# Power BI Intro

East Carolina University

Office for Faculty Excellence

Research and Statistics Workshops, Summer 2024

# About the Presenter

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  - Lean Six Sigma Green Belt, 2015
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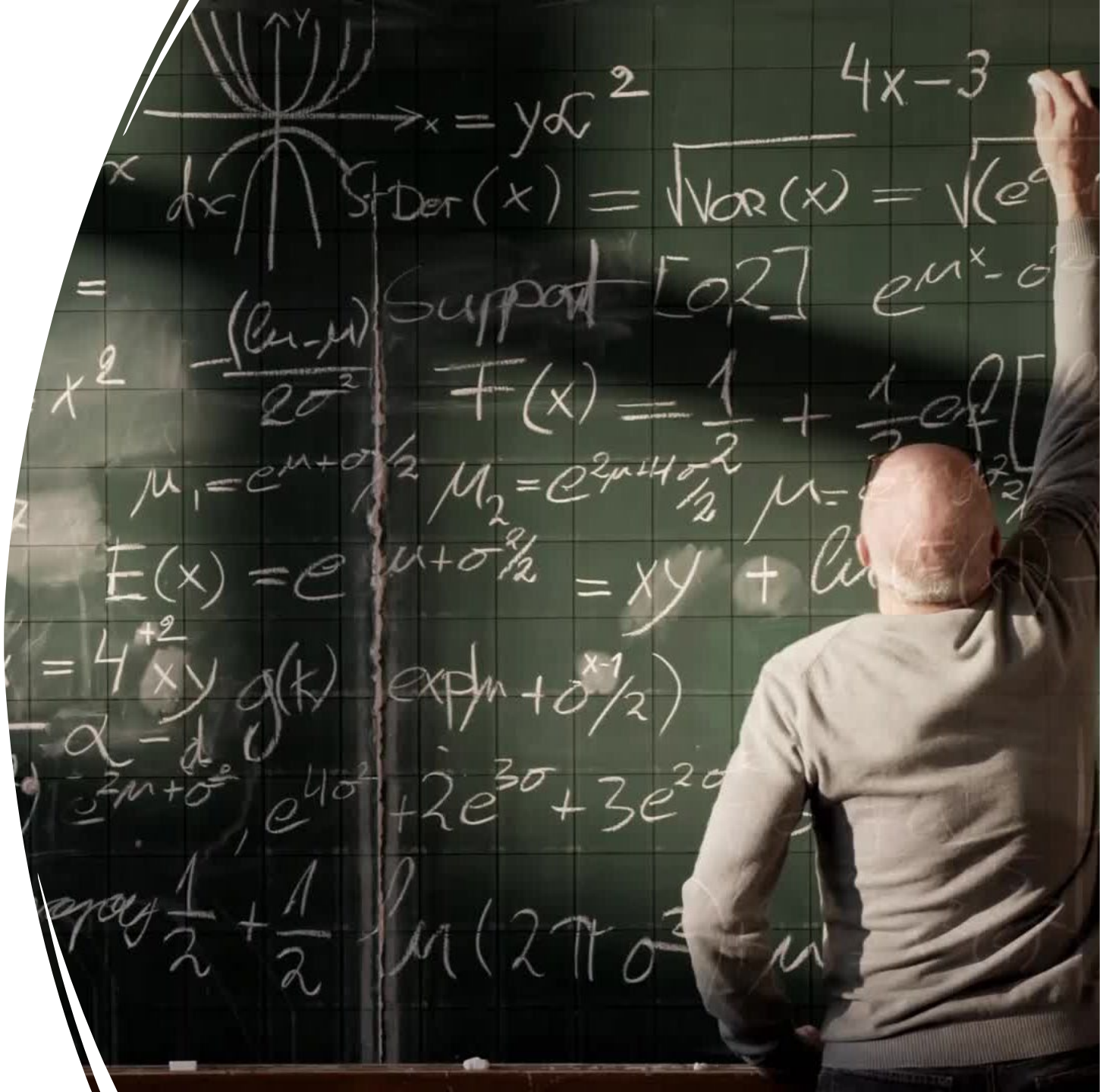
- ECU Pirate Since 2002
- Interests: Cooking, Jogging, Horror Films, and All Things Data!



# Agenda

**Concepts (~50 mins)**

**Importance of Data Visualization (~30 mins)**

- In Business Intelligence
- In Academic Research

**Power BI (~15 mins)**

- Intro & Key Features
- Power BI Desktop

**Break (~10 mins)**

**Demonstration (~50 mins)**

Get Data

Transform & Model Data

Create Visualizations

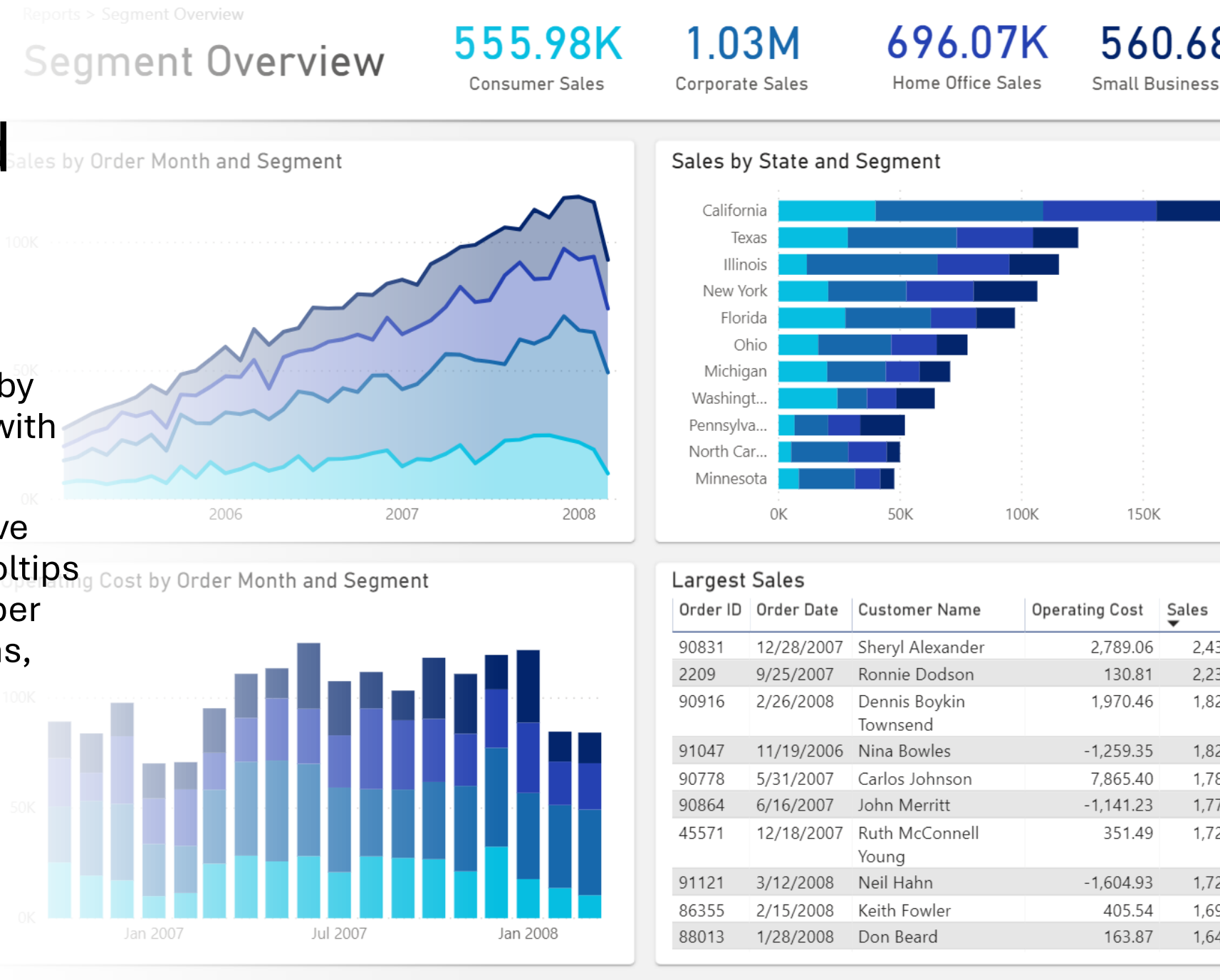
Publish

# Data Visualization in Business Intelligence

- **Why is data visualization important <u>in business intelligence?</u>**
  - Data visualization plays a crucial role in **unlocking the value of data**, driving informed decision-making, and fostering a data-driven culture within organizations.
  - By harnessing the power of visualizations, organizations **can gain deeper insights, communicate more effectively, and achieve better outcomes** across various domains.

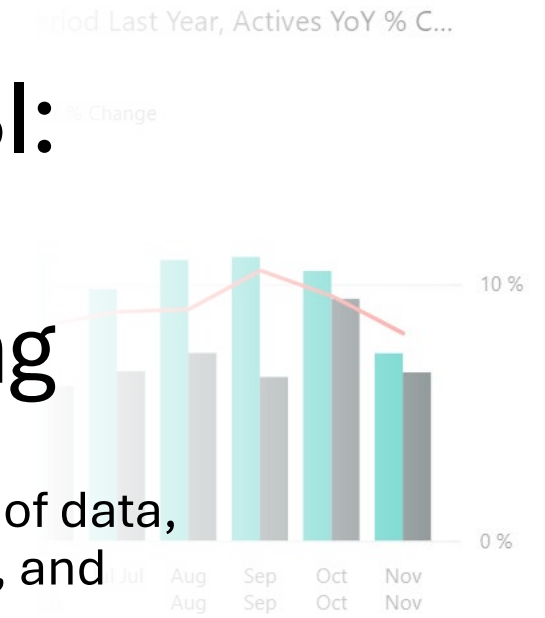
# Data Vis for BI: Exploration and Discovery

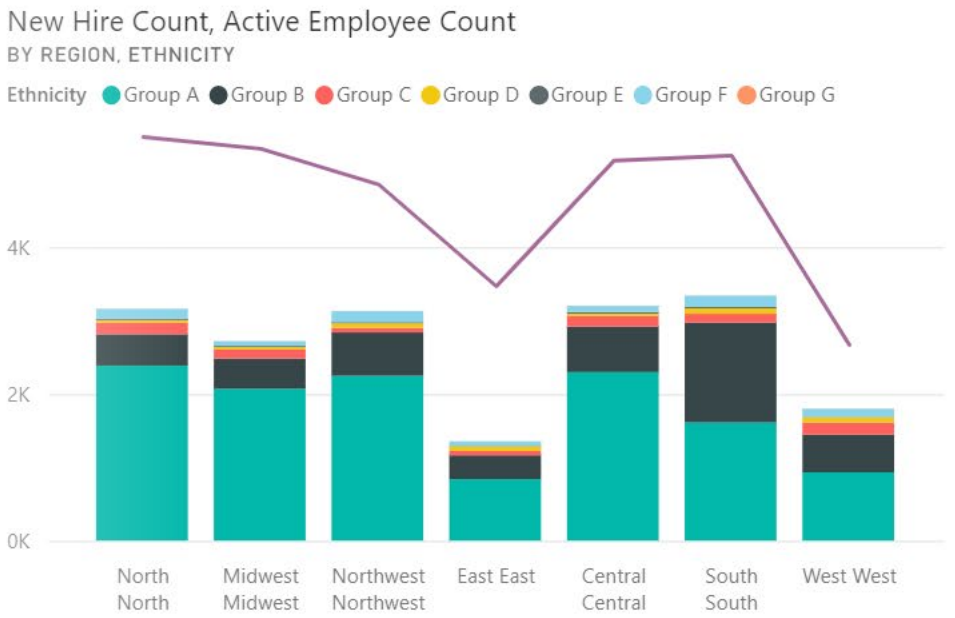
- Visualizations encourage exploration and discovery by allowing users to interact with the data dynamically.
- Features such as interactive filters, drill-downs, and tooltips enable users to delve deeper into the data, ask questions, and uncover new insights, fostering a culture of data-driven exploration and learning.

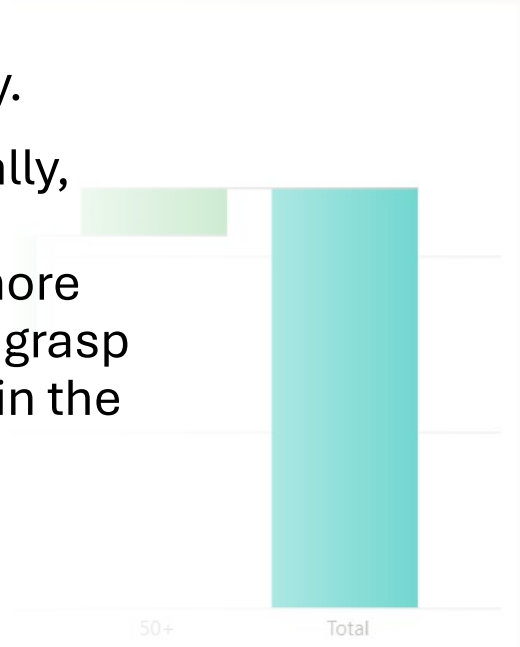


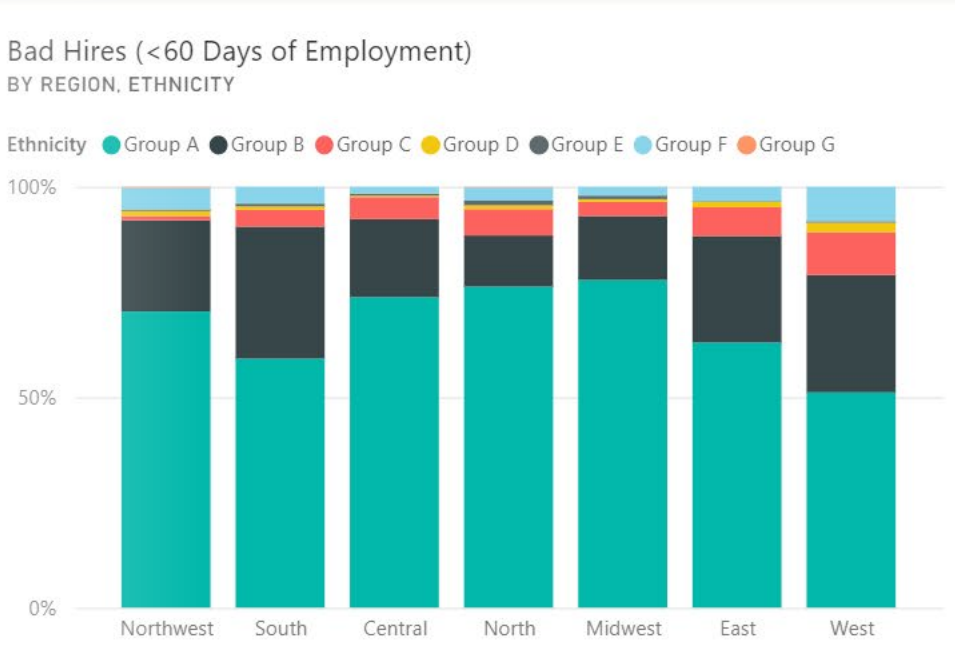
# Data Vis for BI: Clarity and Understanding

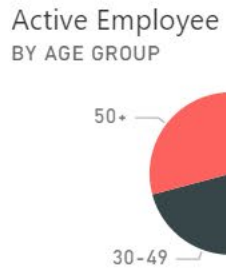
- Visual representations of data, such as charts, graphs, and maps, make complex information easier to understand immediately.
- By presenting data visually, patterns, trends, and relationships become more apparent, helping users grasp the insights hidden within the data more quickly and intuitively.



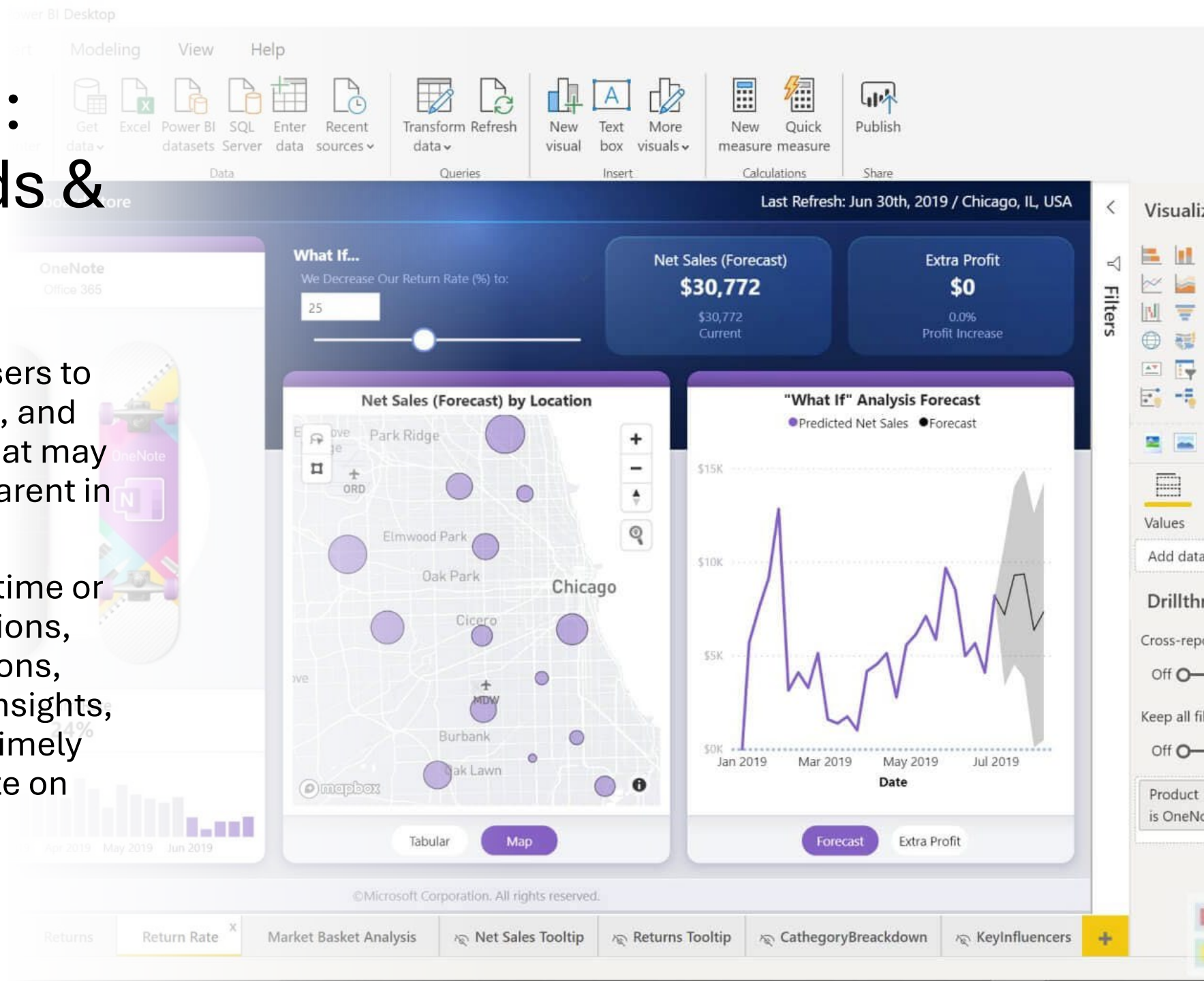


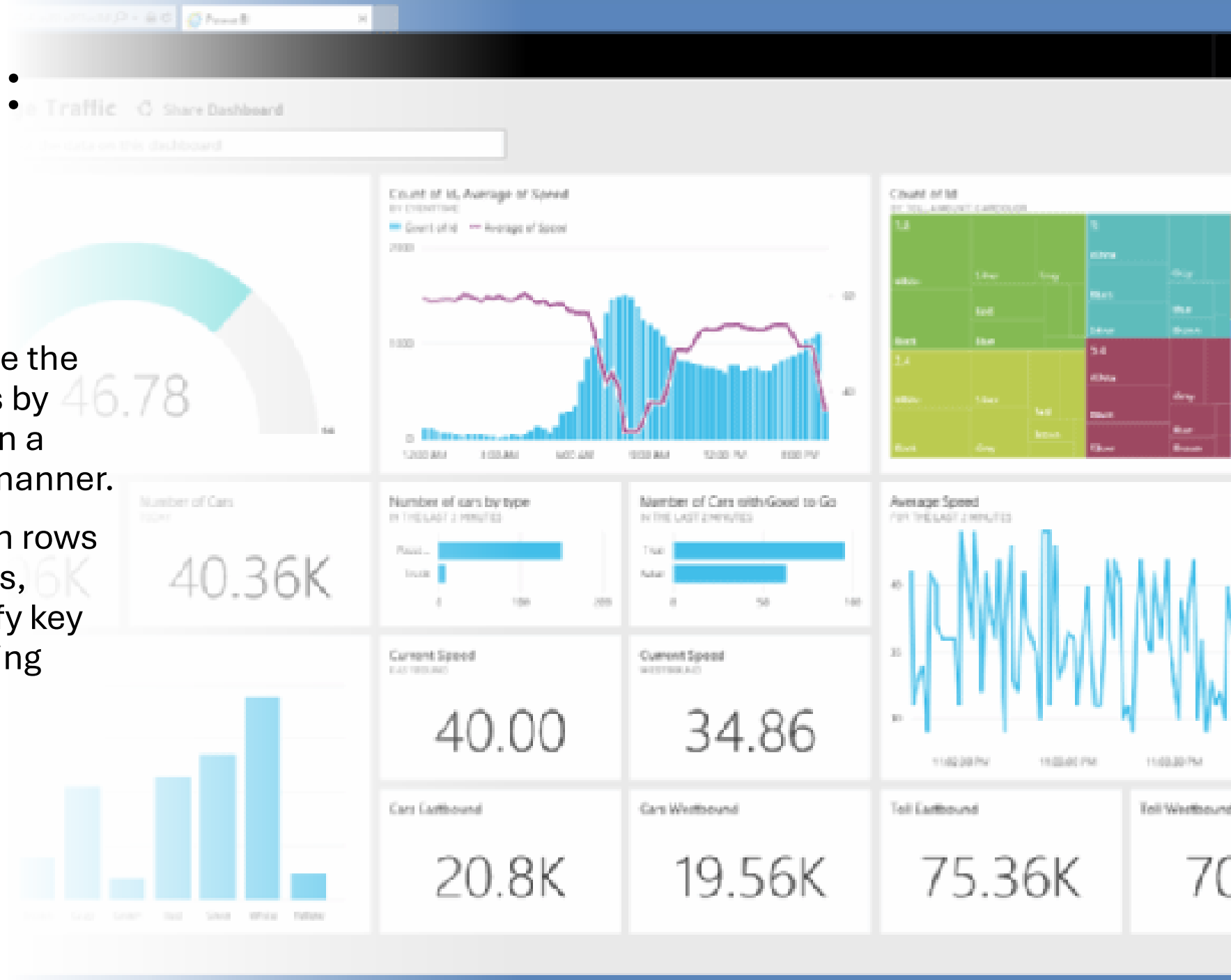
# Data Vis for BI: Spotting Trends & Patterns

- Visualizations enable users to identify trends, patterns, and anomalies in the data that may not be immediately apparent in raw numbers or text.
- By visualizing data over time or across different dimensions, users can spot correlations, outliers, and emerging insights, allowing them to make timely adjustments or capitalize on opportunities.



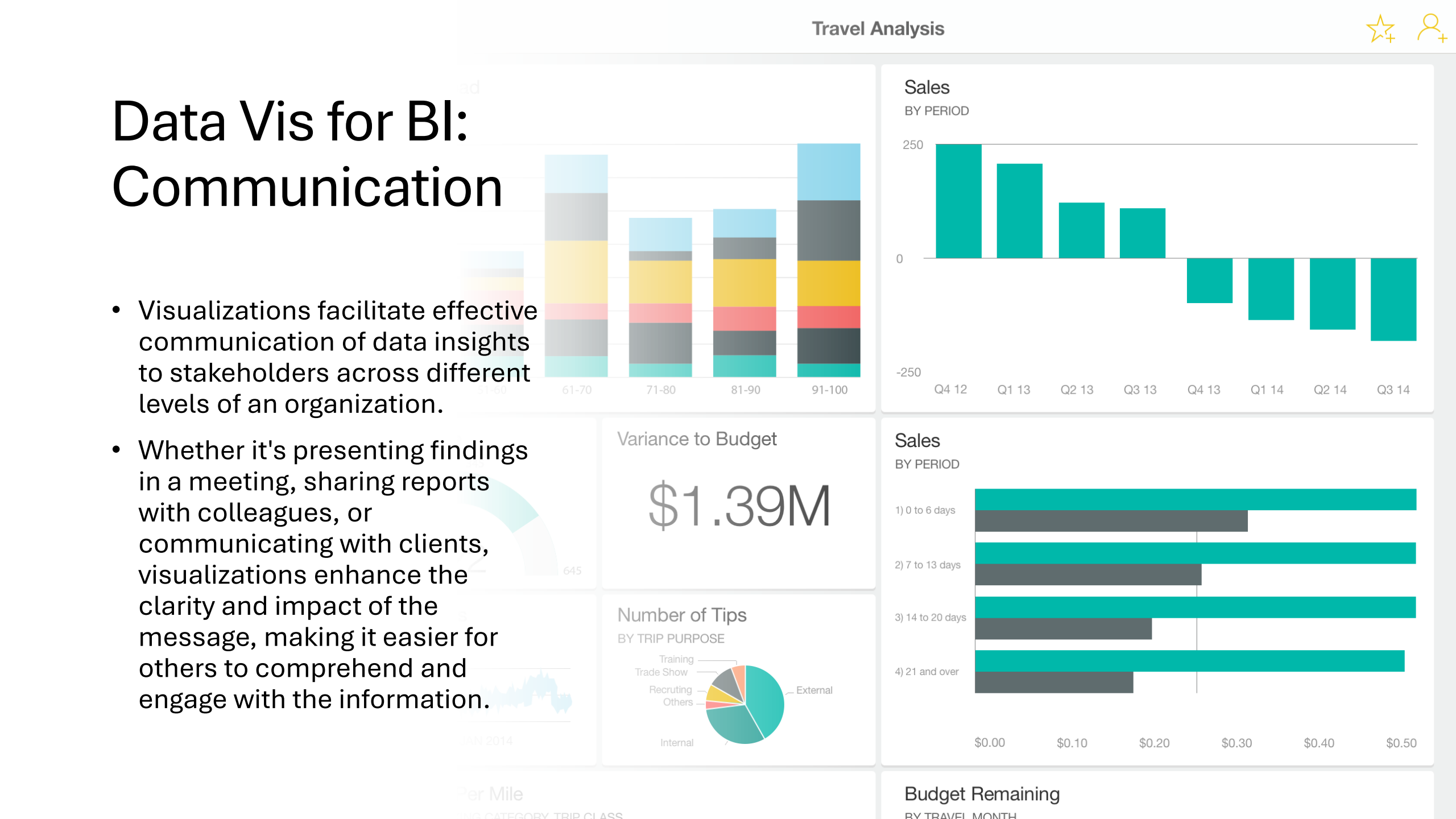
# Data Vis for BI: Efficiency and Productivity

- Visualizations streamline the process of data analysis by presenting information in a concise and organized manner.
- Instead of sifting through rows of data or lengthy reports, users can quickly identify key insights and trends, saving time and increasing productivity.



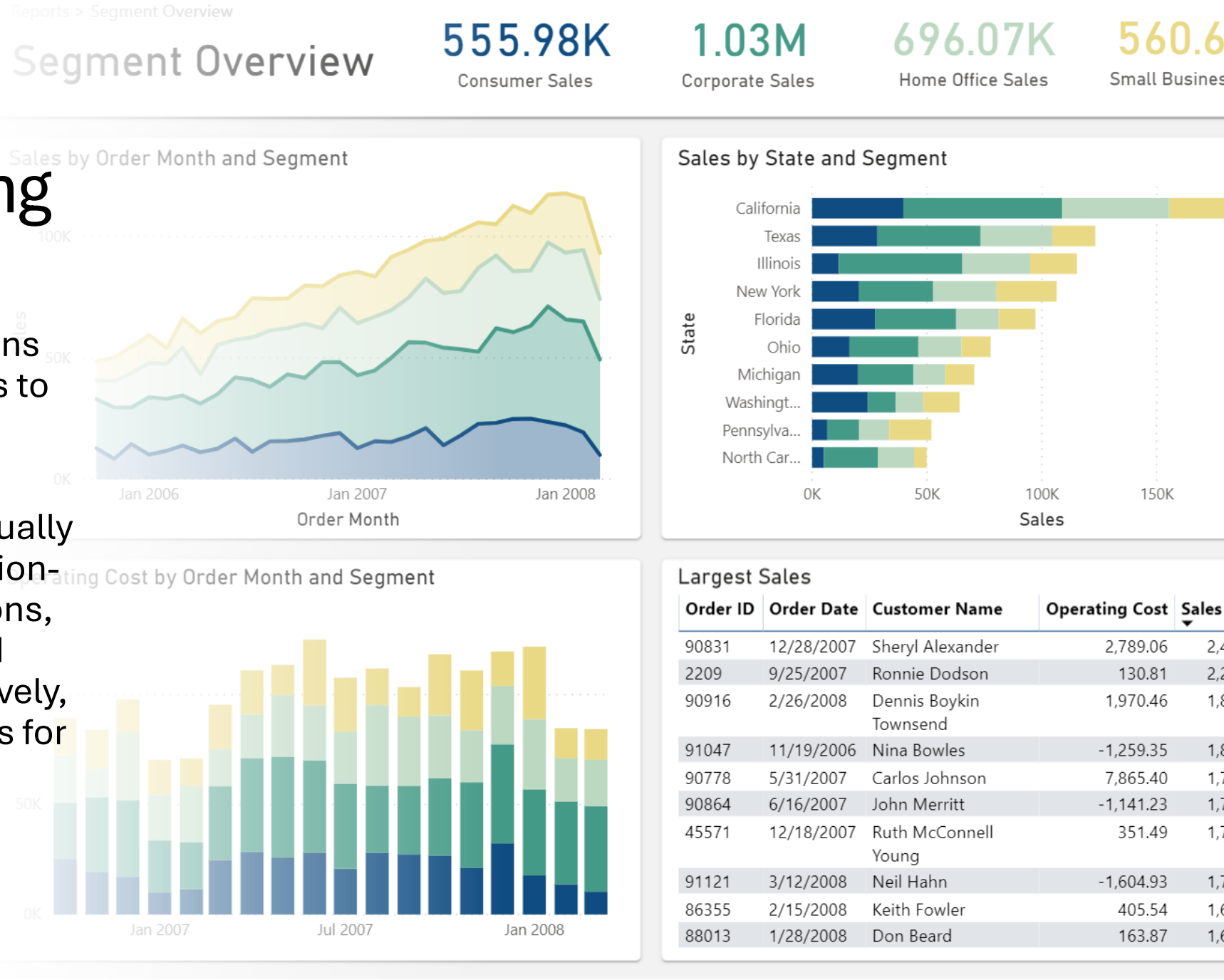
# Data Vis for BI: Communication

- Visualizations facilitate effective communication of data insights to stakeholders across different levels of an organization.
- Whether it's presenting findings in a meeting, sharing reports with colleagues, or communicating with clients, visualizations enhance the clarity and impact of the message, making it easier for others to comprehend and engage with the information.



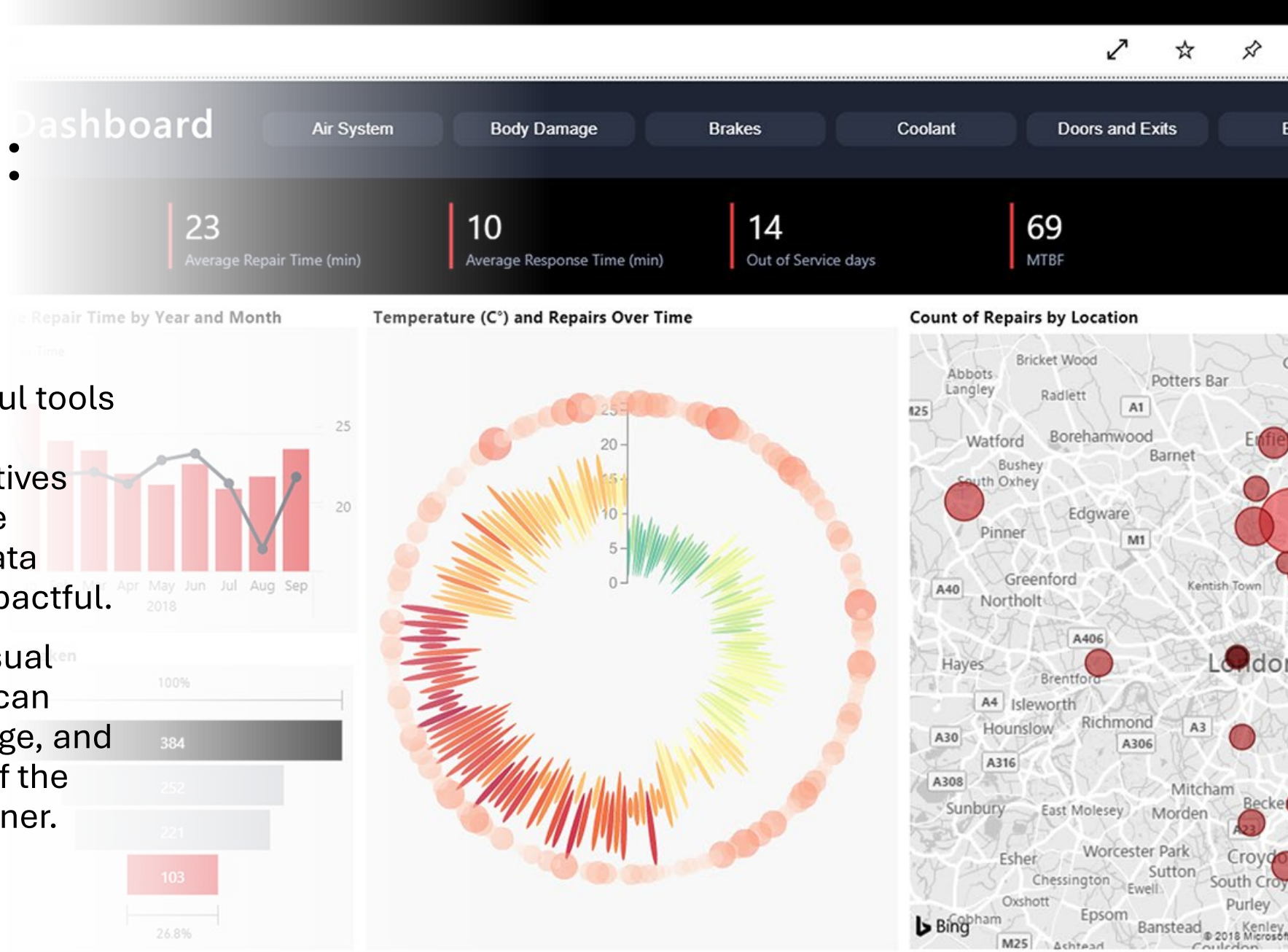
# Data Vis for BI: Decision-Making

- Well-designed visualizations empower decision-makers to make informed decisions based on data.
- By presenting data in a visually compelling manner, decision-makers can evaluate options, identify opportunities, and mitigate risks more effectively, leading to better outcomes for the organization.



# Data Vis for BI: Storytelling

- Visualizations are powerful tools for storytelling. They help transform data into narratives that engage and captivate audiences, making the data more memorable and impactful.
- By crafting compelling visual stories, data storytellers can inspire action, drive change, and convey the significance of the data in a compelling manner.



# Data Visualization in Academic Research

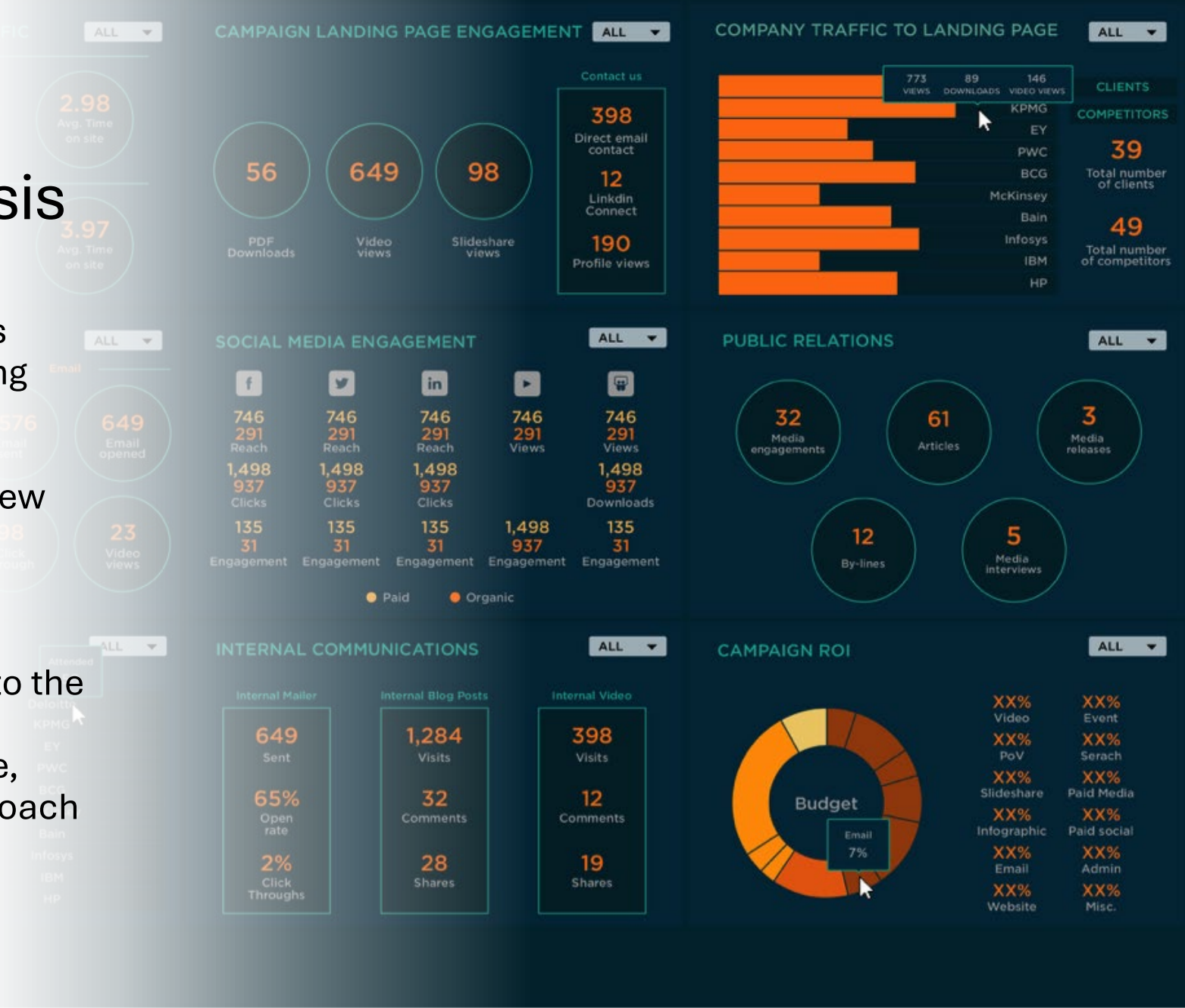
- **Why is data visualization important <u>in academic research?</u>**
  - Data visualization serves as a powerful tool for academic researchers to **explore, analyze, and communicate** their **findings effectively**, ultimately advancing knowledge and driving innovation in their respective fields of study.

# Data Vis for Research: Enhanced Understanding

- Academic research often involves analyzing complex datasets and drawing conclusions from the data.
- Data visualization helps researchers gain a deeper understanding of their data by presenting it in a visual format that is easier to comprehend.
- Visualizations can reveal patterns, trends, and relationships within the data that may not be immediately apparent from raw numbers or text.

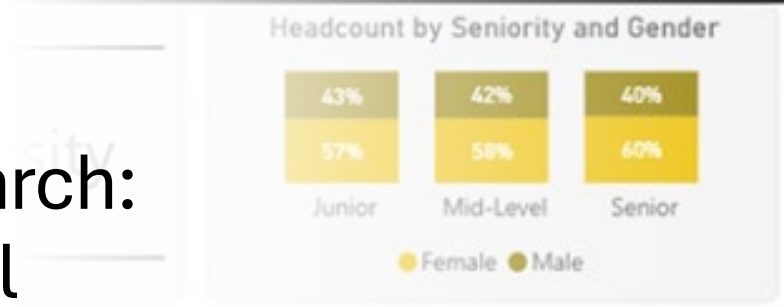
# Data Vis for Research: Exploratory Analysis

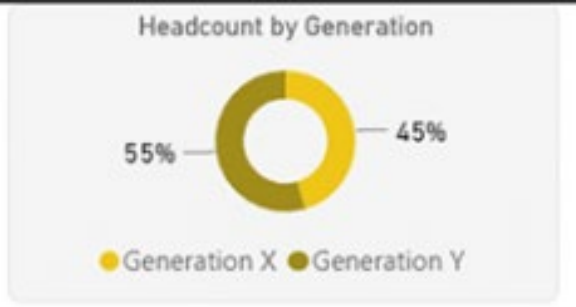
- Data visualization facilitates exploratory analysis, allowing researchers to interactively explore their data, test hypotheses, and generate new research questions.
- Visualization tools with interactive features enable researchers to drill down into the data, filter information, and uncover insights in real-time, fostering a data-driven approach to research.

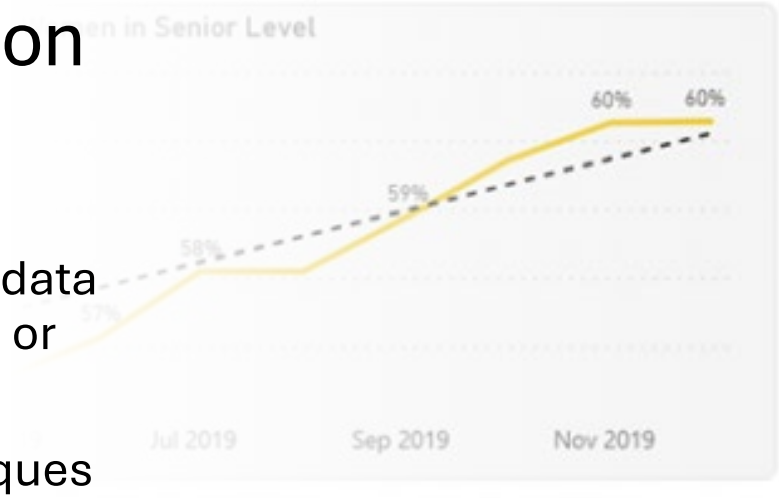


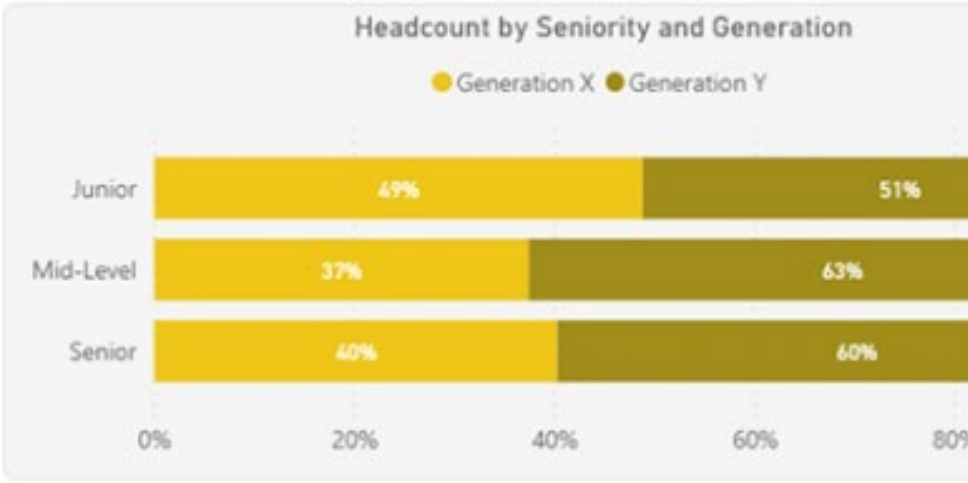
# Data Vis for Research: Multi-Dimensional Data Representation

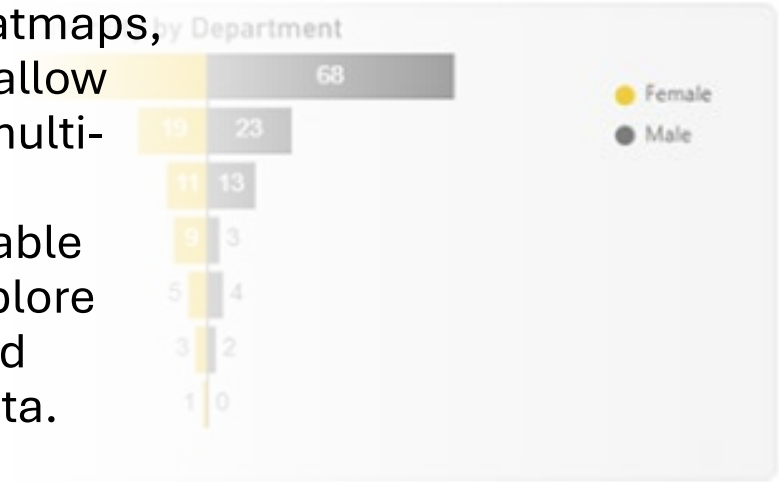
- Many academic research studies involve analyzing data with multiple dimensions or variables.
- Data visualization techniques such as scatter plots, heatmaps, and parallel coordinates allow researchers to visualize multi-dimensional data in a meaningful and interpretable way, enabling them to explore complex relationships and interactions within the data.

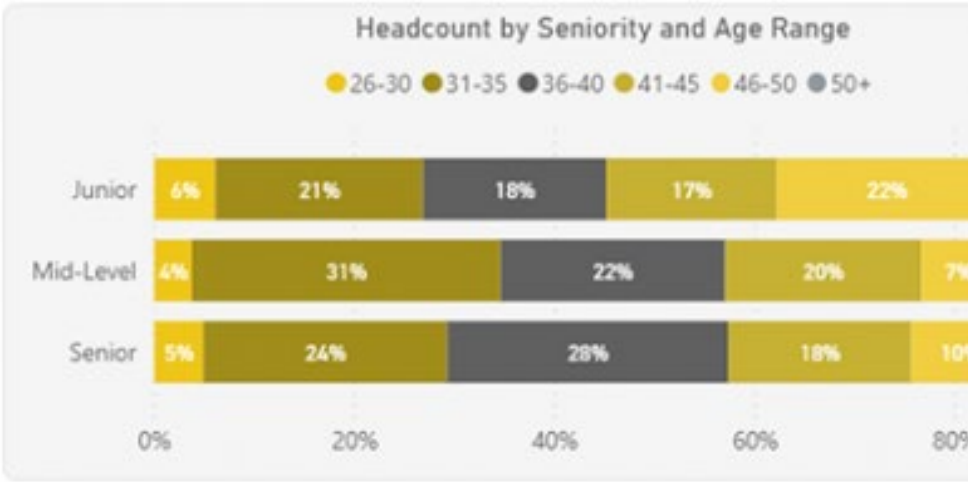




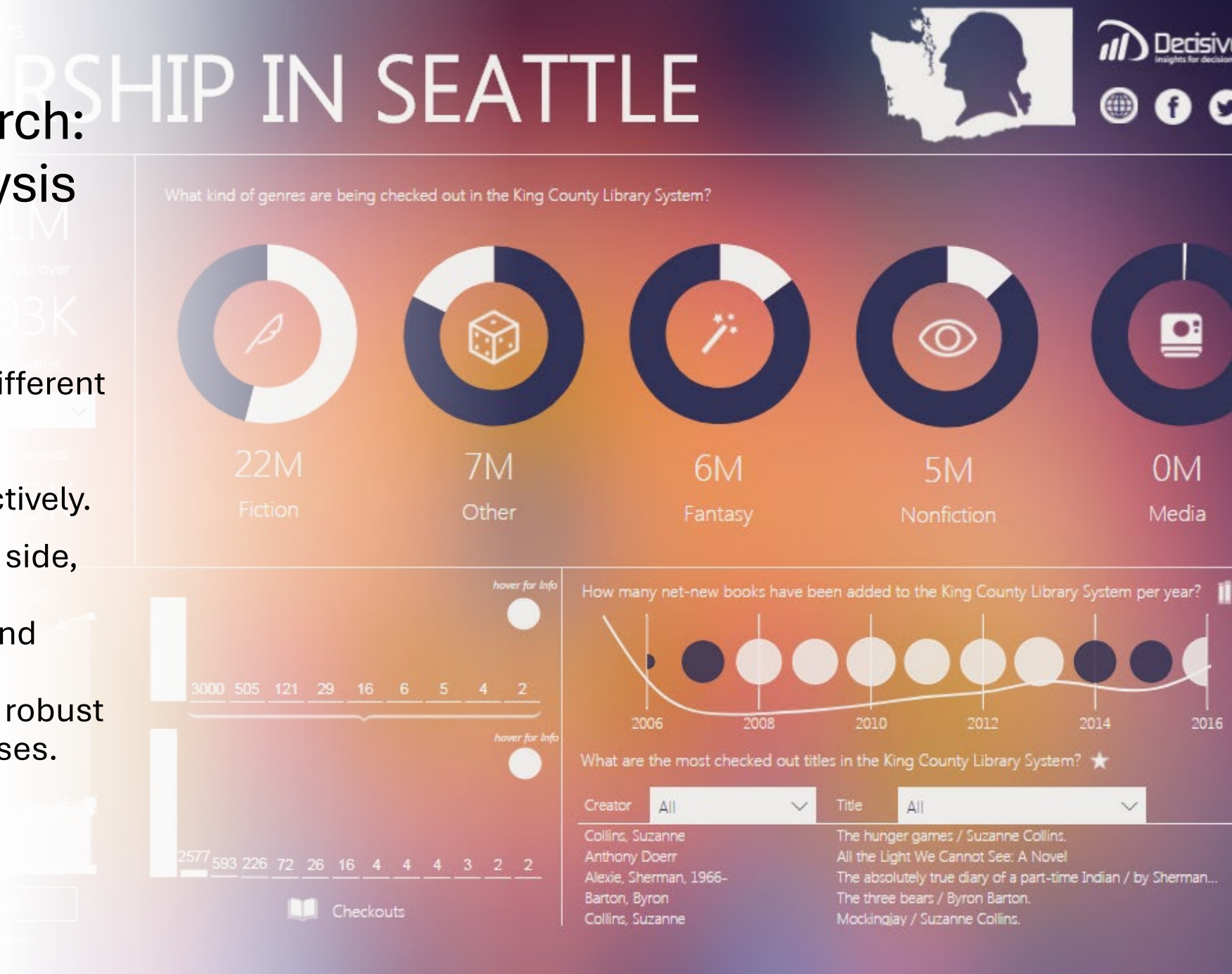



# Data Vis for Research: Testing & Validation

- Visualizations play a crucial role in hypothesis testing and validation by providing empirical evidence to support or refute research hypotheses.
- Visual representations of data allow researchers to evaluate the strength of relationships, assess statistical significance, and validate research findings through visual inspection and analysis.

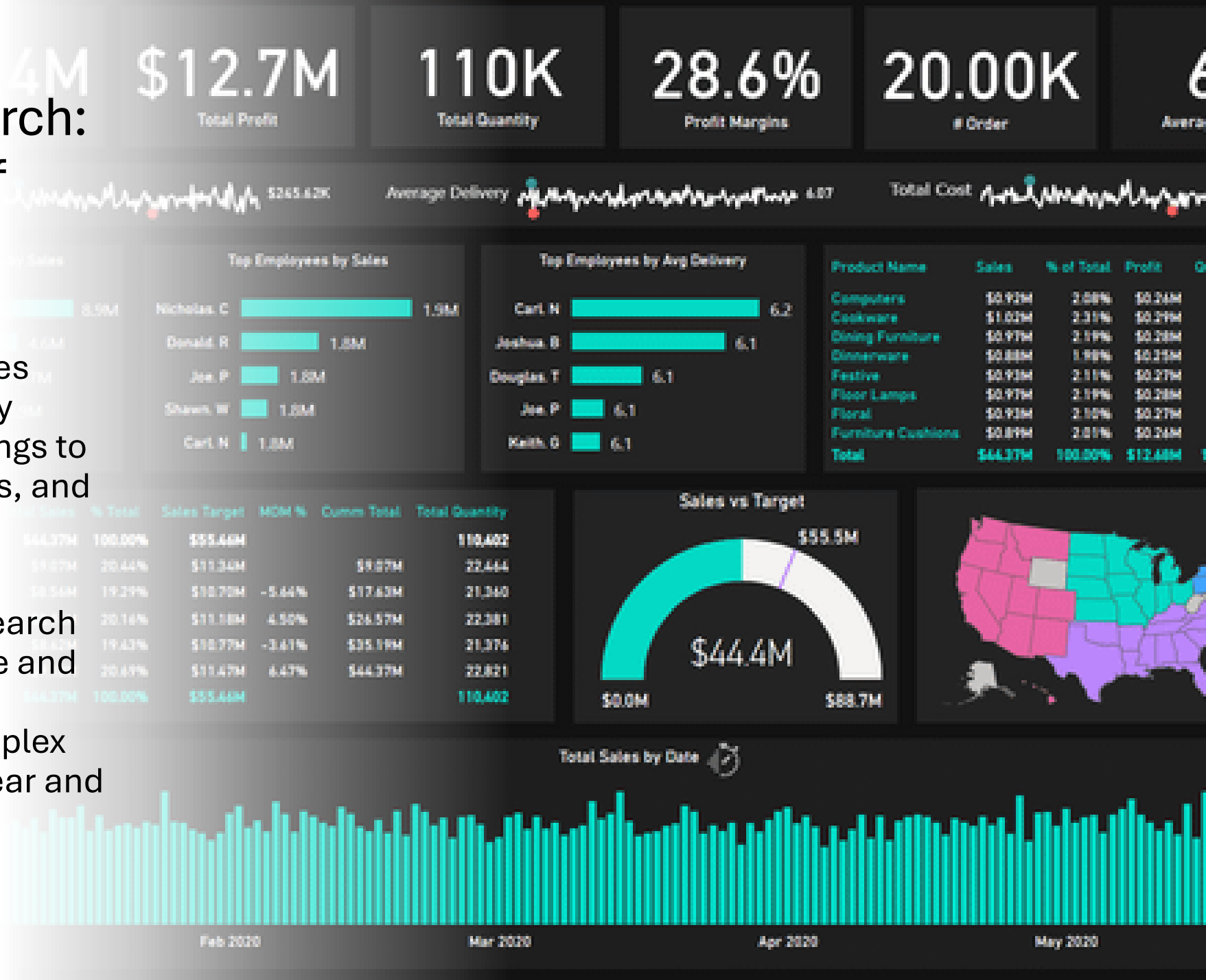
# Data Vis for Research: Comparative Analysis

- Visualizations enable researchers to compare different datasets, experimental conditions, or research methodologies more effectively.
- By visualizing data side by side, researchers can identify similarities, differences, and patterns across multiple variables, leading to more robust and comprehensive analyses.



# Data Vis for Research: Communication of Findings

- Data visualization enables researchers to effectively communicate their findings to their peers, collaborators, and the broader academic community.
- Visualizations make research findings more accessible and understandable, helping researchers convey complex ideas and results in a clear and concise manner.



# Data Vis for Research: Publication & Presentation

- Visualizations are often used in academic publications, presentations, and posters to illustrate key findings and support research conclusions.
- Well-designed visualizations enhance the visual appeal of academic materials, making them more engaging and impactful for readers and audiences.

# Intro to Power BI

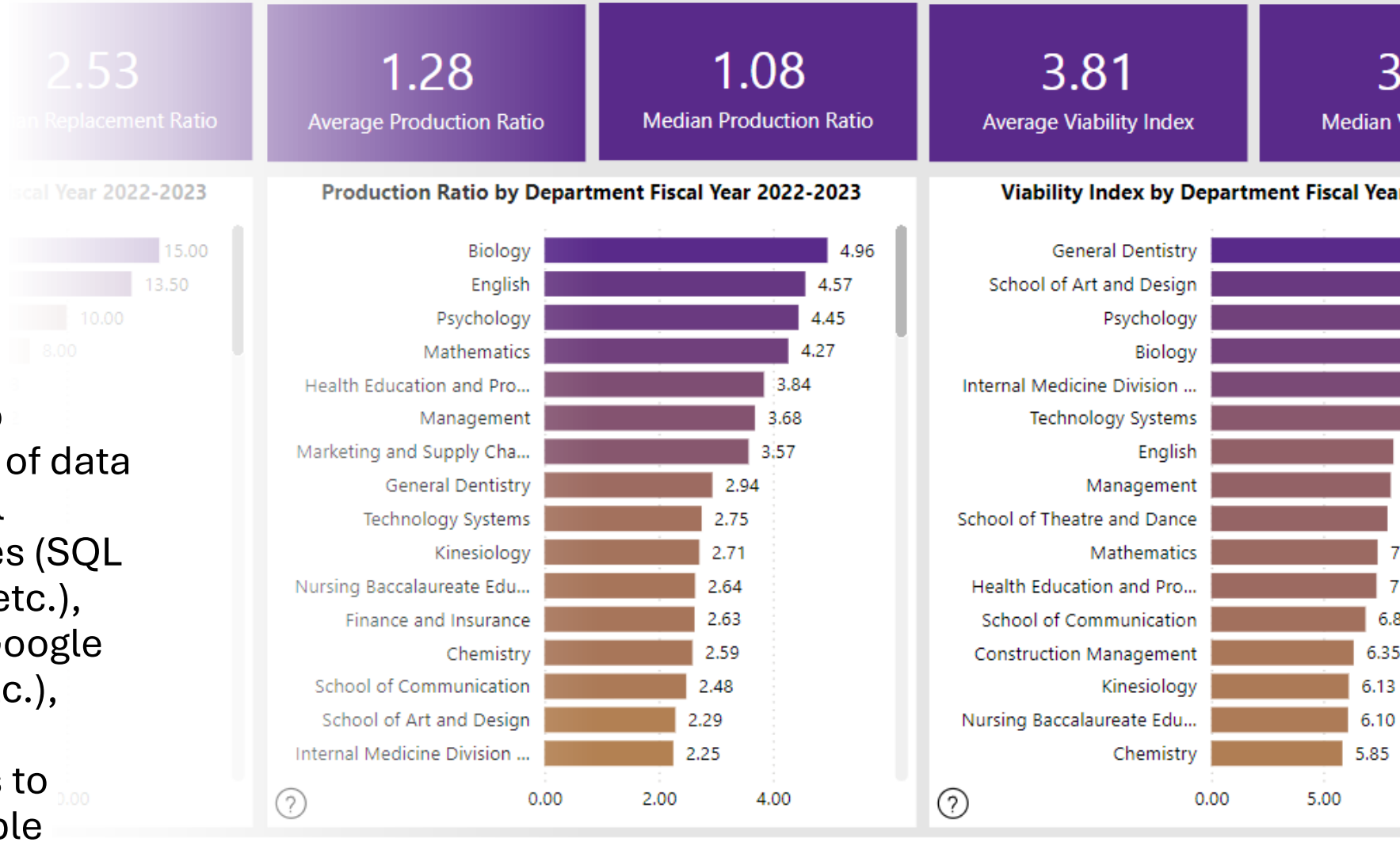
- **What is Power BI?**
  - Power BI is a powerful business analytics tool developed by Microsoft.
  - It enables users to visualize and analyze data from various sources to gain insights and make data-driven decisions.

# Intro to Power BI, cont.

- **What are the key features of Power BI?**
  - Data Connectivity
  - Data Modeling and Transformation
  - Visualization
  - Advanced Analytics
  - Sharing and Collaboration
  - Integration with Microsoft Ecosystem

# PBI Features: Data Connectivity

- Power BI allows users to connect to a wide range of data sources, including Excel spreadsheets, databases (SQL Server, Oracle, MySQL, etc.), cloud services (Azure, Google Analytics, Salesforce, etc.), and many others. This versatility enables users to bring in data from multiple sources for comprehensive analysis.




| Declared Majors and Minors | Credentials Awarded | Replacement Ratio | Departmental SCH | Institutional SCH | Production Ratio | Viability Index | Instructional Expenditures |
|---|---|---|---|---|---|---|---|
| 205 | 49 | 4.18 | 20,908 | 711,270 | 2.94 | 12.30 | $4,351,801 |
| 583 | 120 | 4.86 | 16,296 | 711,270 | 2.29 | 11.13 | $5,124,611 |
| 1,427 | 602 | 2.37 | 31,635 | 711,270 | 4.45 | 10.54 | $4,118,010 |
| 1,208 | 572 | 2.11 | 35,247 | 711,270 | 4.96 | 10.47 | $6,138,825 |
| 337 | 77 | 4.38 | 16,035 | 711,270 | 2.25 | 9.87 | $508,207 |
| 1,322 | 415 | 3.19 | 19,571 | 711,270 | 2.75 | 8.77 | $5,009,665 |

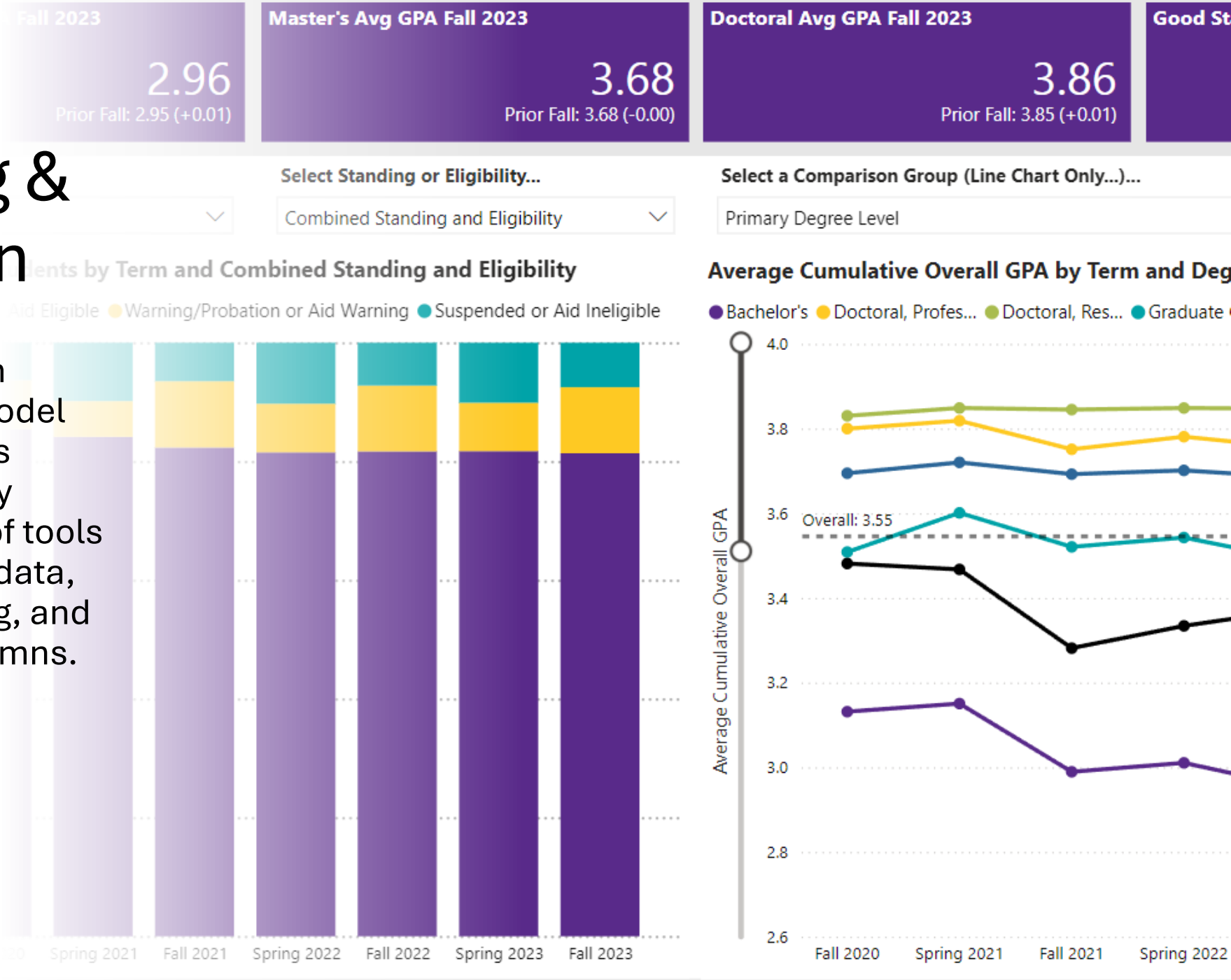
# Power BI Data Source Connectors (sample)

- Excel
- CSV
- Text
- SQL Server Database
- Other Relational Databases
- Azure Data Services
- Online Services
- Web and API Services

- PDF
- Hadoop File (HDFS)
- JSON (JavaScript Object Notation)
- XML (eXtensible Markup Language)
- SharePoint Lists
- File Folder
- R Scrip
- Python Script

# PBI Features: Data Modeling & Transformation

- With Power BI, users can clean, transform, and model data to suit their analysis needs. The built-in Query Editor provides a range of tools for shaping and refining data, such as filtering, merging, and creating calculated columns.



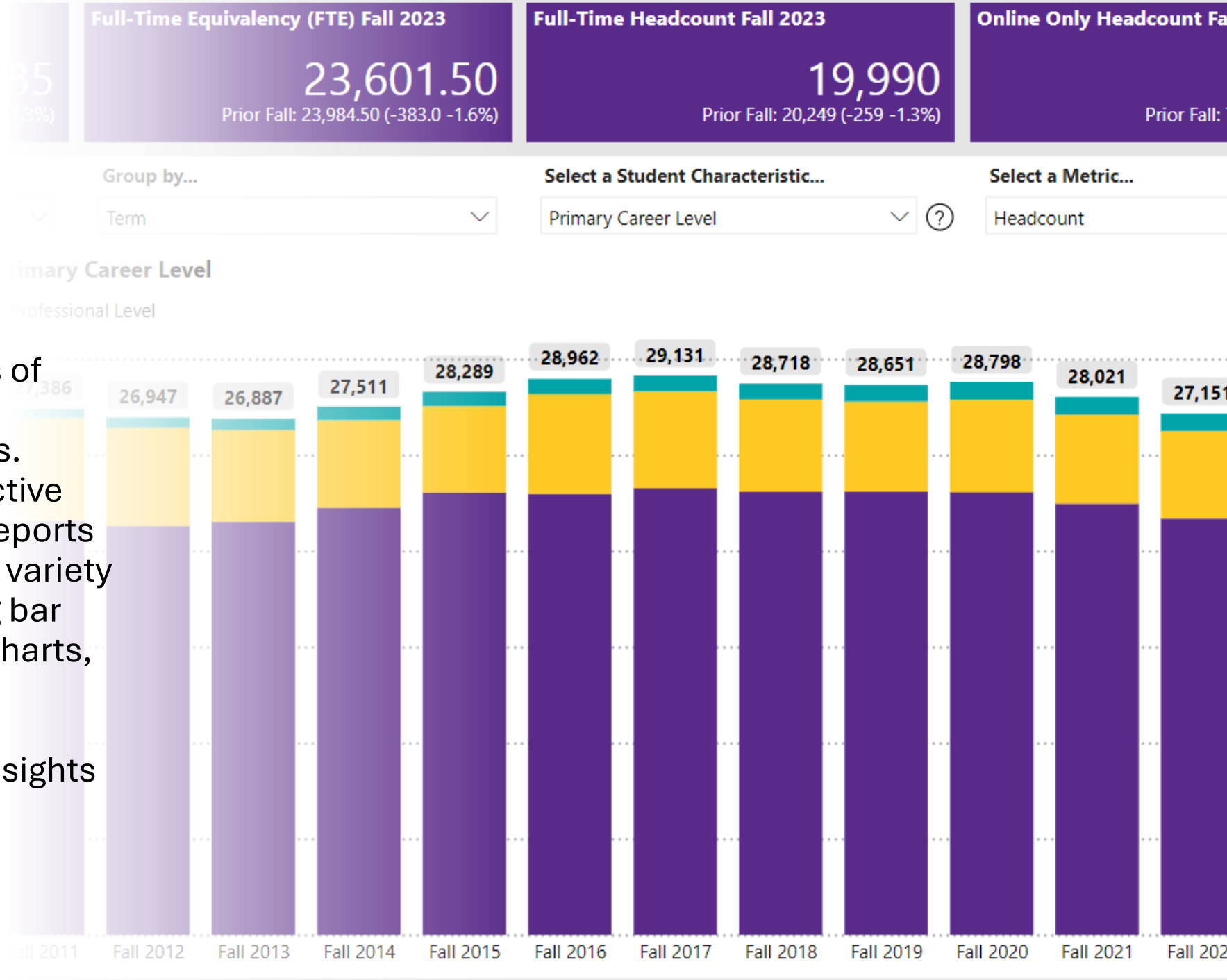
# Power BI Data Trans-formations (sample)

- Filtering
- Sorting
- Add Columns
- Remove Columns
- Split Columns
- Merge Columns
- Data Type Conversion
- Grouping
- Aggregation

- Pivot Data
- Unpivot Data
- Conditional Columns
- Custom Functions
- M Language

# PBI Features: Visualization

- One of the key strengths of Power BI is its robust visualization capabilities. Users can create interactive and visually appealing reports and dashboards using a variety of chart types, including bar charts, line charts, pie charts, maps, and more. These visualizations can be customized to convey insights effectively.

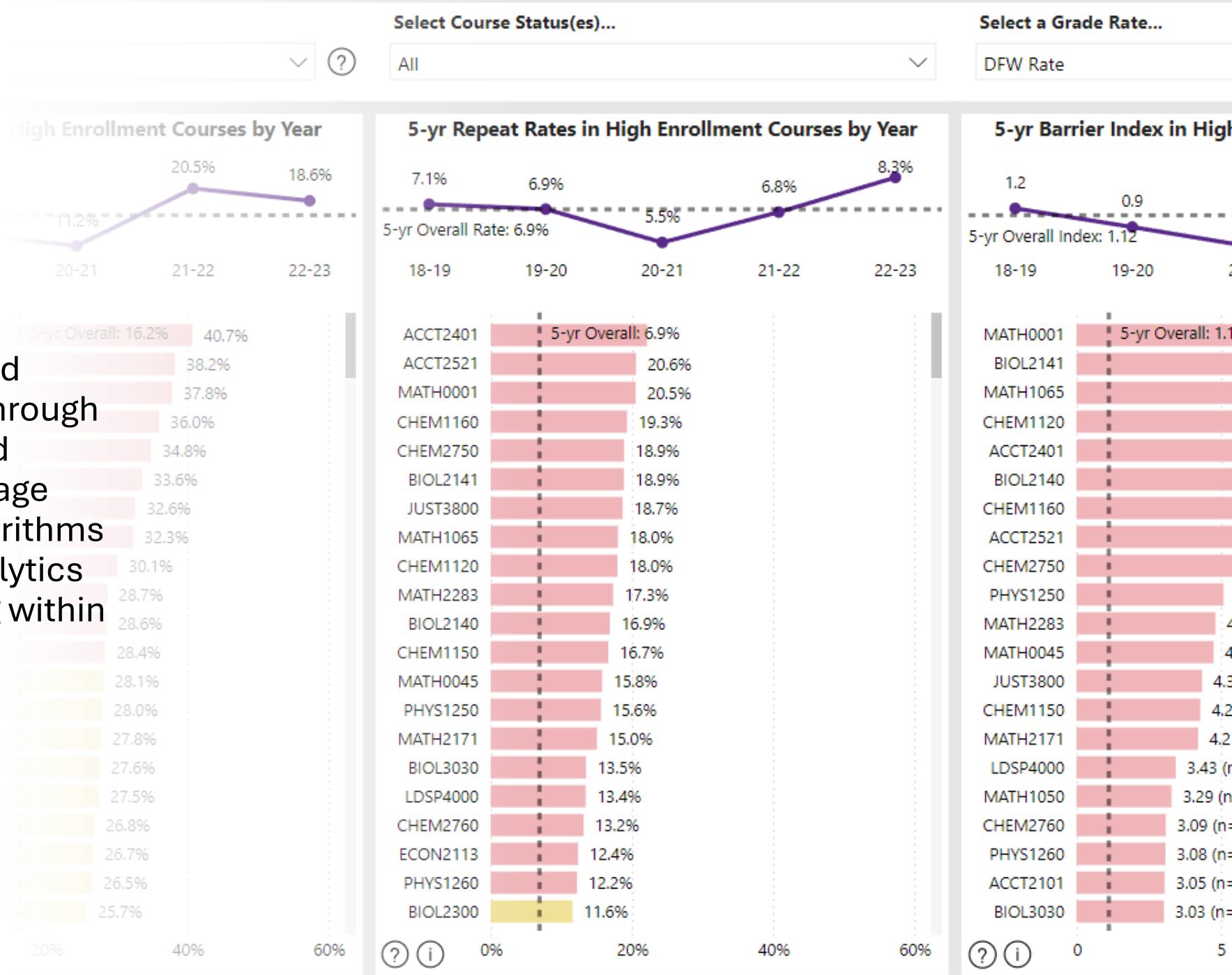


# Power BI Visuals (sample)

- Bar Chart
- Column Chart
- Line Chart
- Area Chart
- Pie Chart
- Donut Chart
- Scatter Chart
- Bubble Chart
- Map
- Gauge
- KPI (Key Performance Indicator)
- Tree Map
- Waterfall Chart
- Funnel Chart
- Ribbon Chart
- Third-Party Visuals

# PBI Features: Advanced Analytics

- Power BI offers advanced analytical capabilities through its integration with R and Python. Users can leverage custom scripts and algorithms to perform complex analytics and statistical modeling within their reports.

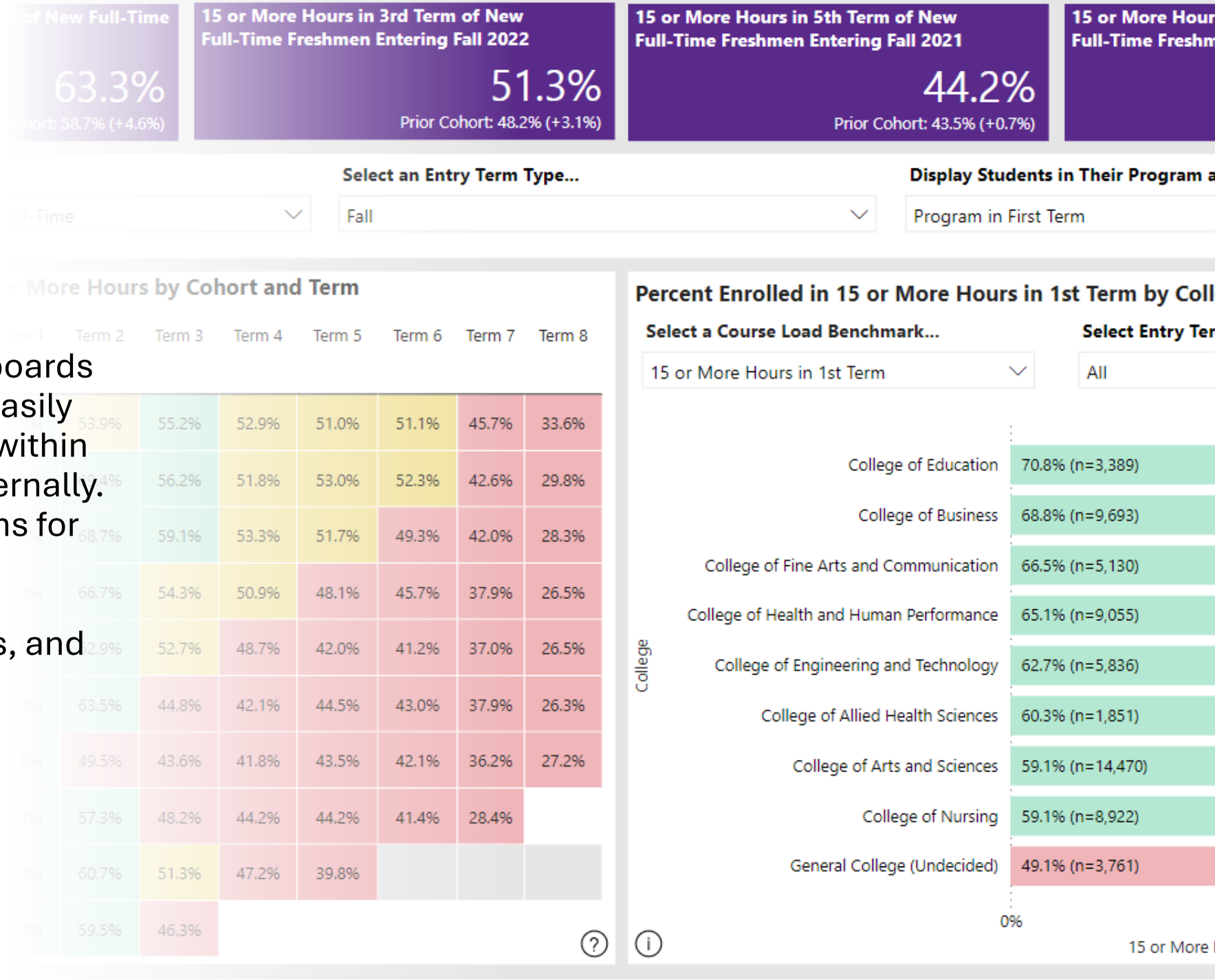


# Power BI Advanced Analytics (sample)

- R Integration
- Python Integration
- Quick Measures
- Key Influencers Visual
- Anomaly Detection
- AI Insights (Premium)

# PBI Features: Sharing and Collaboration

- Once reports and dashboards are created, users can easily share them with others within their organization or externally. Power BI provides options for sharing via the Power BI Service, embedding in websites or applications, and exporting to formats like PowerPoint or PDF.

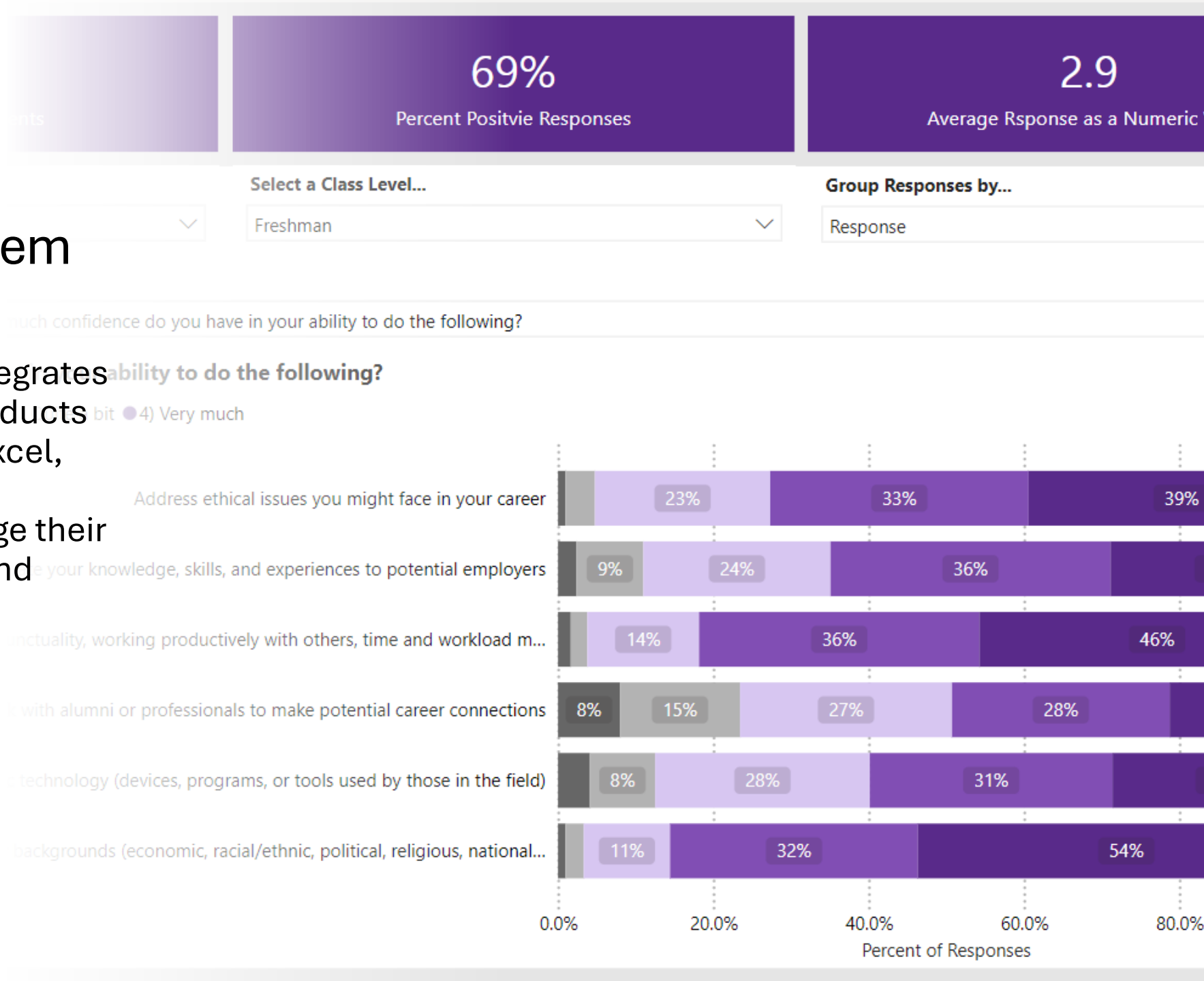


# Power BI Sharing Features

- Publish to PowerBI Service
- Share Reports and Dashboards
- Collaborate with Colleagues
- Commenting and Discussion
- Subscribe to Reports
- Embed Reports
- Microsoft Teams Integration

# PBI Features: Integration with Microsoft Ecosystem

- Power BI seamlessly integrates with other Microsoft products and services, such as Excel, SharePoint, and Teams, allowing users to leverage their existing infrastructure and workflows.

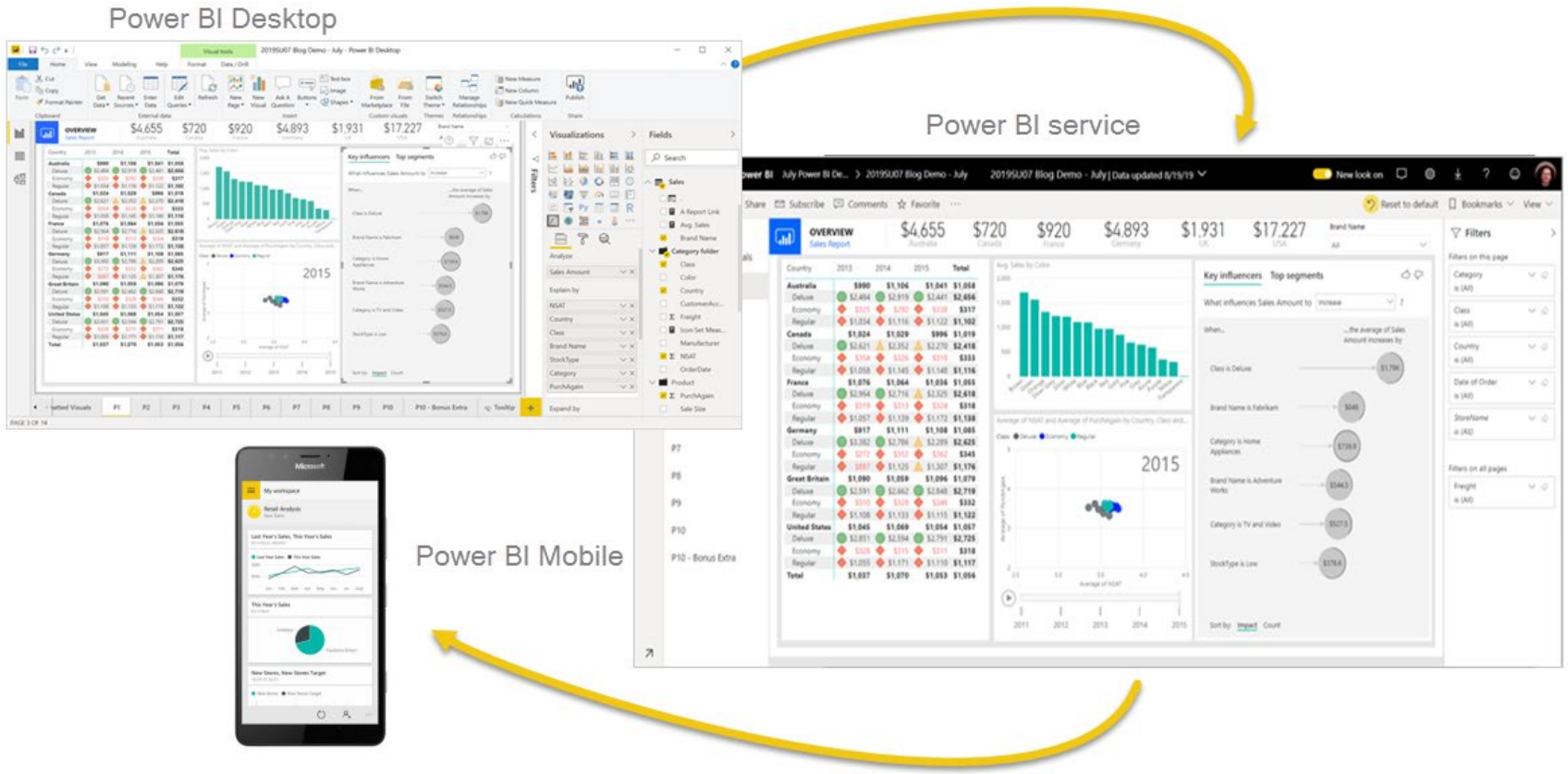


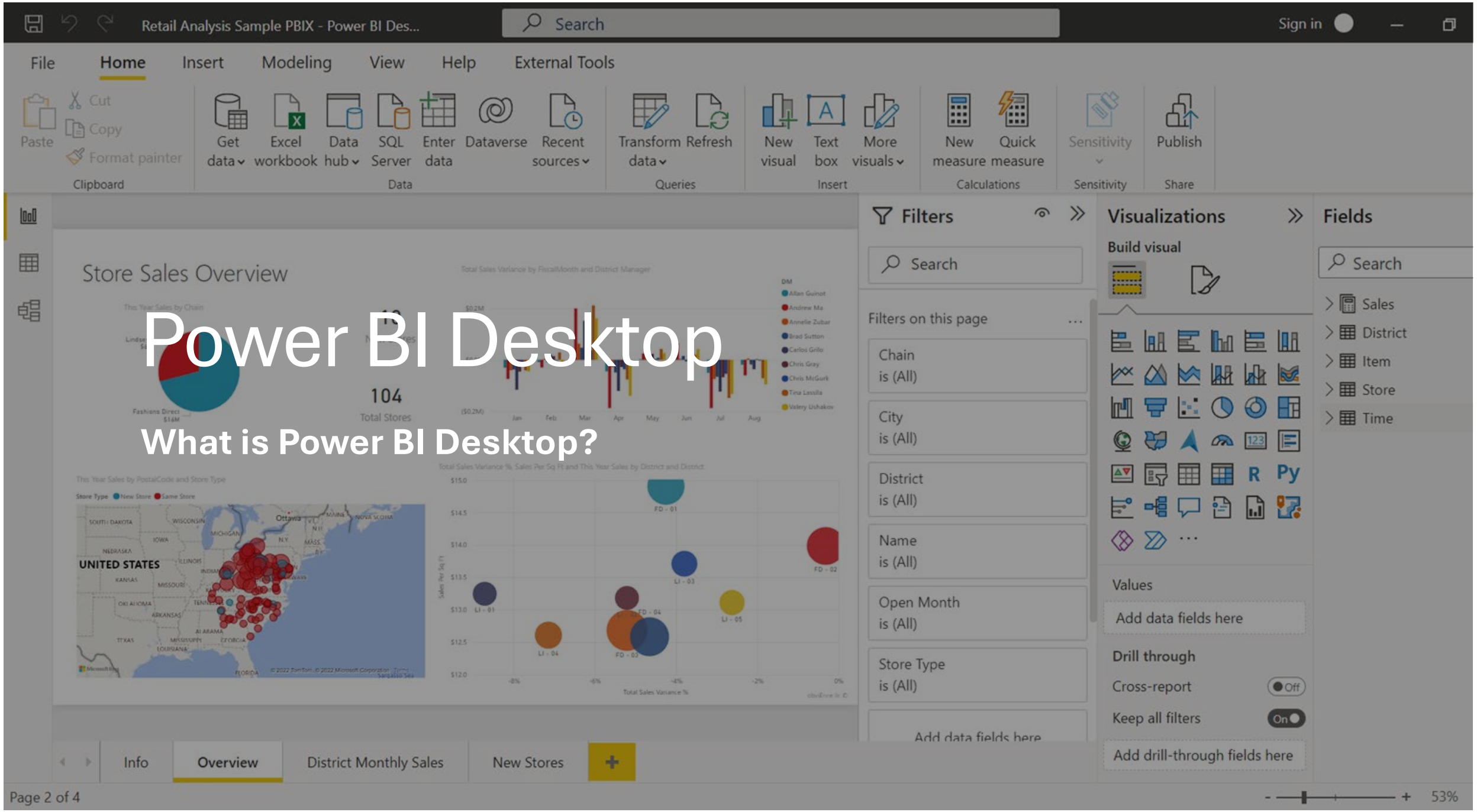
# Power BI Sharing Features

- Excel
- Office 365
- Teams
- Azure
- Dynamics 365
- Power Platform

# Intro to Power BI, cont.

- **What are the components of Power BI?**
  - Desktop
  - Service
  - Mobile
  - *Report Builder*
  - *Report Server*




Retail Analysis Sample PBIX - Power BI Des...
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Format painter
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Data hub
SQL Server
Enter data
Dataverse
Recent sources
Data
Transform data
Refresh
Queries
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Text box
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New measure
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Sales
District
Item
Store
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District Monthly Sales
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Page 2 of 4
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# Power BI Desktop, cont.

- **Where can I download PBI Desktop software?**
  - You can get the most recent version of Power BI Desktop from the **Windows Store**, or as a single executable containing all supported languages that you **download** and install on your computer.

- **When is PBI Desktop software updated?**
  - Power BI Desktop is updated and released **monthly**, incorporating customer feedback and new features. Only the most recent version of Power BI Desktop is supported by Microsoft.

# Break then Demonstration

- Let’s take a break for ~10 minutes.
- Then we’ll get into the demo and build a dashboard!

# About Today’s Demonstration

- Credit: Keven Stratvert

- Kevin’s YouTube Channel:
  - https://www.youtube.com/@KevinStratvert

- How to use Microsoft Power BI Video – Tutorial for Beginners:
  - https://www.youtube.com/watch?v=TmhQCQr_DCA&t=256s