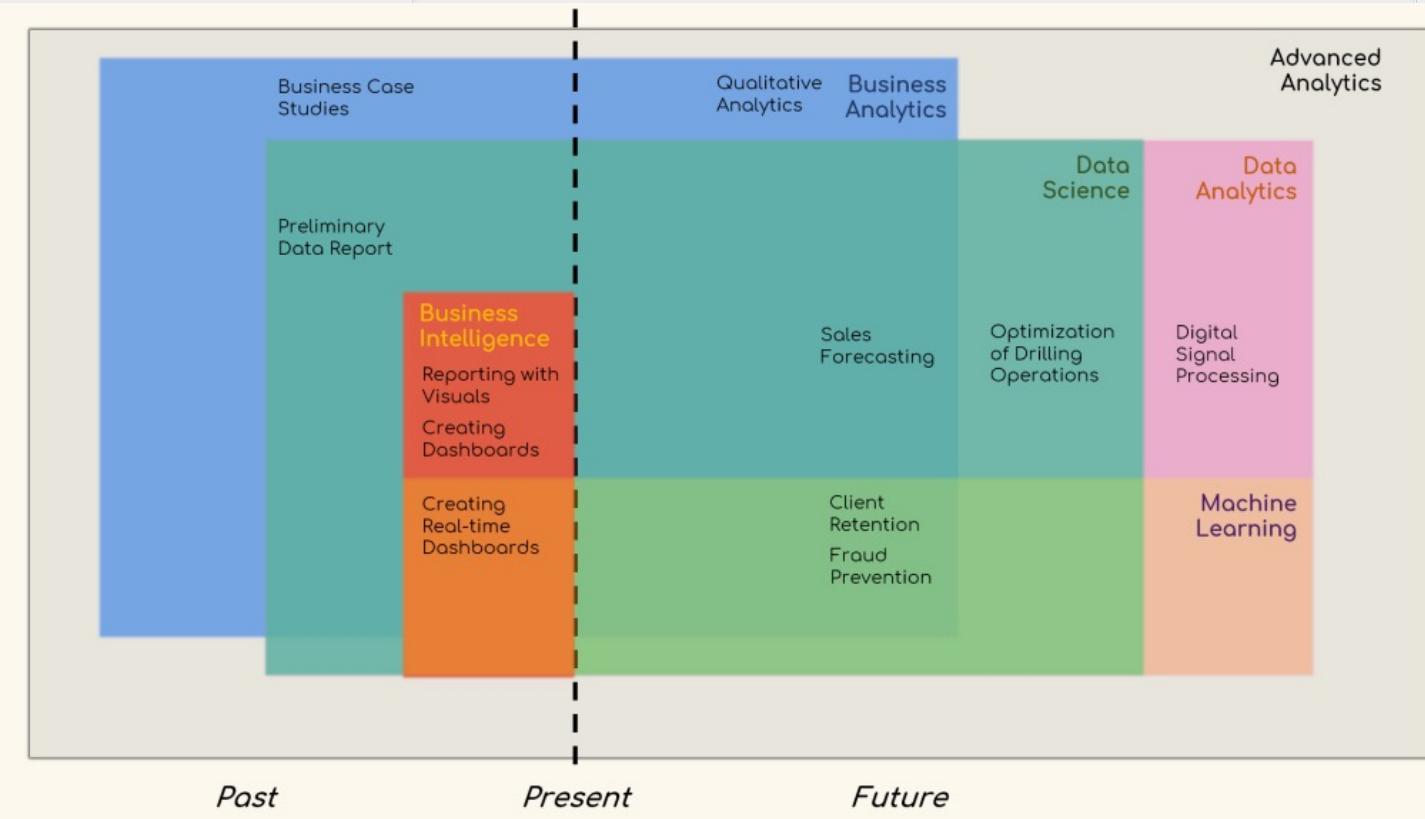
Types of Data Analytics



Data Analysis Process



Data Disciplines



Data Roles

	Most commonly used tools	Possible Job Titles	Beginner Skill Level	Intermediate Skill Level	Advanced Skill Level
	Data Consumers Data consumers use data to make data-driven decisions, and actively have informed conversations with data practitioners.	Business Intelligence tools Tableau or Power BI Spreadsheets Excel or Google Sheets	1. Chief Marketing Officer 2. Human Resources Manager 3. Head of Sales and Business Development	1. Understands what data scientists, machine learning scientists, and data engineers do 2. Knows which questions can (and can't) be answered with data 3. Interpret the results of data projects, including calculations and visualizations.	1. Is able to calculate descriptive statistics 2. Can draw common data visualizations 3. Understands the business applications of data
	Business Analysts Business Analysts are responsible for tying data insights to actionable results that increase profitability or efficiency. They have deep knowledge of the business domain and often use SQL alongside non-coding tools to communicate insights derived from data.	Business Intelligence tools Tableau or Power BI Databases SQL Spreadsheets Excel or Google Sheets	1. Business Analyst 2. Marketing Analyst 3. Data Analyst 4. Supply Chain Analyst	1. Is able to calculate descriptive statistics 2. Can draw common data visualizations 3. Understands the business applications of data	1. Has a deep knowledge of the business domain 2. Is able to report and communicate using data
	Data Analysts Similar to Business Analysts, Data Analysts are responsible for analyzing data and reporting insights from their analysis. They have a deep understanding of the data analysis workflow and report their insights through a combination of coding and non-coding tools.	Programming languages R or Python Business Intelligence tools Tableau or Power BI Databases SQL Spreadsheets Excel or Google Sheets	1. Business Analyst 2. Marketing Analyst 3. Data Analyst 4. Supply Chain Analyst	1. Is able to calculate descriptive statistics 2. Can draw common data visualizations 3. Understands the business applications of data	1. Perform the data analysis workflows, including importing, manipulating, cleaning, calculating, and reporting on business data 2. Has a strong grasp of business intelligence tools
	Data Scientists Data Scientists investigate, extract, and report meaningful insights in the organization's data. They communicate these insights to nontechnical stakeholders and have a good understanding of machine learning workflows and how to tie them back to business applications. They work almost exclusively with coding tools, conduct analysis, and often work with big data tools	Programming languages R or Python Databases SQL Command line tools Git or Bash Big data tools Airflow or Spark	1. Data Scientist 2. Analytics Engineer 3. Data Analyst	1. Perform the data analysis workflows, including importing, manipulating, cleaning, calculating, and reporting on business data 2. Understands the business applications of data	1. Understands fundamental statistics, including distributions, modeling, and inference 2. Designing simple experiments such as A/B tests 3. Can create dashboards 1. Applies analysis to business applications such as finance, marketing, and healthcare 2. Understands supervised and unsupervised machine learning workflows 3. Work with non-standard data types, such as time series, text, geospatial, and images.

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Data Roles

Most commonly used tools	Possible Job Titles	Beginner Skill Level	Intermediate Skill Level	Advanced Skill Level
Machine Learning Scientists  <p>Machine Learning Scientists design and develop machine learning models that make predictions from the organization's data. They solve problems like predicting customer churn and lifetime value and are responsible for deploying models for the organization to use. They work exclusively with coding-based tools.</p>	Programming languages R or Python Databases SQL Big data tools Airflow or Spark Command line tools Git or Bash	1. Data Scientist 2. Research Scientist 3. Machine Learning Engineer	1. Perform the data analysis workflows, including importing, manipulating, cleaning, calculating, and reporting on business data	1. Performing supervised and unsupervised machine learning workflows including feature engineering, training models, testing goodness of fit, making predictions 2. Applies analysis to business applications such as finance, marketing, and healthcare
Statisticians  <p>Similar to Data Scientists, Statisticians work on highly rigorous analysis, which involves designing and maintaining experiments such as A/B tests and hypothesis testing. They focus on quantifying uncertainty and presenting findings that require exceptional degrees of rigor, like in finance or healthcare.</p>	Programming languages R Python Scala Databases SQL	1. Quantitative Analyst 2. Inference Data Scientist 3. Clinical Data Analyst	1. Perform the data analysis workflows, including importing, manipulating, cleaning, calculating, and reporting on business data 2. Understands the business applications of data	1. Perform statistical modeling workflows, including feature engineering, training models, testing goodness of fit, and inferring significance 2. Test hypotheses and design simple experiments such as A/B tests
Programmers  <p>Programmers are highly technical individuals that work on data teams and work on automating repetitive tasks when accessing and working with an organization's data. They bridge the gap between traditional software engineering and data science and have a thorough understanding of deploying and sharing code at scale.</p>	Programming languages R Python Scala Databases SQL Command line tools Git or Shell	1. Software Engineer 2. Data Scientist 3. Dev-Ops Engineer	1. Write functions to avoid repetitive code 2. Benchmark and optimize code to improve performance	1. Develop best practices for testing code 2. Work with web APIs 3. Develop packages for sharing code
Data Engineers  <p>Data Engineers are responsible for getting the right data in the hands of the right people. They create and maintain the infrastructure and data pipelines that take terabytes of raw data coming from different sources into one centralized location with clean, relevant data for the organization.</p>	Programming languages R Python Scala Databases SQL Command line tools Git or Shell Big data tools Airflow or Spark Cloud platforms AWS GCP Azure	1. Data Engineer 2. Software Engineer 3. Dev-Ops Engineer	1. Efficiently extract, transform, and load data	1. Process data and automate data flows using the command line 2. Process data in the cloud 3. Manage, optimize and process big datasets and large databases

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INTRODUCTION TO DATA VISUALIZATION AND STORYTELLING

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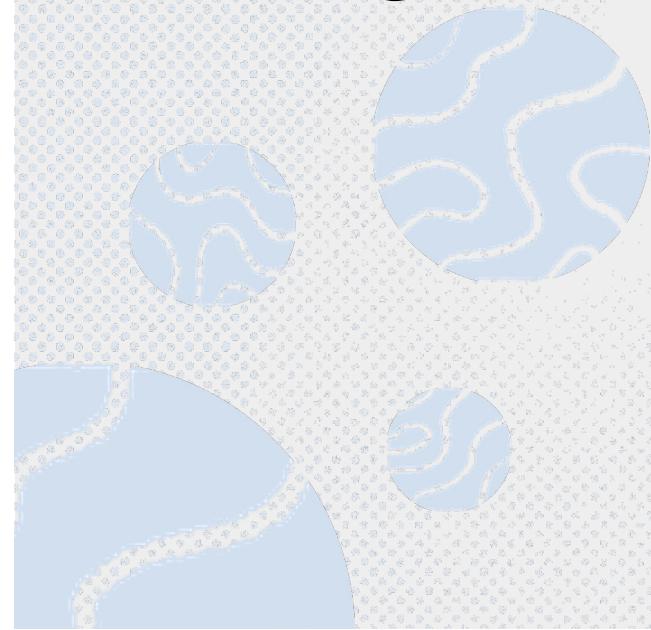
The importance of data visualization is evident in the "age of Big Data," where it helps make sense of the trillions of rows of data generated every day

Someone Said So

Introduction to Data Visualization

Data Visualization refers to the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.

PROJECT PORTFOLIO MANAGEMENT



Project Management Dashboard As of: 30th July, 2020

creo technologies

Project Management Dashboard

Total No. of Projects: 27 | No. of Delayed: 7 | No. of On Track: 12 | # of Ahead of time: 8

CONSTRUCTIONS

Total No. of Projects: 9 | No. of Delayed: 2 | No. of On Track: 4 | # of Ahead of time: 3

MODIFICATIONS

Total No. of Projects: 13 | No. of Delayed: 4 | No. of On Track: 6 | # of Ahead of time: 3

BIOMEDICAL

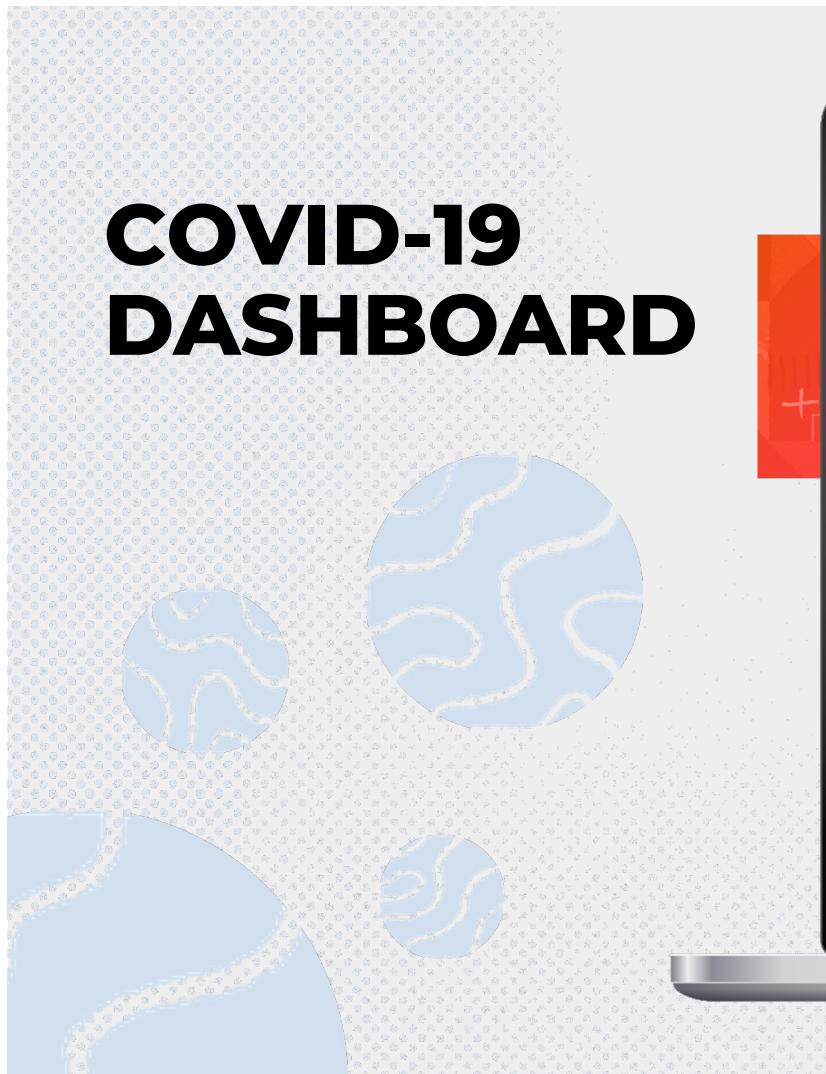
Total No. of Projects: 5 | No. of Delayed: 1 | No. of On Track: 2 | # of Ahead of time: 2

Budget (Construction) Overrun % / Underrun %: 142% | Yearly Budget Utilization %: 87% | Budget %

Executive Summary **Dashboard Reports**

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COVID-19 DASHBOARD



COVID 19 - School Investigation Details Dashboard

creo technologies

COVID 19 - School Investigation Details Dashboard

Total # of Cases: 245

Total # Schools Affected: 99

By Occupation

Occupation	# Cases
Student	185
Support Staff	45
Administration	9
Teacher/Teaching Assistant	6

Cases Trend Occupation Group

The chart shows a fluctuating trend of cases over time. The legend indicates:

- Staff (Blue)
- Total Cases (Orange)
- Students (Green)

Date	Staff	Total Cases	Students
Nov 24	24	16	27
Nov 25	40	49	11
Nov 26	60	41	9
Nov 27	50	41	9
Dec 04	9	13	9
Dec 27	27	27	27

By Gender

Gender	# Cases
Male	107
Female	135
Undefined	3

Institution Details

School Name	Location	Action	# Case
AL ITTIHAD PRIVATE SCHOOL		No Action	1
		Switch close contacts only to DL/RW	1
AL ITTIHAD PRIVATE SCHOOL (BR)	Jumeira	Close class & switch to DL/RW	2
		No action	1
ALMAWAKEB SCHOOL- AL GASHIUD		No action	1
		Switch close contacts only to DL/RW	4

Traced Close Contacts for Cases

Close Contact Name	Location	Close Contact
Aine Mc Cartan		Same School Bus
Freya Elizabeth		Assigned to different locations at school

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SALES



SALES



“

Data storytelling is the art of **presenting** complex data and analytics in a compelling narrative that helps **tell a story** and **influence** and **inform** a particular audience

Microsoft

DATA STORYTELLING

- A powerful tool for conveying complex information in a way that is easily digestible and can greatly benefit businesses in their marketing campaigns, as it helps target audiences grasp the information being presented
- Data storytelling involves using data to craft a compelling narrative, often employing mediums like **infographics**, data **visualizations**, **interactive** maps, and feature insights.

IMPORTANCE IN A BUSINESS CONTEXT

Facilitates Informed Decision-Making

- Understand the “**Why**” behind the data
- **Data-Driven Insights:** Transforms raw data into actionable insights that guide strategic decisions

Enhance Communication

- **Bridging the Gap:** Translates complex data into a format that is easily understandable, bridging the gap between data experts and non-experts.
- **Engagement:** Stories are inherently engaging, making the conveyed data more compelling and memorable.

IMPORTANCE IN A BUSINESS CONTEXT

Drive Organizational Alignment

- **Unified Understanding:** Ensures that all stakeholders, regardless of their technical expertise, have a unified understanding of key data points and insights.
- **Strategic Alignment:** Helps in aligning various departments towards common organizational goals and objectives by providing a clear picture of the data.

Enhance Data Accessibility

- **Democratizing Data:** Makes data accessible and comprehensible to all, fostering a data-driven culture within the organization.
- **Encouraging Participation & Collaboration:** Enables more employees to participate in data-driven dialogues and decision-making processes.

IMPORTANCE IN A BUSINESS CONTEXT

Increasing the memorability and persuasiveness of data insights

- Effective data storytelling increases the memorability, persuasiveness, and engagement of data insights
- **Standardizing** communication of data: Data storytelling can be a way to standardize the communication of data, ensuring that it can reach as broad an audience as possible

GENERAL ROLES IN A TYPICAL DATA PROJECT

Different Roles In a BI Project

Stakeholder

- Has an interest in the project's outcome
- Can be single individuals or entire organization
- Their input can directly impact the outcome of the project

Sponsor

- An individual or group providing the financial resources for the project
- "Owns" the project and shows an active interest in its progress
- Holds a significant stake in the project's outcome and is usually a key decision-maker regarding project changes and direction.

Different Roles In a BI Project

End User

- The direct user of a product or service, often both internal and external to the company executing the project

Team Member

- An individual who is part of the project team, contributing specific skills, knowledge, or expertise towards the completion of the project

Different Roles In a BI Project

Business Analyst

- An individual responsible for understanding project objectives, gathering and analyzing requirements, ensuring stakeholder needs are communicated and met, and often assisting in validating that the delivered solution meets the defined requirements.

Project Manager

- An individual responsible for planning, executing, and closing the project, ensuring it is completed on time, within scope, and on budget, while managing resources, risks, and stakeholders throughout the project lifecycle.

Different Roles In a BI Project

In Summary:

- **Stakeholder**: Interested or affected party in both business and project contexts.
- **Sponsor**: Financial backer and key decision-maker.
- **End User**: Ultimate user of the product, service, or solution.
- **Team Member**: Contributor towards business operations or project tasks.
- **Business Analyst**: Bridge between stakeholders and solution providers, ensuring requirements are understood and met.
- **Project Manager**: Leader of the project, ensuring its successful planning, execution, and closure.
- **UI/UX Expert**
- **Dashboard Developer**

UNDERSTANDING STAKEHOLDERS AND CONTEXT (IN DATA STORYTELLING)

Understanding Stakeholders

In the realm of data analysis and storytelling, **stakeholders** refer to **individuals** or **groups** who have an interest in the data, or whose decisions and actions can be influenced by it. This could range from **internal** stakeholders like executives, managers, and employees, to **external** ones like customers, investors, and regulatory bodies.

Why Understanding Stakeholders is Crucial

- **Alignment with Expectations:** Different stakeholders have varied expectations and requirements from data. For instance, an executive might seek strategic insights, while a manager may need operational details.
- **Effective Communication:** Knowing your stakeholders allows you to tailor the communication and visualization style to be most impactful for them. The technicality and depth of data storytelling will vary based on the audience's expertise and interest.
- **Driving Action:** Understanding what matters to your stakeholders enables you to highlight the most relevant and persuasive insights, thereby driving desired actions and decisions

Why Understanding Stakeholders is Crucial

Key Considerations:

- **Empathy:** Putting yourself in the stakeholders' shoes to comprehend their challenges, objectives, and pain points.
- **Diversity:** Acknowledging and navigating through the diverse needs and preferences of different stakeholders.
- **Engagement:** Keeping stakeholders engaged through relevant and compelling data stories.

Establishing the Right Context for Analysis

- Establishing the right context for analysis means understanding the background, situational details, and functional aspects of a given situation or event

Significance of Context in Data Analysis:

- **Accurate Interpretation:** Without the right context, data can be misinterpreted, leading to misguided decisions. For instance, a sudden spike in sales might be seen positively, but with context, it might be attributed to a pricing error and thus be a concern.
- **Relevance:** Context ensures that the data analysis and insights derived are pertinent to the prevailing business scenario or challenge.
- **Strategic Alignment:** It ensures that the data analysis is aligned with broader business objectives and strategies, ensuring that insights and recommendations are actionable and valuable.

Establishing the Right Context for Analysis

Key Considerations

- **Questioning:** Continuously asking questions like “Why?”, “How?”, and “What if?” to explore and establish context.
- **Alignment:** Ensuring that the context aligns with the business environment, challenges, and objectives.
- **Validation:** Continuously validating the established context against external and internal variables to ensure its relevance and accuracy.

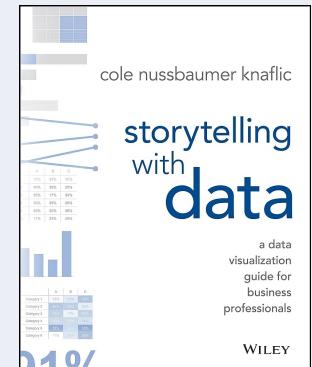
Establishing the Right Context for Analysis

In Practice

- **Scenario Analysis:** Engage in scenario analysis, considering various contexts and stakeholder perspectives, to explore diverse possible narratives and insights from the same data.
- **Feedback Loops:** Establish feedback loops with stakeholders to validate findings, ensure relevance, and refine context.
- **Continuous Learning:** The business environment, stakeholder needs, and context are dynamic. Thus, continuous learning and adaptation are crucial to remain relevant and impactful

Storytelling with Data

- Understand the context:** Before creating a data story, it is essential to understand the context of the data, including the audience, the purpose of the story, and the message that needs to be conveyed
- Choose an effective visual display:** Selecting the right visual display is crucial to ensure that the data is presented in a clear and understandable way. The choice of visual display should be based on the type of data and the message that needs to be conveyed
- Eliminate clutter:** Clutter can distract the audience from the message and make the data story difficult to understand. It is essential to eliminate unnecessary elements and simplify the visual display to ensure that the message is clear
- Direct the audience's attention:** Highlighting the most important parts of the data and directing the audience's attention to them is crucial to ensure that the message is understood. This can be achieved through the use of color, size, and other visual cues
- Think like a designer:** Design thinking involves considering the audience's needs and preferences when creating a data story. It is essential to create a story that is visually appealing, easy to understand, and engaging
- Leverage the power of storytelling:** Storytelling is a powerful tool that can help make data more relatable and memorable. By incorporating a narrative into the data story, it is possible to create a more engaging and impactful message



Activity

<https://public.tableau.com/app/discover/viz-of-the-day>

Pick **ONE** visualization your team thinks it represents a **good** design. Explain why.

Pick **ONE** Visualization your team thinks it represents a **bad** design. Explain why.

Dashboards

A dashboard is a **visual interface** that provides a **consolidated, interactive** view of various data points, metrics, and key performance indicators (**KPIs**), typically designed to enable quick analysis and decision-making.

Visual Vocabulary

Visual Vocabulary

There are so many ways to visualise data - how do we know which one to pick? Click on a category below to decide which data relationship is most important in your story, then look at the different types of charts within the category to form some initial ideas about what might work best. This list is not meant to be exhaustive, nor a wizard, but is a useful starting point for making informative and meaningful data visualisations.

Click any section below to view the charts



Deviation

Emphasise variations (+/-) from a fixed reference point. Typically the reference point is zero but it can also be a target or a long-term average. Can also be used to show sentiment (positive/neutral/negative).

Correlation

Show the relationship between two or more variables. Be mindful that, unless you tell them otherwise, many readers will assume the relationships you show them to be causal (i.e., one causes the other).

Ranking

Use where an item's position in an ordered list is more important than its absolute or relative value. Don't be afraid to highlight the points of interest.

Distribution

Show values in a dataset and how often they occur. The shape (or 'skew') of a distribution can be a memorable way of highlighting the lack of uniformity or equality in the data.

Change over Time

Give emphasis to changing trends. These can be short (intra-day) movements or extended series traversing decades or centuries: Choosing the correct time period is important to provide suitable context for the reader.

Part-to-Whole

Show how a single entity can be broken down into its component elements. If the reader's interest is solely in the size of the components, consider a magnitude-type chart instead.

Magnitude

Show size comparisons. These can be relative (just being able to see larger/bigger) or absolute (need to see fine differences). Usually these show a 'counted' number (for example, barrels, dollars or people) rather than a calculated rate or per cent.

Spatial

Used only when precise locations or geographical patterns in data are more important to the reader than anything else.

Flow

Show the reader volumes or intensity of movement between two or more states or conditions. These might be logical sequences or geographical locations.

Data Puke

"**Data puke**" is a term used in the data visualization field to describe charts, graphs, or dashboards that present an overwhelming amount of data without clear organization, focus, or meaningful interpretation.

Essentially, it's when a visualization offers a lot of data but little to no insight or clarity.

Data Puke

Here are a few characteristics often associated with data puke:

- **Overwhelming Information:** Too many data points, metrics, or dimensions are presented all at once without clear categorization or prioritization.
- **Lack of Clarity:** The visualization may lack a clear message or key takeaway, making it difficult for the audience to understand the main point or action item.
- **Poor Design:** This might involve using too many colors, overly complex charts, or cluttered layouts, which can distract from the data and make it hard to discern any meaningful patterns or trends.
- **No Narrative or Context:** Data puke often lacks a storyline or context to guide the viewer through the data and to understand its relevance or importance.
- **Inaccessibility:** It might be difficult for a wide range of audiences to understand due to jargon, complex data representations, or lack of explanatory text.

Mockups

Mockups are visual guides that represent the skeletal framework of a dashboard or visualization, often used to plan layout and user interactions without detailed design or data integration

Components

- **Layout:** The arrangement of various elements like charts, graphs, and controls.
- **Content Placement:** Indicating where text, images, and data visualizations will be placed.
- **User Interaction:** Representing how users will interact with the dashboard, including click, scroll, and hover actions.

Mockups

Significance of Mockups

Avoiding Pitfalls:

- **Minimizing Revisions:** Mockups allow for early feedback, reducing the need for revisions after development has begun.
- **Clarifying Vision:** They ensure that all stakeholders have a clear and unified vision of the final product, minimizing miscommunications or misaligned expectations.

Enhancing Collaboration:

- **Stakeholder Involvement:** Engaging stakeholders in the mockup phase can ensure their needs and expectations are considered from the start.
- **Interdepartmental Communication:** Facilitates better understanding and communication between design, development, and business teams.

Mockups

User Experience (UX) Planning:

- User Journey: Mockups help plan and visualize the user's journey and interactions with the dashboard.
- Accessibility: Ensures that considerations for user accessibility and usability are planned from the outset.

Efficient Resource Utilization:

- Time and Cost: Identifying and addressing issues in the mockup phase is generally quicker and more cost-effective than during development.
- Prioritization: Helps in prioritizing features and elements, ensuring that key components are focused upon during development.

POC vs MVP vs Pilot vs Prototype

Notes/Screens from Online Searching in Class

WHAT IT IS

PURPOSE

STAGE IN PRODUCT DEVELOPMENT

HOW TO BUILD A MINIMUM VIABLE PRODUCT

NOT LIKE THIS

1 → 2 → 3 → 4

LIKE THIS

1 → 2 → 3 → 4 → 5

MINIMUM VIABLE PRODUCT

A pared-down version of a product that only contains core functionality

Whether there is a fit for core functions v product

Iteration and/or iteration phase

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PLURALSIGHT

USER EXPERIENCE

User Interface (UI) and User Experience (UX) in Data Visualization

User Interface (UI)

- UI design is concerned with the visual elements and interactive features of a data visualization tool or application.
- It focuses on creating a visually appealing and intuitive interface for users to interact with the data.
- UI designers work on aspects such as layout, color schemes, typography, and iconography to ensure a cohesive and engaging user experience

User Experience (UX)

- UX design is responsible for the overall experience and satisfaction of users when interacting with a data visualization tool or application.
- It focuses on understanding user needs, goals, and behaviors to create a seamless and meaningful experience.
- UX designers work on aspects such as information architecture, interaction design, and usability testing to ensure that the data visualization tool is effective and easy to use

Role of UI and UX in Storytelling

User Interface (UI)

- Facilitate Interaction
- Present Information
- Guide Navigation

User Experience (UX)

- Enhance Navigation
- Ensure Satisfaction
- Drive Engagement



Activity

Creating a mockup to communicate an idea to business

Introduction to Power BI

The 4 Types of Data Analytics

1

Descriptive Analytics

Provides insight into what has happened in the past through dashboards and reports

2

Diagnostics Analytics

Analyzes data to understand why something happened

3

Predictive Analytics

Uses statistical and machine learning models to make predictions about the future

4

Prescriptive Analytics

Recommends actions to take to achieve optimal business outcomes

Data visualization is a key component across all types of analytics, enabling users to better understand and act on insights.

Data Democratization Through Visualization

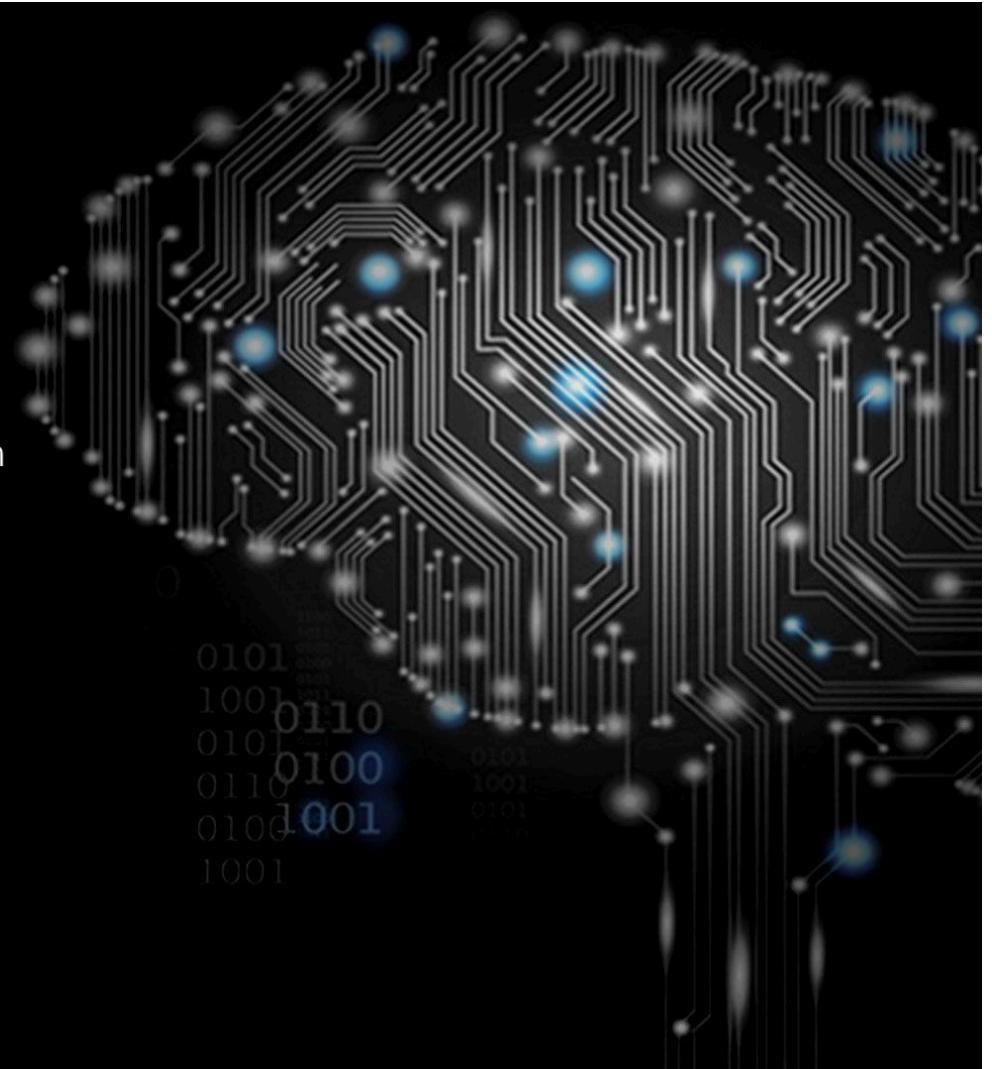
Making Data Accessible and Interpretable to Non-Technical Users

- ① Accessibility and Interpretability
- ② Self-Service Business Intelligence (BI)
- ③ Access for non-technical users
 - Financial overview and funding needs
- ④ Faster Insights
- ⑤ Improved Engagement
- ⑥ Standardizing Communication of data

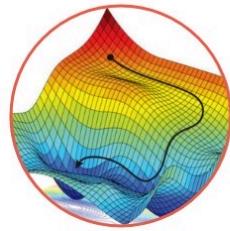
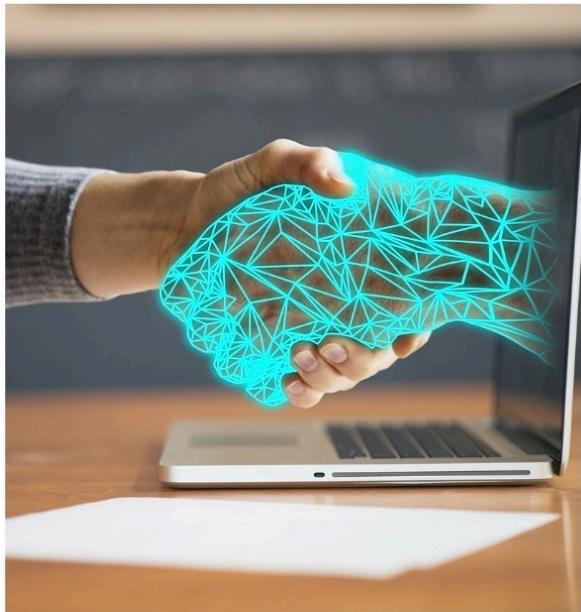
Visualization plays a key role in this by translating complex data sets into understandable and actionable insights.

Integrating with AI and ML

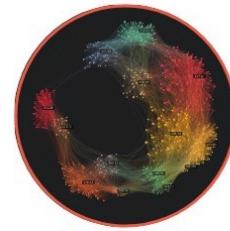
The intersection of AI/ML and data visualization opens up new frontiers for understanding complex datasets and enhancing decision-making processes. This synergy not only aids in interpreting AI/ML model outputs but also enriches visualization with advanced analytics capabilities.



Intersection between Data Visualization and AI/ML



Data Visualization for
AI/ML



AI/ML in Data
Visualization



AI/ML for Data
Visualization

Three areas of integration with AI/ML



Data Visualization for AI/ML



Model Evaluation

Examples include confusion matrix, ROC curves, and precision-recall curves, calibration curve, ACF plot, residual plots ..etc



Feature Importance

Examples like **SHAP** (SHapley Additive exPlanations) and **LIME** (Local Interpretable Model-agnostic Explanations) use visualization to explain a model



MLOps

Using visualization and Dashboards to track the health of ML systems, monitoring model performance over time, data drift, and operational metrics



Interactive Exploration

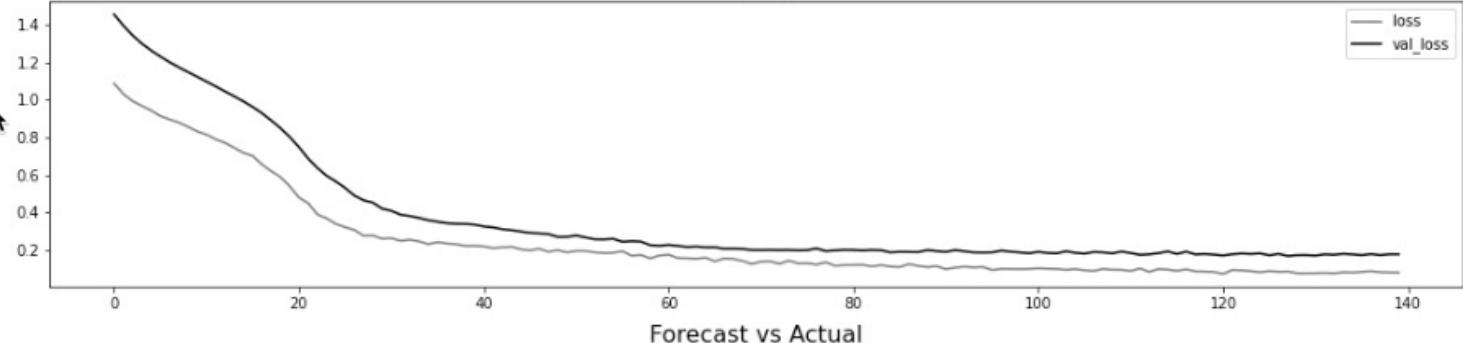
Examples include tools like TensorBoard and MLflow that offer interactive visual interfaces for tracking experiments, comparing model runs ..etc

Visualizations are a crucial tool for understanding, debugging, and monitoring machine learning models throughout the model development lifecycle.

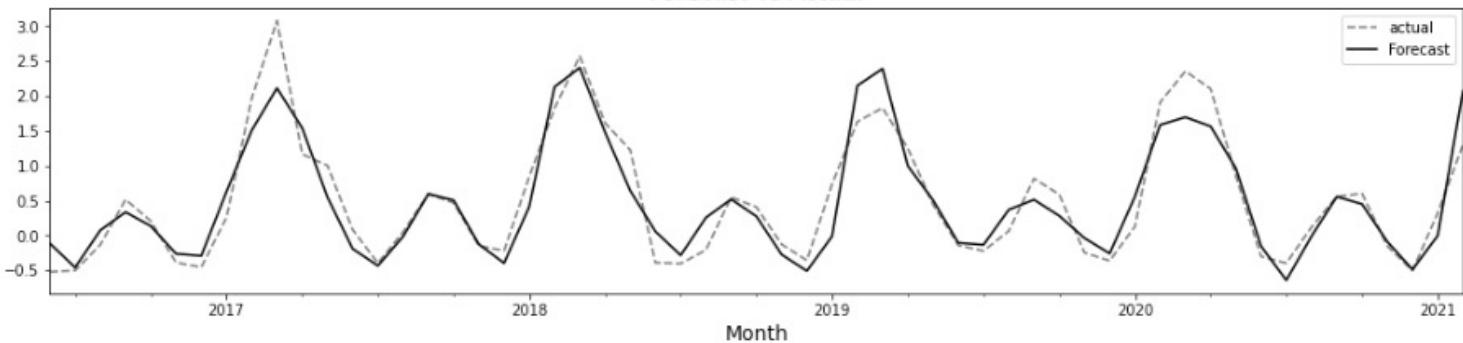


Data Visualization for AI/ML

Loss by Epoch



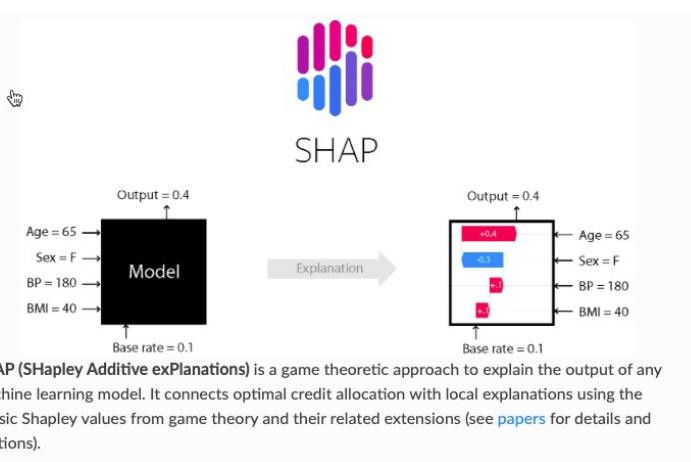
Forecast vs Actual



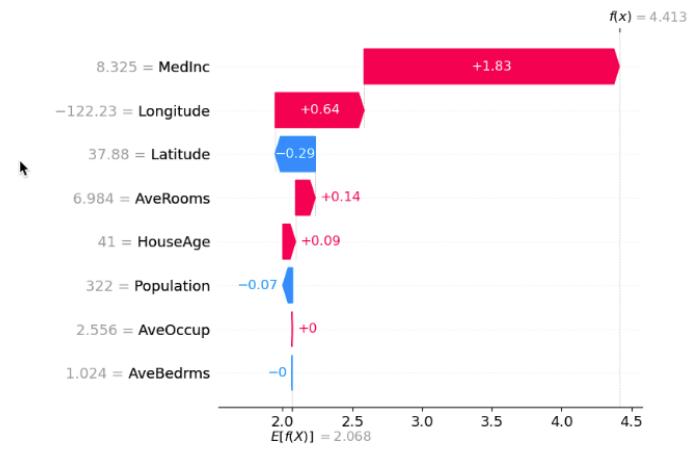
Example of model evaluation visually



Data Visualization for AI/ML



<https://shap.readthedocs.io/en/latest/>



Example of using SHAP for model interpretability (explaining a model)

AI/ML in Data Visualization



Predictive Analytics

ML models can forecast future trends based on historical data, which can be visualized through line charts or heat maps, providing a clear view of expected future patterns.



Trend Identification

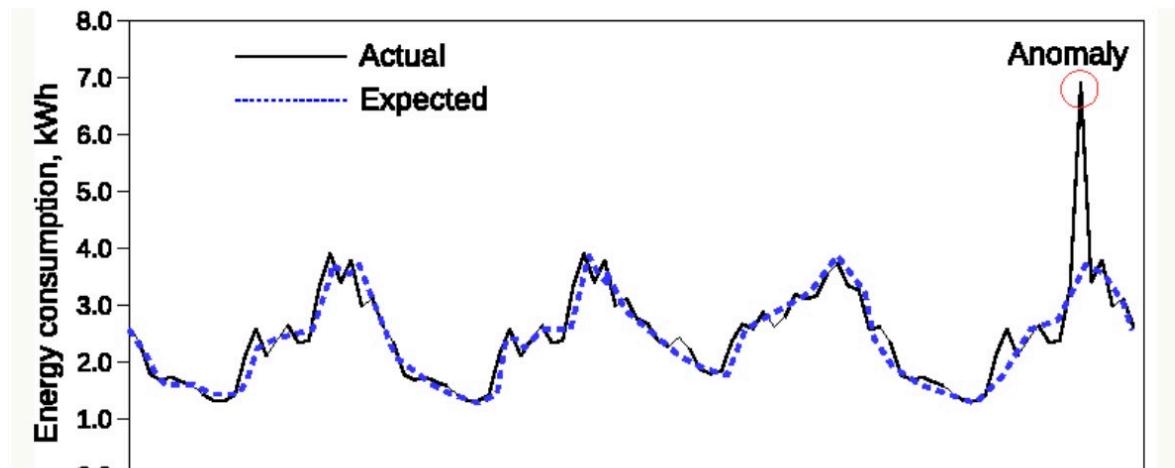
Algorithms can analyze large datasets to identify underlying trends, anomalies, or patterns, which are then visualized to make them understandable and actionable.

AI/ML techniques like predictive analytics and trend identification enable more powerful insights from data visualization by revealing patterns and trends



AI/ML in Data Visualization

Anomaly Detection

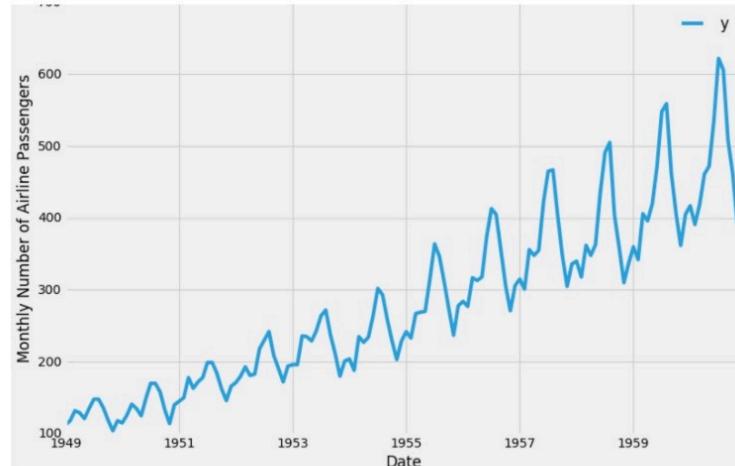


In financial monitoring, anomaly detection models identify fraudulent transactions. Visualizations highlight unusual patterns or outliers in transaction data, enabling quick action

Platforms like Elasticsearch with Kibana, and specialized libraries like PyOD in Python, offer visualization capabilities to spot anomalies in real-time data streams.

AI/ML in Data Visualization

Time Series Analysis & Forecasting

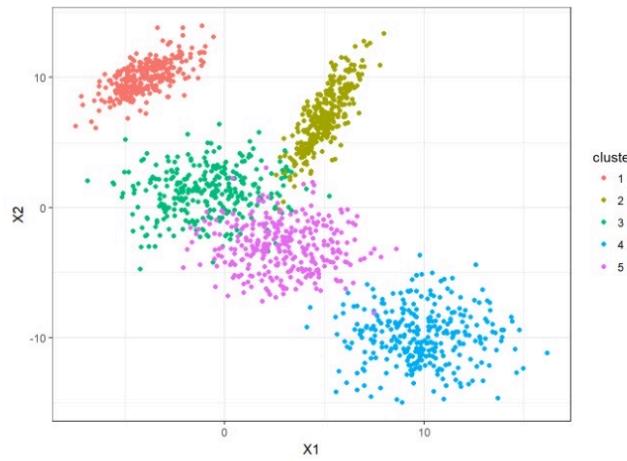


Retail companies forecast demand for products using time series analysis. Visualization of these forecasts helps in inventory planning and avoiding stockouts or overstocks.

Facebook's Prophet library, coupled with visualization in Python's Matplotlib or Plotly, provides clear forecasts and confidence intervals, making future demand visually understandable.

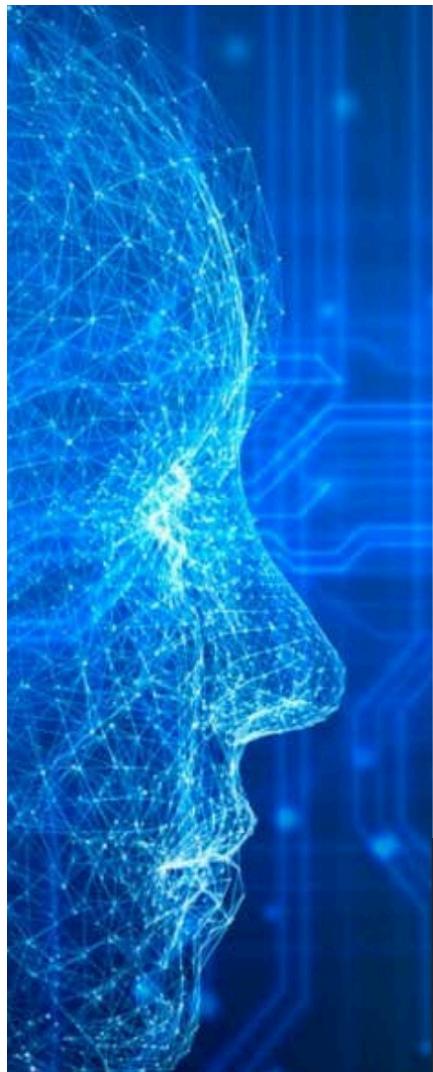
AI/ML in Data Visualization

Cluster Analysis & Segmentation



Marketing departments use cluster analysis for customer segmentation. Visualizing these clusters helps in identifying distinct customer groups based on purchasing behavior, preferences, or demographics.

Scikit-learn for ML clustering algorithms, visualized using seaborn's clustermap or scatter plots in Python, can effectively display customer segments.



Generative AI in Data Visualization

- **Automated Data Visualization**
- **Conversational Analytics**
- **Auto Insights**
- **Data Augmentation**
- **Data Imputation & Synthesis**

GenAI is revolutionizing the field of business intelligence and data visualization by automating processes, improving data quality, and providing contextualized insights

Generative AI Transforming Visualization



Automating graphic creation

GenAI can create complex data visualizations such as charts, graphs, diagrams, etc. automatically without manual effort



Reducing time and costs

This automation saves time and costs associated with hiring designers and developers to create custom visualizations



Increasing accessibility

Enables non-experts to easily generate quality visualizations for their use cases and datasets

Generative AI is transforming data visualization by automating complex graphic creation, reducing time and costs, and increasing accessibility for non-experts.

More Emerging Trends



Real-time visualization

Real-time data visualization allows users to see data as it's generated to identify insights and patterns.



Data animation

Data animation brings data to life by showing trends and changes over time through motion graphics.



Mobile analytics

Mobile analytics tools allow data analysis on the go for faster decision making.

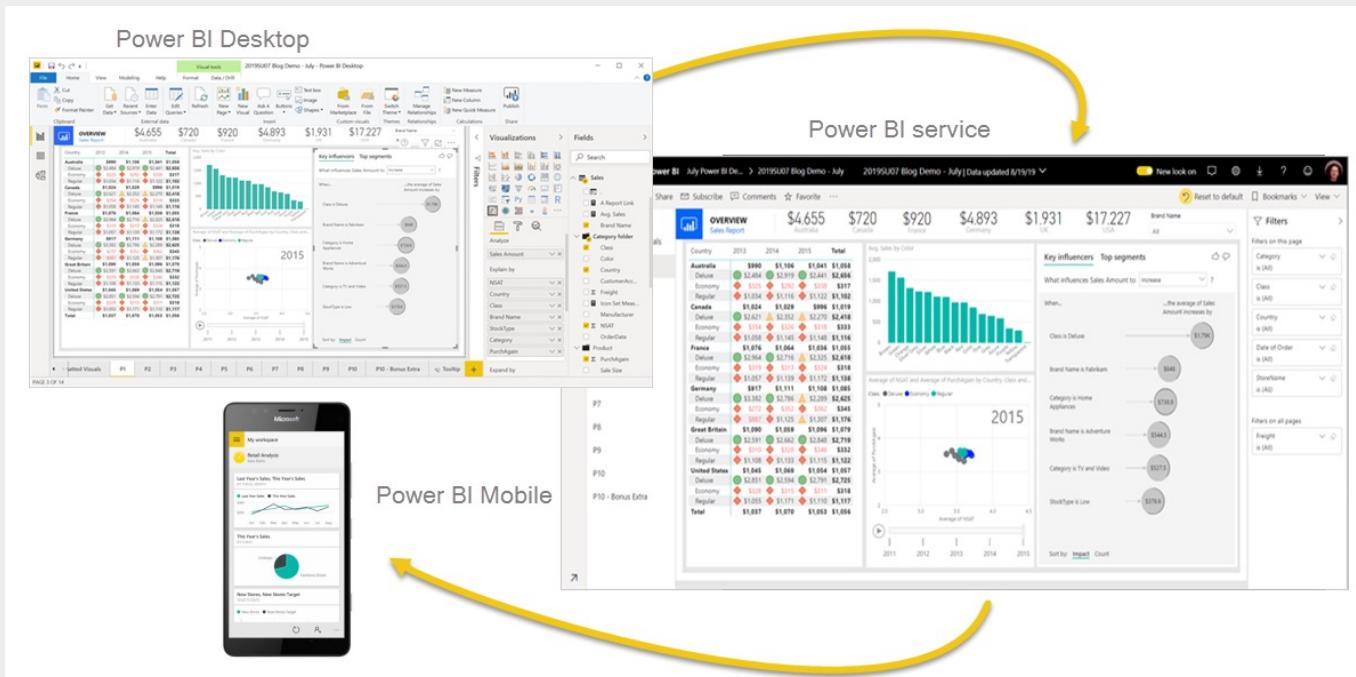


AR/VR

Augmented and virtual reality immerse users into data environments for new perspectives.

Emerging visualization methods make data more engaging, intuitive and impactful.

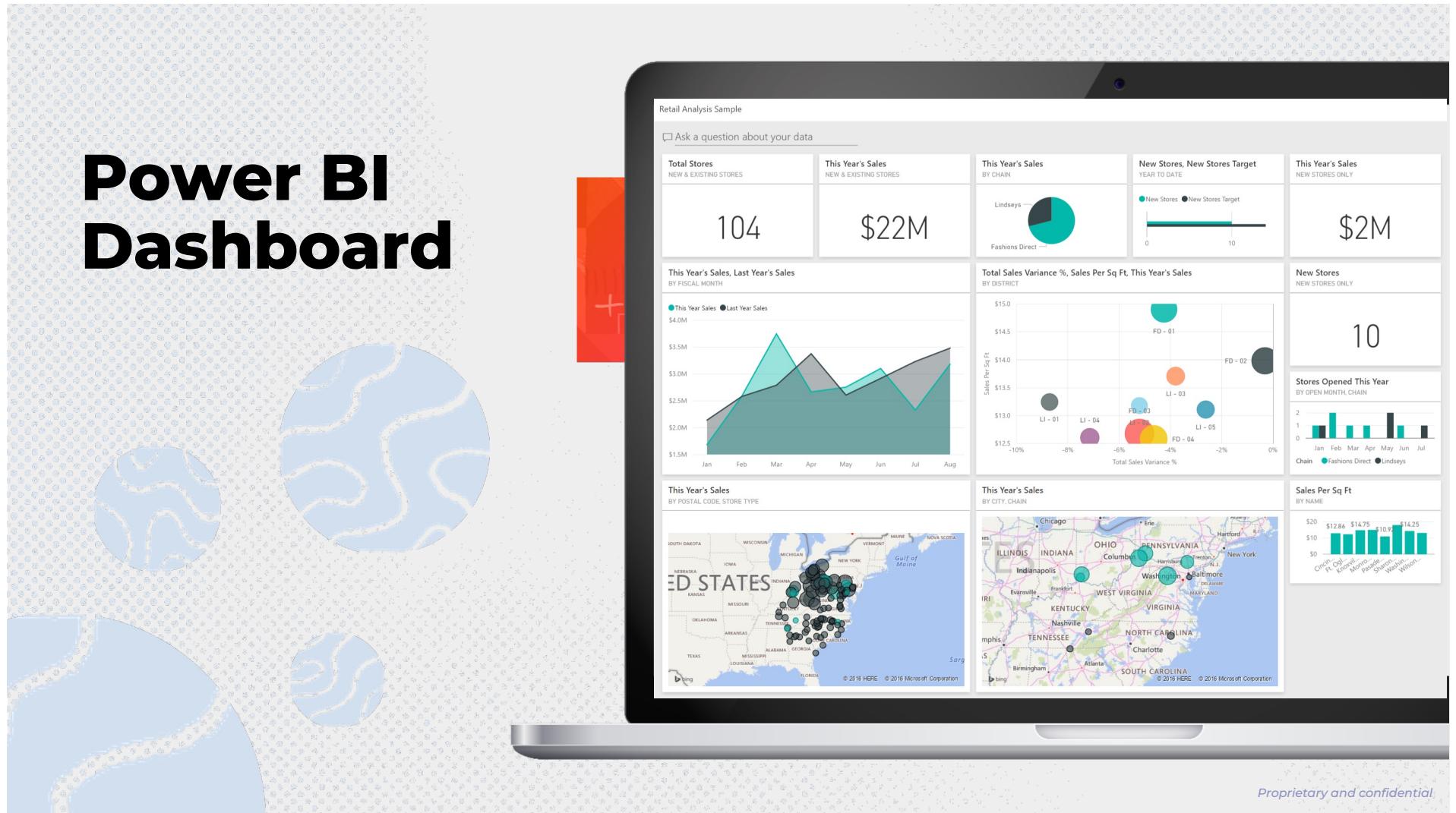
Power BI



Proprietary and confidential

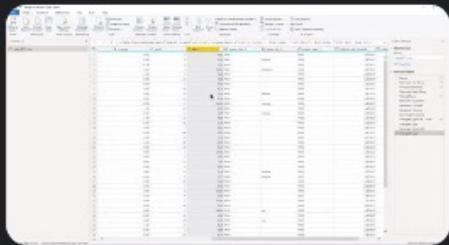
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Power BI Dashboard

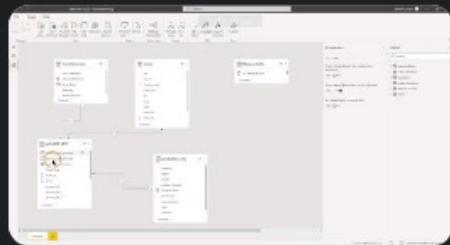


What is Power BI

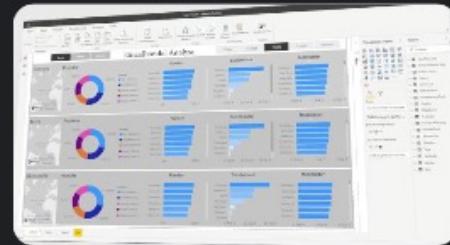
Data Transformation



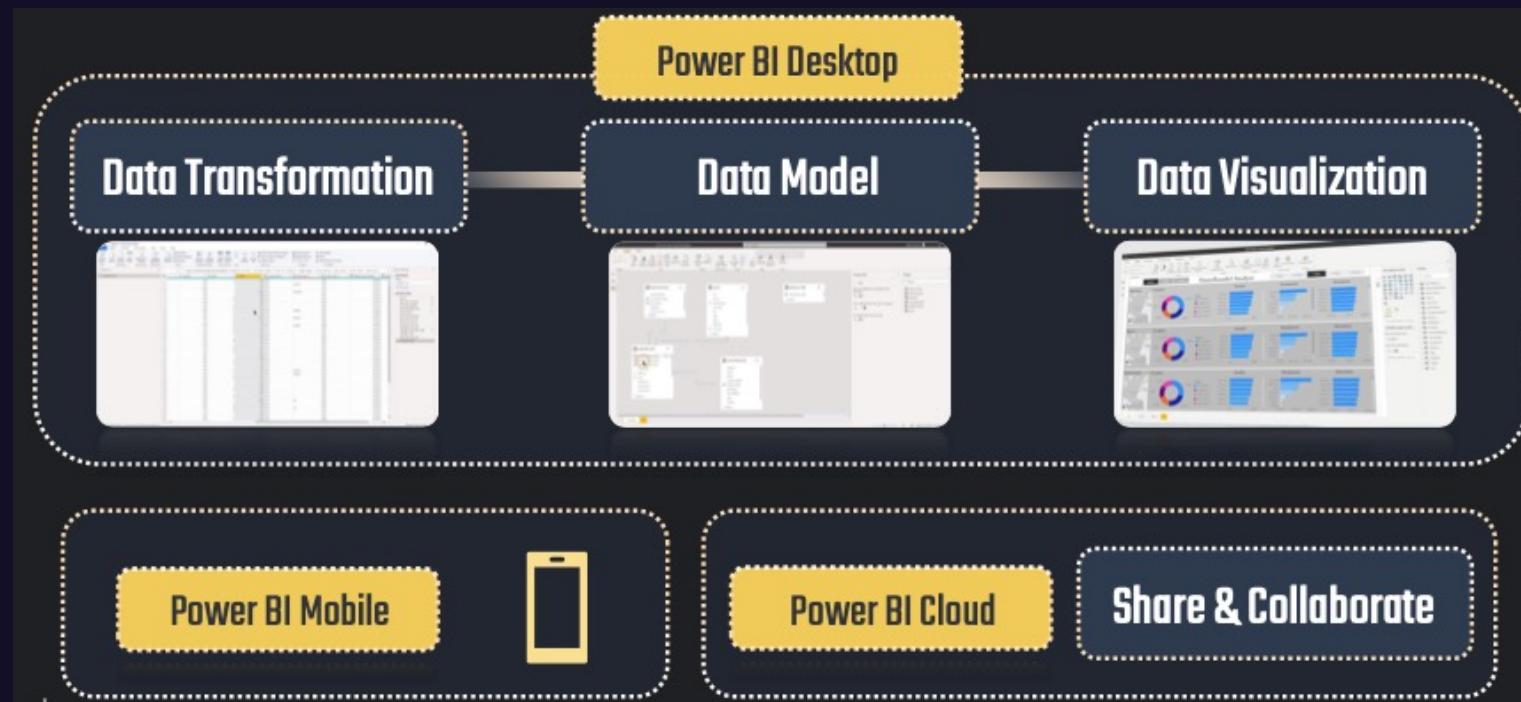
Data Model



Data Visualization



What is Power BI



Updates to Power BI Premium License Agreement

[Important Update to Power BI Premium Licensing \(announcement 1\)](#)

[Important Update to Power BI Premium Licensing \(announcement 2\)](#)

What is Microsoft Fabric

The screenshot shows the Microsoft Fabric Home page. At the top, there's a navigation bar with icons for Home, Settings, Help, and User profile. The main title "Microsoft Fabric" is displayed prominently, followed by the subtitle "All your data. In one location. Organize. Collaborate. Create." Below this, a section titled "Explore the experience" features eight cards, each representing a different service:

- Power BI**: Find insights, track progress, and make decisions faster using rich visualizations.
- Data Factory**: Solve complex data ingestion, transformation, and orchestration scenarios using cloud-scale data movement and data transformation services.
- Data Activator**: Detect patterns and conditions in your Power BI reports and streaming data, and then take actions such as alert users or kick-off workflows.
- Industry Solutions**: Use out-of-the-box industry data solutions and resources.
- Real-Time Intelligence**: Discover insights from your streaming data. Quickly ingest, index, and partition any data source or format, then query the data and create visualizations. You can also create alerts to flag anomalies.
- Synapse Data Engineering**: Create a lakehouse and operationalize your workflow to build, transform, and share your data estate.
- Synapse Data Science**: Unlock powerful insights using AI and machine learning technology.
- Synapse Data Warehouse**: Scale up your insights by storing and analyzing data in a secure SQL warehouse. Benefit from top-tier performance at petabyte scale in an open-data format.

At the bottom, there are two calls-to-action: "Read documentation" with a file icon and "Explore community" with a people icon.

Types of Data Connection (Storage Modes)

Import

- Local Power BI Copy of the semantic Model from the data source
- Data refreshes can be scheduled or on-demand

DirectQuery

- No local copies of the data (not caches)
- Direct connection
- Ensures most up-to-date data

Dual (Composite)

- You can select some data to be imported and other data to be queried live



Reflections

- Something new/interesting you learned in the previous days?
- Something you are still struggling with?

Merge vs Append Query in Power BI

Append Query

ID	FirstName	LastName	Course
10	Susan	Mitchel	English
11	Mary	Stuart	English

ID	FirstName	LastName	Course
1	Reza	Rad	Math
2	Mike	Woody	Math
3	Jimmy	Mitchel	Math



ID	FirstName	LastName	Course
1	Reza	Rad	Math
2	Mike	Woody	Math
3	Jimmy	Mitchel	Math
10	Susan	Mitchel	English
11	Mary	Stuart	English

Merge vs Append Query in Power BI

Merge Query

ID	Title	Timing	Capacity
1	Math	Q1 2017	15
2	Physics	Q1 2017	5
3	English	Q2 2017	25

ID	FirstName	LastName	Course
1	Reza	Rad	Math
2	Mike	Woody	Math
3	Jimmy	Mitchel	Math
10	Susan	Mitchel	English
11	Mary	Stuart	English



ID	FirstName	LastName	Course	Timing	Capacity
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3	Jimmy	Mitchel	Math	Q1 2017	15
10	Susan	Mitchel	English	Q2 2017	25
11	Mary	Stuart	English	Q2 2017	25

Thank you!

If you have any additional questions, please ask! If



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