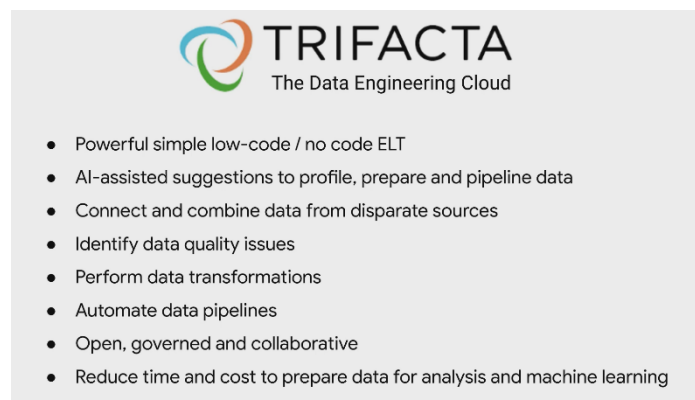# Optimizing Microsoft Power BI workflow with Machine Learning

By harnessing the power of artificial intelligence algorithms and external tools, Power BI offers a comprehensive suite of advanced functionalities that streamline and optimize various stages of the data analysis workflow. These capabilities, including data preparation, natural language querying, data visualization, machine learning integration, personalized dashboards, AI-powered insights, natural language generation and advanced analytics, empower users to leverage data-driven insights more effectively, facilitating informed decision-making and driving business success.

1. Automated Data Preparation

Tools like Power Query in Power BI allow to leverage AI algorithms to detect and fix data quality issues, handle missing values, and perform data transformations. There are multiple options to choose from:

Trifacta Wrangler - data preparation platform that leverages AI and machine learning techniques to automate and accelerate the process of cleaning and transforming data. It provides intuitive visual interfaces, smart suggestions, and data profiling capabilities to help users prepare their data for analysis in Power BI. To connect Power BI to Trifacta Wrangler and leverage the cleaned and transformed data, follow these steps:

TRIFACTA
The Data Engineering Cloud

- Powerful simple low-code / no code ELT
- AI-assisted suggestions to profile, prepare and pipeline data
- Connect and combine data from disparate sources
- Identify data quality issues
- Perform data transformations
- Automate data pipelines
- Open, governed and collaborative
- Reduce time and cost to prepare data for analysis and machine learning

1. Use Trifacta Wrangler's data preparation capabilities to clean, transform, and shape your data as needed. Ensure that the data is in a format suitable for analysis in Power BI. (.xlsx, CSV, .txt, ETL, ect.)
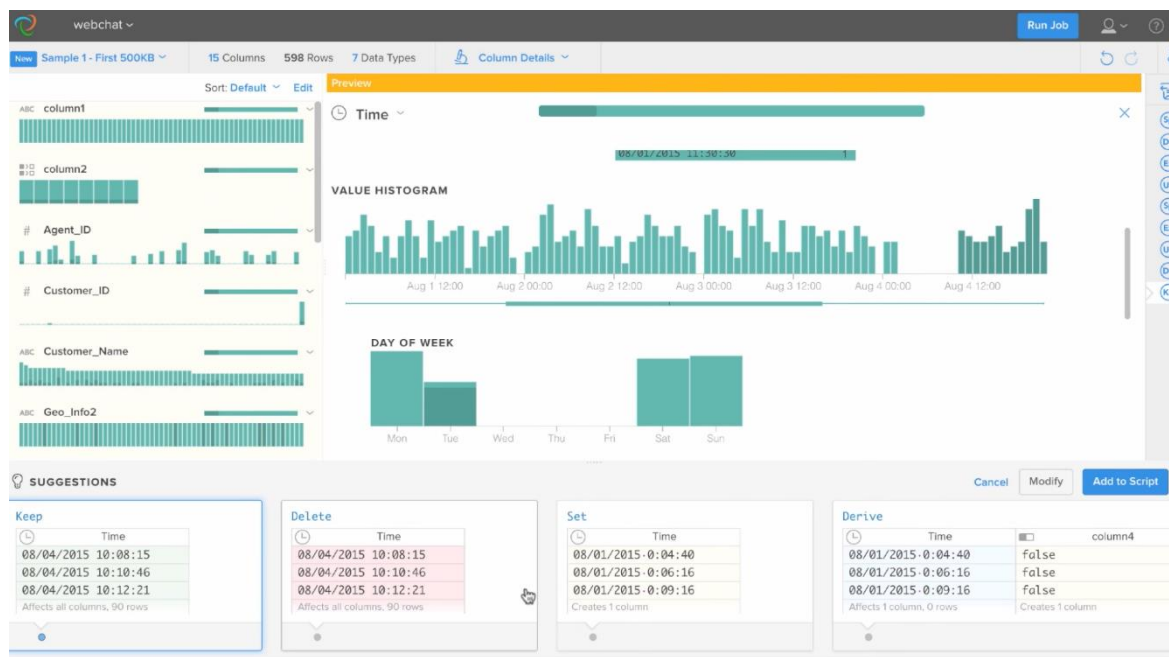
2. Once you have prepared the data in Trifacta Wrangler, export it in a compatible format such as CSV, Excel, or connect directly to a database. Save the cleaned dataset in a location accessible to Power BI.

3.Open Power BI Desktop or Power BI Service, depending on your preference and available options.

4. In Power BI, click on the "Get Data" button on the Home tab. It is located in the "Home" ribbon at the top of the Power BI interface.

5. In the "Get Data" window, choose the appropriate data source option based on where you have exported your cleaned data. For example, if you exported as a CSV file, select "Text/CSV." If you exported as an Excel file, select "Excel."

6. Follow the prompts in the data source selection window to provide the necessary information and connect to the cleaned data. This may involve specifying the file location, database credentials, or other relevant details.

7. Once connected, Power BI will display a preview of the data. Review the preview to ensure that the data is correctly imported. If everything looks good, click the "Load" button to load the data into Power BI.

8. With the data loaded into Power BI, you can now analyze, create visualizations, and build reports and dashboards using the cleaned and transformed data from Trifacta Wrangler. Utilize the various features and functionalities of Power BI to gain insights from your data.

Alteryx Designer - comprehensive data preparation and analytics platform that incorporates AI and machine learning capabilities. It offers advanced data profiling, cleansing, and transformation features, as well as predictive analytics and spatial tools. It can integrate seamlessly with Power BI, allowing us to implement AI data preparation workflows.

Paxata - self-service platform that assists in cleansing, integrating, and enriching data. It provides an intuitive interface with smart suggestions, semantic profiling, and anomaly detection features.

Tamr - data mastering and integration platform. Automates the process of identifying and resolving data inconsistencies, duplicates, and other quality issues. It can be integrated with Power BI to provide high-quality, unified data for analysis.

RapidMiner - end-to-end data science platform that incorporates machine learning capabilities. It offers data preparation features such as data cleaning, transformation, and feature engineering.

2. **Natural Language Querying**

Power BI's Q&A feature uses AI algorithms to understand user queries and generate visualizations and insights based on the underlying data.

3. **Smart Data Visualization**

Features provided by Power BI like **Quick Insights** and **AutoML** allow us to automatically generate visualizations and discover patterns and correlations in data. They can help to quickly explore and gain insights from data without requiring deep technical expertise.

4. **Machine Learning Integration**

Power BI allows you to integrate machine learning models and algorithms into your reports and dashboards. You can leverage AI frameworks like Azure Machine Learning or Python/R scripts to build and deploy custom models for tasks such as forecasting, anomaly detection, or sentiment analysis. These models can then be embedded in Power BI to provide advanced analytics and predictions.

5. **Personalized Dashboards and Recommendations:**

Power BI offers **built-in AI capabilities** that enable the creation of personalized dashboards and recommendations based on user preferences and usage patterns. It bases on collaborative filtering, content-based filtering, reinforcement learning and NLP. It can learn from user interactions, analyze their data consumption behavior, and suggest relevant insights, reports, or visualizations to enhance their productivity.

6. AI-Powered Data Insights

Power BI supports AI-powered services like **Azure Cognitive Services**, which provide capabilities such as text analytics, image recognition, and sentiment analysis. We can leverage these services to extract insights from unstructured data sources like social media feeds, customer feedback, or documents, and integrate the results into your Power BI reports and dashboards.

7. Natural Language Generation

Natural language generation tools automatically generate narratives and textual summaries of data visualizations. NLG can help in explaining complex data patterns and trends in a human-readable format, making it easier to understand and communicate insights. Power BI itself provides **a built-in feature called "Explain the Increase/Decrease"** that can generate natural language explanations for changes in data. This feature allows users to understand the factors contributing to variations in their data and helps explain the key drivers behind the changes. It uses AI algorithms to analyze the data and generate written explanations in a human-readable format.

The Business Benefits of AI

We surveyed 250 executives who were familiar with their companies' use of cognitive technologies to learn about their goals for AI initiatives. More than half said their primary goal was to make existing products better. Reducing head count was mentioned by only 22%.

PERCENTAGE OF EXECUTIVES WHO CITE THE FOLLOWING AS BENEFITS OF AI

Enhance the features, functions, and performance of our products	51%
Optimize internal business operations	36
Free up workers to be more creative by automating tasks	36
Make better decisions	35
Create new products	32
Optimize external processes like marketing and sales	30
Pursue new markets	25
Capture and apply scarce knowledge where needed	25
Reduce head count through automation	22

SOURCE DELOITTE 2017
FROM "ARTIFICIAL INTELLIGENCE FOR THE REAL WORLD,"
BY THOMAS H. DAVENPORT AND RAJEEV RONANKI, JANUARY–FEBRUARY 2018
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Fig 2. Deloitte 2017, The Business benefits of AI

To use the "**Explain the Increase/Decrease**" feature in Power BI, you can follow these steps:

1) Open the Power BI report or dashboard that contains the visual with the data you want to analyze.
2) Select the visual or data point you want to explore further.
3) Right-click on the visual or data point, and from the context menu, select "Explain the Increase" or "Explain the Decrease" based on the change you want to analyze.
4) Power BI will analyze the data, and a card with the explanation will be generated. The explanation will provide insights into the contributing factors and provide context for the observed increase or decrease in the data.
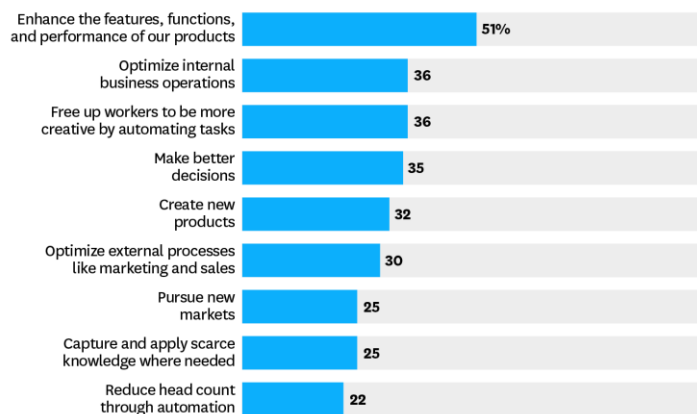
However there are also several external tools useful for NLG, such as:

- *Wordsmith* by Automated Insights - specializes in generating narratives from data. It allows to connect multiple data sources, define templates, and customize the output to generate narratives that explain the data visualizations in a narrative format. It supports various use cases, including financial reports, marketing dashboards, and business intelligence applications.
- *Arria NLG* - a comprehensive NLG platform that can be integrated with data visualization tools, including Power BI. It uses advanced AI algorithms to transform visualizations into

narratives and written reports. It supports multiple languages and can generate personalized, contextual explanations based on user-defined rules and templates.

- ***Tableau Extensions*** - a popular data visualization tool, offers extensions that integrate NLG. These extensions, such as ***Automated Insights for Tableau***, allow to automatically generate written explanations and summaries of visualizations. These tools provide a seamless integration within the Tableau environment.
- ***Narrative Science*** provides an NLG platform called ***Quill*** that can generate natural language narratives from data. It supports various data sources and visualization platforms, including Power BI. By leveraging Quill, it helps to transform data visualizations into engaging narratives that explain the insights and key findings in a user-friendly manner.
- ***IBM Watson Studio*** - it includes NLG capabilities through the Watson Natural Language Understanding service. It provides customization options and supports integration with various data visualization tools.