Finding Hidden Patterns in Data with Machine Learning and Qlik

Navigating from 'What' to 'Why' with Qlik AutoML

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Purpose of this eBook

This eBook is designed to equip business leaders, data analysts, and decision-makers with a comprehensive understanding of how to leverage Qlik AutoML to transform their data analytics processes. The eBook provides practical insights, real-world applications, and step-by-step guidance to help readers uncover hidden patterns in their data, transitioning from simply understanding "What" is happening to discovering "Why" it is happening. This will enable you to uncover hidden patterns in your data, gain a deeper understanding of your business operations, and drive strategic, data-driven decisions that propel your organization forward.

Introduction

IPC Global is a leader in providing services around data analytics, data science, data integration, and cloud solutions. With the evolution of data and technology, **IPC Global Data Science** team has adopted Qlik AutoML to enhance its service offerings. Qlik AutoML, part of the Qlik Cloud platform, empowers businesses to find hidden patterns in their data and transition from understanding "What" is happening to discovering "Why" it is happening.

In today's fast-paced business environment, merely identifying trends and anomalies (the "What") is not sufficient. Businesses need to understand the underlying causes (the "Why") to make informed decisions and drive strategic actions. Machine learning, particularly automated solutions like Qlik AutoML, facilitates this deeper level of analysis, enabling businesses to predict future outcomes and prescribe optimal actions.

Machine Learning in Data Analytics

Machine learning (ML) is a branch of artificial intelligence that enables computers to learn from data and improve their performance over time. ML algorithms build models based on patterns found in historical data, which can then be used to make predictions about future data.

Working with machine learning begins with preparing a training dataset, which you provide to the machine learning program to learn from. In this context, learning means the program explores the dataset to uncover hidden patterns and understand how each factor influences a given outcome (the **prediction target**). Various techniques, known as **algorithms**, are used to analyze the data and identify these patterns. Once an algorithm has been trained on the dataset and is ready to make predictions, it is referred to as a **Model**. Think of the algorithm as the recipe and the model as the finished meal.

From Descriptive to Prescriptive Analytics

Data Analytics can be categorized into descriptive, diagnostic, predictive, and prescriptive. Qlik AutoML enables businesses to seamlessly transition through these stages.

1. **Descriptive Analytics**: Focuses on summarizing past data.
2. **Predictive Analytics**: Uses historical data to forecast future events.
3. **Diagnostic Analytics**: Examines why certain events occurred.
4. **Prescriptive Analytics**: Suggests actions to achieve desired outcomes.

Each phase of analytics plays a crucial role in helping businesses make better decisions. As organizations mature, the shift towards more advanced prescriptive analytics becomes essential. Qlik, through its comprehensive suite of tools and capabilities, supports businesses at every stage of this journey, enabling them to move from

understanding "What" happened to uncovering "Why" it happened and determining "What" they should do next. This progression ensures that organizations become more **data-driven** and strategic in their actions, ultimately leading to better business outcomes.

Descriptive Analytics: Traveling back in time

Descriptive analytics focuses on summarizing historical data to identify trends, patterns, and anomalies. It answers the question, "What happened?" and it is the first stage in a company's data maturity journey.

How Qlik Helps:

- **Qlik Analytics Platform**: Qlik's robust analytics platform offers powerful tools for creating interactive dashboards, reports, and visualizations. These tools help users to easily explore their data and uncover insights.

Predictive Analytics: Foreseeing the Future

Predictive analytics uses historical data to forecast future events. It answers the question, "What is likely to happen?". This is usually the first contact a company has with Artificial Intelligence and Statistical Modeling.

How Qlik Helps:

- **Qlik AutoML**: Predictive analytics is the first significant outcome delivered by Qlik AutoML. It automates the process of building and deploying machine learning models, making predictive analytics accessible to users without deep technical expertise.

Diagnostic Analytics: Understanding the "Why"

Diagnostic analytics delves deeper to understand the reasons behind past events. It answers the question, "Why did it happen?". It is not always seen this way, but Diagnostic and Predictive have a much higher benefit than Predictive analysis.

How Qlik Helps:

- **Qlik AutoML and SHAP Values**: Qlik AutoML provides detailed diagnostics through SHAP (SHapley Additive exPlanations) values, which highlight feature importance and explain why the model is making certain predictions.

- **Root Cause Analysis**: By analyzing SHAP values, users can identify the key factors that influenced specific outcomes, uncovering hidden patterns and providing a clear understanding of the root causes behind the data.

Prescriptive Analytics: Recommending Actions

Prescriptive analytics goes beyond predicting future outcomes to recommend actions that can influence those outcomes. It answers the question, "What should we do?". This is the highest level

How Qlik Helps:

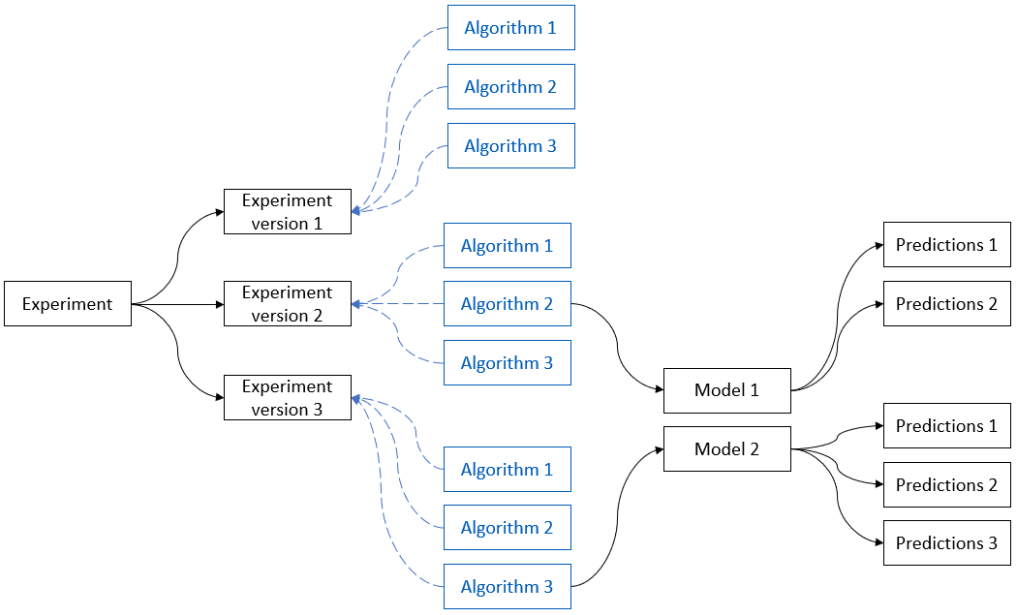
In addition to all the options described in the Diagnostic Analysis, Qlik helps to achieve prescriptive analysis by:

- **Interpreting Diagnostics Data**: The diagnostic insights provided by SHAP values help users understand the underlying causes of predicted outcomes, offering a clear "why" behind the data.

- **Combining with Generative AI**: By integrating the diagnostic data with Generative AI capabilities, users can receive suggested actions to achieve specific goals. Generative AI can analyze diagnostic analytics and provide actionable recommendations, making the decision-making process more data-driven and effective.

Qlik AutoML: Uncovering Hidden Patterns

Qlik AutoML simplifies the machine learning process, making it accessible to users without deep technical expertise. While AutoML does not replace the need for a data scientist, it enables these professionals to focus on more analytical and statistical roles rather than programming. By automating many of the time-consuming tasks involved in machine learning, Qlik AutoML saves weeks of work by training and evaluating the training data against several algorithms and recommending the best model.



It all starts with creating a Machine Learning experiment in Qlik AutoML. Simply provide Qlik AutoML with a dataset for training and specify the target field you want to predict. From there, Qlik AutoML automates the entire process, saving you and your team weeks of work. Here's how it works:

1. Imputation of Nulls

- Automatically handles missing values in the dataset, ensuring that the model training process is not disrupted by incomplete data.

2. Encoding Categorical Features

- Transforms categorical data into a numerical format that machine learning algorithms can understand and process effectively.

3. Feature Scaling

- Standardizes the range of independent variables or features of data, which helps improve the performance and training stability of the model.

4. Automatic Holdout of Training Data

- Reserves a portion of the data for testing and validation, ensuring that the model's performance is evaluated on unseen data.

5. Five-Fold Cross-Validation

- Splits the data into five parts, trains the model on four parts, and validates it on the fifth part. This process is repeated five times, with each part used for validation once. This technique ensures a more reliable and unbiased evaluation of the model's performance.

Integration with Qlik Ecosystem

Qlik AutoML integrates seamlessly with Qlik's suite of data visualization and business intelligence tools. This integration allows users to enhance their existing data workflows with powerful machine learning capabilities, leading to more insightful and actionable analytics. The combined power of Qlik AutoML and Qlik's visualization tools helps users not only to identify trends and patterns but also to understand the underlying factors driving these patterns.

Practical Applications and Use Cases

Qlik AutoML offers versatile applications across various industries, providing tailored solutions to meet specific business needs. By leveraging the power of automated machine learning, organizations can gain deeper insights, improve efficiency, and drive better outcomes. Below are some industry-specific examples that demonstrate the practical benefits of Qlik AutoML.

- **Healthcare**: Patient Readmission, Length of Stay, Appointment Cancellations, Revenue Forecasting, Employee Retention, Budget Planning.

- **Retail**: Inventory optimization, personalized marketing, customer segmentation, sales forecasting.

- **Finance**: Fraud detection, credit risk assessment, risk management.

- **Education**: Student performance prediction, personalized learning plans, course recommendation, Enrollment forecasting, dropout prevention, admission analytics, faculty performance evaluation.

- **Manufacturing and Supply Chain**: Predictive maintenance, quality control, supply chain optimization, energy management.

Qlik Cloud and AutoML Use Case

The Qlik platform has been specifically designed to move in-stride with your business and user groups. By combining data integration, analytics, and automation into a singular platform, our customers can reach a level of data utilization and value creation not possible before.

Let's look at an application around **Inventory Management** and get a glimpse of how a team uses Qlik Cloud in fluidity to handle inventory levels across multiple stores. This use case is easily translated into other common scenarios, like Patient Readmission, Fraudulent Financial activities, and others.

Continuous	**Qlik Data Integration** ensures sales data from various stores is monitored in real-time and continuously integrated into the centralized system.
7:00 am	The *Inventory Management app* has an **AutoML** model that runs in parallel with sales data reloads. The model identifies items with high stockout risk, predicts restock dates, and suggests optimal reorder quantities.
8:00 am	A **Qlik Alert** is sent for a product that is predicted to stock out soon in one of the stores, with prescribed insights from **AutoML**, enhanced by **Generative AI** models.
9:00 am	A daily Inventory **Tabular Report** is automatically scheduled for store managers, providing insights into current stock levels, predicted demands, and restocking schedules.
10:00 am	A **Qlik app** powered by **AutoML** suggests restock quantities for each store based on sales forecasts and current inventory levels.
11:00 am	**Automated workflow** enables store managers to approve restock orders directly from the app, which then triggers the logistics team to start the restocking process.

Business Outcomes

- **Quality of Service**: Improved customer satisfaction due to better product availability.

- **Revenue Optimization**: Increased sales by reducing stockouts and overstock situations.

- **Operational Efficiency**: Streamlined inventory management processes.

- **Risk Reduction**: Mitigated risks of lost sales and excess inventory holding costs.

Key Takeaways

Qlik AutoML provides a powerful, user-friendly solution for businesses seeking to enhance their data analytics capabilities. By automating many of the complex tasks involved in machine learning, Qlik AutoML enables users to uncover hidden patterns in their data, transitioning from merely understanding "What" is happening to discovering "Why" it is happening. This deeper insight facilitates more informed decision-making and strategic planning. Key benefits and capabilities of Qlik AutoML include:

- Automated Data Preprocessing and Model Training: Simplifies the machine learning process, making it accessible to users without deep technical expertise.

- Feature Importance through SHAP Values: Provides detailed, row-level prescriptive analysis, helping users understand the underlying factors driving model predictions.

- Integration with Qlik's Ecosystem: Enhances existing data workflows with powerful machine learning capabilities, leading to more insightful and actionable analytics.

- Versatile Applications Across Industries: Demonstrates value in various sectors, including healthcare, retail, finance, manufacturing, and supply chain.

- Support for Predictive, Diagnostic, and Prescriptive Analytics: Empowers businesses to move beyond descriptive analytics, gaining deeper insights and actionable recommendations.

What's next?

Businesses today operate in a data-rich environment where the ability to quickly and accurately analyze data is crucial. Qlik AutoML offers an accessible and efficient way to leverage machine learning, enabling organizations to unlock the full potential of their data.

We encourage you to explore Qlik AutoML and discover how it can transform your data analytics practices.

IPC Global, with its expertise in data analytics and data science, is here to support you every step of the way. From initial setup and integration to advanced analytics and strategic planning, IPC Global provides comprehensive services to help you harness the power of Qlik AutoML. Together, we can drive your business towards more insightful and actionable data analytics, leading to better decision-making and improved business outcomes.

Start your journey with Qlik AutoML today and experience the transformative power of advanced data analytics.

About IPC Global

IPC Global is a diverse, nationwide team of experienced, engaging, and effective data analytics experts. We provide advisory, consulting and managed services to solve your organization's Enterprise Intelligence challenges.

For more than 20 years we have been the go-to source for Artificial intelligence, Data Analytics, Data Science & Research, Business intelligence, Cloud Solutions, Data Integration, Education, Advisory services and more.