



Business Growth Secrets:

Exploring How AI Enhances Client Data Analysis



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Artificial Intelligence and Understanding of Client Behaviors

In an era where solutions like ChatGPT and dynamic technological development are widely popularized, enterprises are increasingly harnessing the potential of Artificial Intelligence (AI) for analyzing and interpreting customer behavior. AI, based on machine learning (ML) algorithms, is emerging as a key tool for acquiring, processing, and interpreting data on a scale that, until recently, was challenging using traditional methods. In this context, let's take a look at how artificial intelligence enhances the understanding of customer behavior and the specific benefits it brings to modern companies.

Traditional methods of analyzing customer data, relying on manual information processing, are becoming less and less effective due to the growing volume and sources of available data. The introduction of AI enables automatic and effective processing of large data sets, facilitating the identification of hidden patterns, dependencies, and trends in customer behavior. Algorithms can process and interpret data on a much

larger scale, leading to a more precise understanding of customer preferences and expectations.

One of the key aspects where AI revolutionizes the understanding of customer behavior is personalization. Algorithms analyzing customer data accurately identify individual preferences, shopping habits, and reactions to various stimuli. This empowers companies to tailor their offers, marketing campaigns, and interactions with customers, resulting in increased effectiveness and customer loyalty.

AI also plays a crucial role in predicting customer behavior. Predictive algorithms allow companies to anticipate how customers may respond to various stimuli and offers. This predictive capability enables proactive actions while avoiding ineffective strategies. For instance, if the system predicts increased interest in a given product, the company can adjust its inventory, scale up production and direct marketing campaigns appropriately.

Another area where AI plays a vital role is in the improvement of customer service. The introduction of chatbots enables quick and effective online customer service. Thanks to natural language processing (NLP) algorithms, chatbots like ChatGPT understand complex customer queries, provide precise answers, and offer assistance in the purchasing process, saving time and enhancing the quality of customer service.



AI also plays a key role from the perspective of customer data security. Algorithms monitoring activity and analyzing customer behavior patterns can detect potential threats and irregularities in transactions. This capability allows companies to quickly respond to security breaches, safeguarding their customers' data.

Despite numerous benefits, there are challenges associated with using AI to analyze customer behavior. One of the main issues is the liability for system errors. Decisions made by machine learning algorithms can sometimes be challenging to understand or explain, necessitating continuous improvement of these systems.

In conclusion, artificial intelligence represents a revolution in understanding customer behavior. Personalization, proactive actions, improved customer service, and data security are just some of the aspects that AI brings to the field of customer data analysis. As technology progresses, we can expect even more advanced systems enabling companies to better meet the expectations and adapt to the needs of their customers. The effective use of AI is becoming not only a matter of competitiveness, but also a key element in the sustainable development of modern business.

Comarch has been providing advanced systems for analyzing customer data for over 17 years, including those based on artificial intelligence algorithms. In this publication, we highlight the most common areas of AI use in customer data analysis and the sources from which information about customers can be obtained.

Customer Data Sourcing and Processing

Obtaining customer information from various sources is becoming increasingly complex due to the multitude of communication channels and data formats. Consequently, there is a growing need to integrate and process data in a central location, such as a data warehouse or data lake. This central platform serves as the foundation for effectively analyzing customer data using Business Intelligence solutions and more complex algorithms (AI).

The central data warehouse collects and aggregates information from various systems, with the most popular sources for storing customer data including:

Enterprise Resource Planning (ERP) Systems

ERP systems play a pivotal role in collecting and managing customer data, encompassing functions in finance, logistics, production, and human resources. Regarding customer data, ERP systems gather information related to business transactions, purchase history, payment statuses, and delivery data.

Customer Relationship Management (CRM) Systems

Dedicated to customer relationship management, CRM systems compile detailed information about customer interactions, contact history, preferences, and demographic data. Additionally, CRM systems contain information about marketing activities, customer service requests, and potential leads, enabling effective personalization of business activities.

Web Analytics

Tools like Google Analytics or Adobe Analytics analyze data related to customers' online activity, providing detailed insights into user behavior on the website. This includes not only the number of visits but also navigation paths, time spent on individual pages, traffic sources, and conversion data.

Loyalty Programs

Discount cards, scoring systems, or other loyalty programs collect data on purchasing preferences, frequency of purchases, and the use of promotional offers. These systems are also a source of information about the effectiveness of loyalty campaigns and their impact on revenue growth.

Feedback and Customer Reviews

Utilizing a customer review platform like Opineo or Yelp provides companies with direct feedback from customers, including opinions about products, customer service, and overall satisfaction. This information helps identify areas for improvement and build a positive brand image.

Mobile Applications

Mobile apps are a valuable source of data, especially for companies offering mobile services. In addition to location information, they collect data about application usage habits, time spent on individual functions, user preferences, and interactions with content.

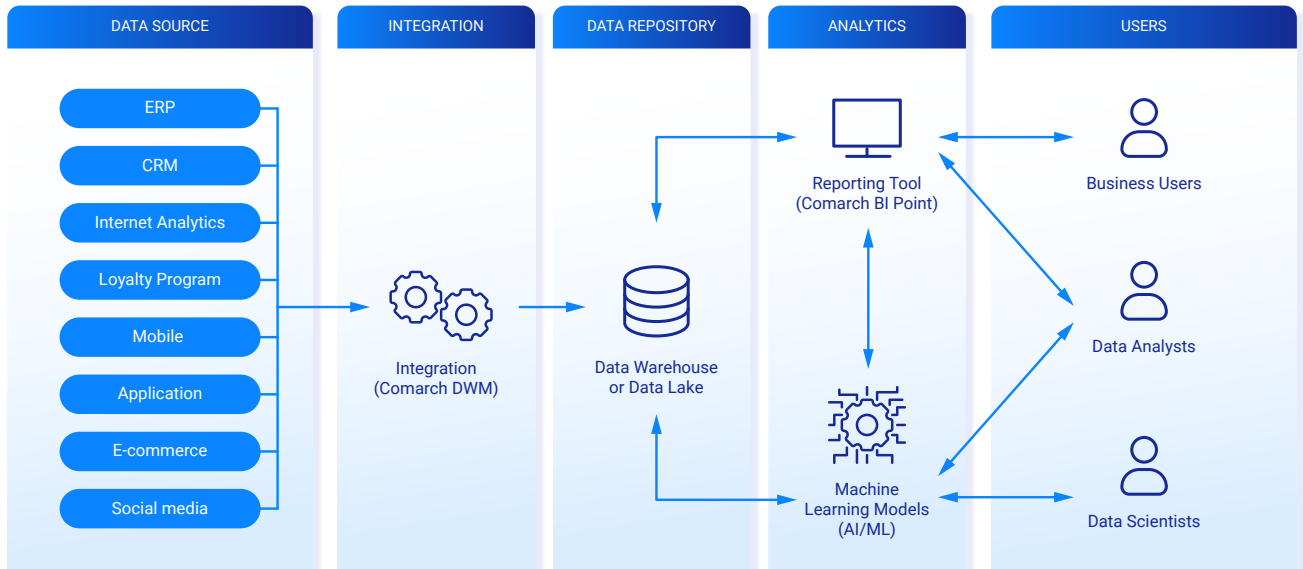
E-commerce Systems

For companies selling products online, e-commerce systems are a key source of customer data, containing information about shopping carts, transaction history, product preferences, as well as delivery and payment details.

Social Media

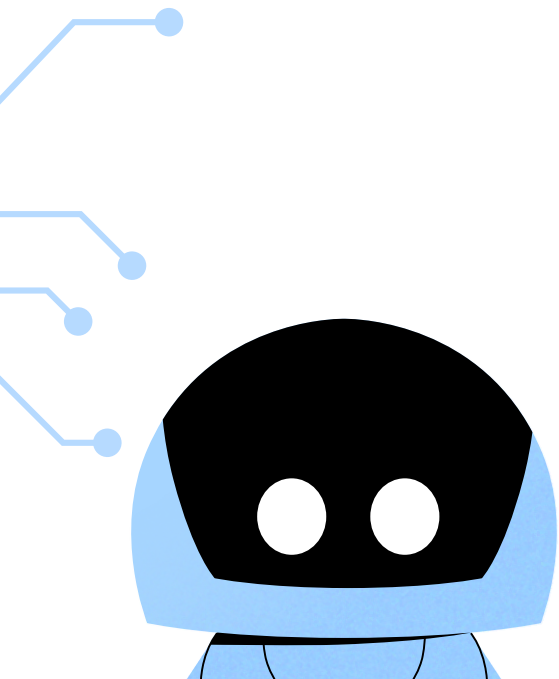
Companies' activities on social media platforms generate data on customer engagement, reactions to content, shares, and communication with the brand. This information is crucial for building a brand image and conducting effective marketing activities.

The integration of the above data allows for obtaining a comprehensive picture of the client. An example architecture of the Comarch analytical platform is presented in the diagram below.

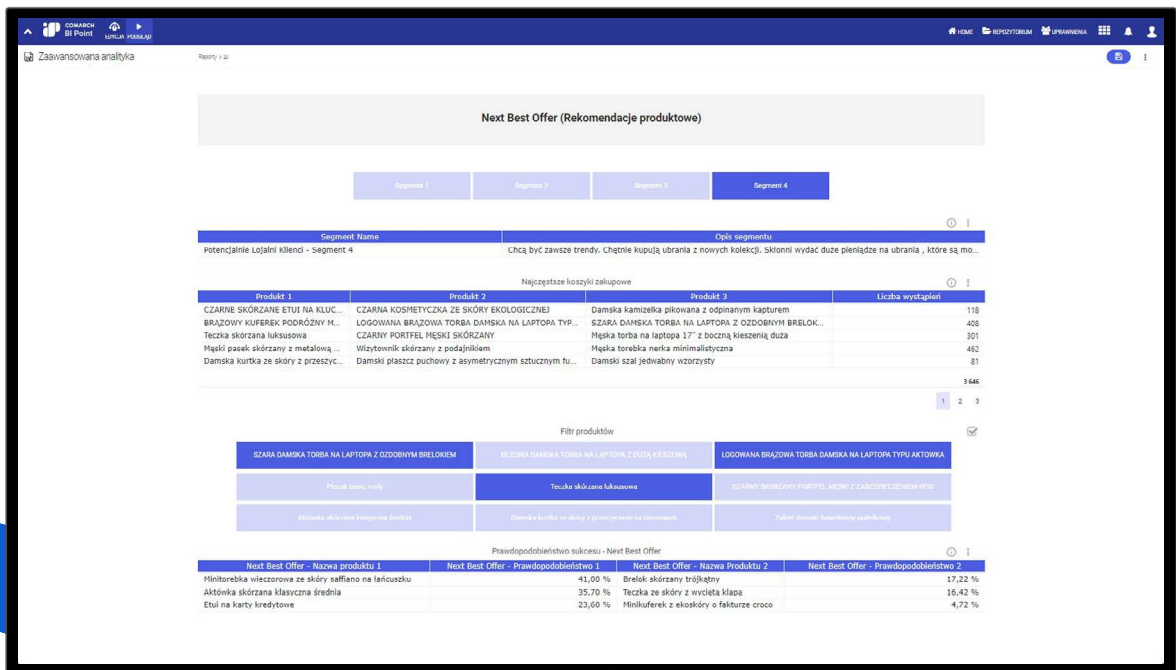
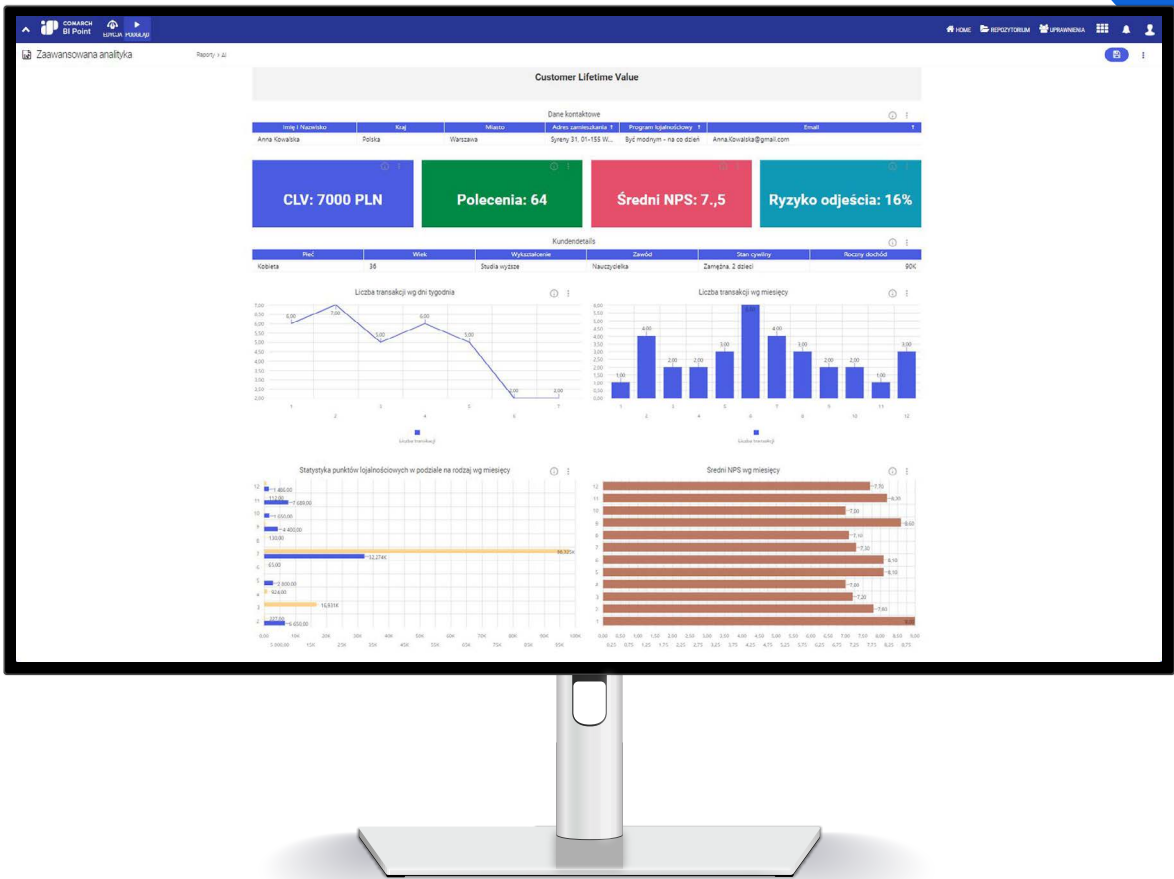


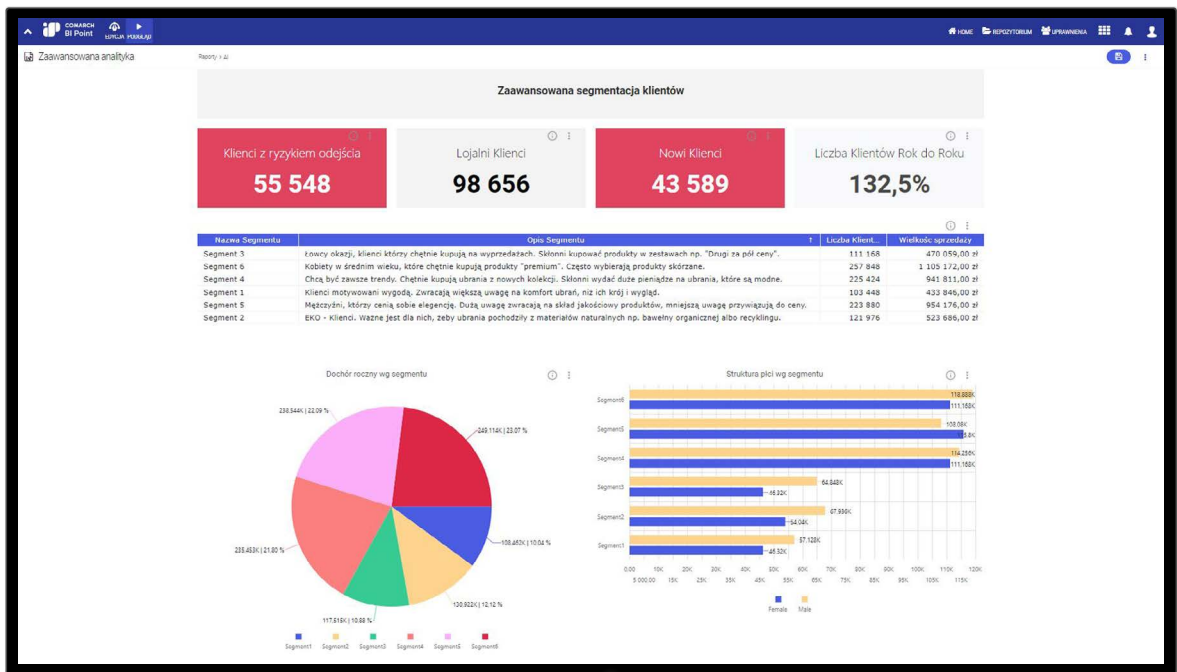
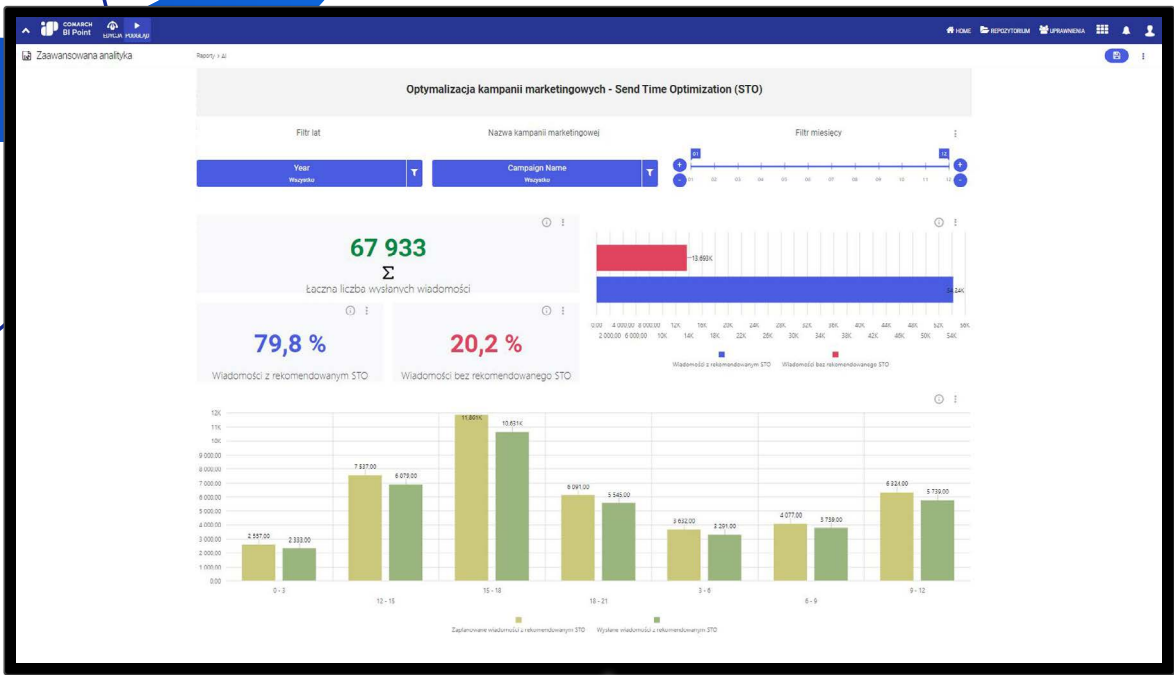
The use of AI technology to analyze customer data enables a precise understanding of their behavior, preferences, and needs. However, the sheer abundance of information often poses an interpretation challenge for companies. In this context, Business Intelligence (BI) tools play a crucial role in transparently presenting complex data through intuitive and attractive visualizations.

Visualizing customer data from AI model conversions in a BI reporting tool not only facilitates the understanding of complex analyses but also enables quick strategic decision-making. The combination of powerful AI algorithms with an effective BI tool allows enterprises to track trends, forecast customer needs, and optimize marketing activities. Consequently, organizations can more effectively adapt their strategies to changing market conditions, gaining a competitive advantage and building lasting relationships with customers. In this context, data visualization becomes a key element in the effective use of the potential of analyses generated by AI models.



Below is an example of a dashboard with converted AI models in the Comarch BI Point tool.







How Valuable is Your Customer? Customer Time Value

The customer stands as the core of a company's functionality and undeniably serves as a key factor in its competitive advantage. However, can you precisely measure or calculate the value that clients bring to the company? Is there an indicator that determines the potential profit a given customer can yield?

Customer Lifetime Value (CLV or LTV) aids in determining how valuable a particular customer is throughout the history of their relationship with the company. The CLV indicator is a crucial measure illustrating the average value a customer relationship brings to a given company over its entire duration. The objective of understanding customer lifetime value is to maximize profit by identifying and targeting customers with the highest potential net value over time.

Thanks to CLV analysis, companies gain insight into the monetary worth of a customer, enabling the marketing department to precisely allocate resources for customer acquisition. An important advantage of this measure lies in its ability to estimate the financial viability of acquiring, retaining, or re-acquiring a specific customer for the company.

Furthermore, it facilitates an accurate assessment of the effectiveness of various business strategies before implementation, enabling organizations to make informed decisions that are most beneficial. Often, maintaining long-term relationships with current customers proves more profitable than acquiring new ones. Understanding the customer's lifetime value results in more effective business decisions, such as selecting appropriate promotional strategies or evaluating the profitability of specific communication channels.

Calculating the customer's value over the entire period of cooperation with the company can be done in several ways. The calculation method and level of complexity will vary based on the industry, company business profile, data collection methods, and level of detail. Models based on ML and AI provide valuable support in analyzing and forecasting these values, processing vast amounts of data and estimating indicators tailored to the specific nature of the business.

One straightforward method to calculate customer lifetime value is to sum the revenues obtained from the customer,

subtracting the initial cost of acquiring the customer. While determining the exact value of the initial customer acquisition cost can be challenging, it can be estimated by dividing the costs of an advertising campaign or promotion by the number of new customers it attracts.

Another popular calculation method for online stores is to calculate CLV based on the transactions of all customers. While this method is easy to use, it may be subject to errors if the store's assortment is very diverse. Here's the formula:

$$\text{CLV} = \text{TPC} \times \text{LP} \times \text{TV} \times \text{GM}$$

- **TPC** – Average number of transactions per customer.
- **LP** – Average customer loyalty period (the time from the first purchase to the last one, after which the customer does not return).
- **TV** – Average transaction value in a given period.
- **GM** – Average gross margin from one sale.

Using the formula, let's calculate CLV for an online store where the average customer loyalty period is 2 years and 3 months. During the period under review, 775 customers completed 2,100 orders. Therefore, the average number of transactions per single customer is rounded to 2.71. The average transaction value, also known as the average shopping cart value, was 149.89 USD – this value can be calculated by dividing the aggregated sales in a given period by the number of transactions made. The average margin in this store is 15%. Based on this data, we can make the following calculation:

$$\text{CLV} = 2.71 \times 2.25 \times 146.89 \text{ USD} \times 15\% = 134.35 \text{ USD}$$

In the example above, the CLV value is 134.35 USD. What conclusions can the store owner draw from this information? Firstly, spending more than 134.35 USD to acquire one customer will be an economically unfavorable scenario for the company because the costs of customer acquisition will exceed earnings. Moreover, if the company actively works to acquire customers, whether through online store positioning, Google Ads campaigns, or social media marketing, the calculated CLV can be compared with the average customer acquisition costs in these given channels. Information about how much one customer is worth to the company allows for more effective planning of the operating strategy and determining the costs of acquiring new and maintaining existing customers.

The aforementioned methods are relatively simple and take into account only a few basic variables. For example, in companies trading in a wide range of products distributed through various channels, these methods will not work optimally. In such cases, it is optimal to leverage the assistance of machine

learning and artificial intelligence. Models created by AI can process vast amounts of data in real-time, detecting transactions that significantly differ from the average and identifying unusual customer behavior. These models can take into account various customer segments, sentiment towards a specific brand, or the customer's position in the company's internal ranking in terms of generated revenues. AI allows for capturing hidden trends and seasonality in customer purchase behavior, continuously building more effective forecasting models.

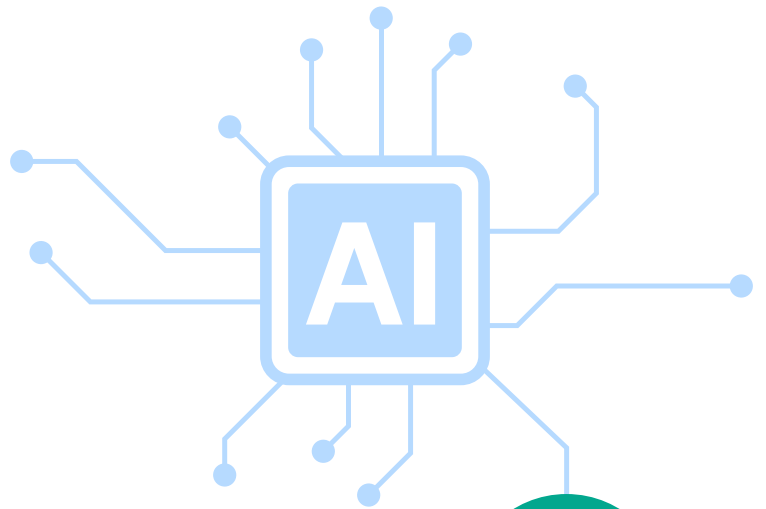
The more transactional and historical data available, the more accurate ML and AI-based probabilistic models can be. It is crucial to have information about customer attributes, including for example:

- Invoice number and date
- Order date
- Code and description of the purchased product
- Aggregate order value
- Unit price of the product
- Customer number
- Place of residence

Such data can be used by AI algorithms to construct various forecast models. One of the most popular models is based on a historical approach with the AI-driven division of customers into cohorts. Depending on business goals, customer segmentation data may include geographic location, date of first purchase, or purchase history. From this clustered data, unique CLVs can be estimated for different groups, providing a more precise picture of the business. This method allows for the individual analysis of the group of the most profitable customers, as well as the segment that generates the highest costs, and it can also be broken down into a specific region or considered with demographic data.

To calculate CLV using machine learning in probabilistic models, the following variables also can be considered and calculated:

- Expected number of transactions in a given period
- Assumed number of repeat purchases made by the customer
- Potential average profit earned per client
- Expected customer activity – ML analyzes how often customers make purchases and predicts the likelihood of making purchases in the future



Benefits of Using AI in the Area of CLV Analysis and Forecasting

- **Understanding the Profitability of a Single Customer:** Customer lifetime value is crucial for the sales department. It enables a focus on acquiring new customers with specific profiles or testing the possibility of selling at a higher price in the current customer base.
- **Building a More Accurate Customer Profile:** With the knowledge of this measure, the company can prepare more accurate and detailed data about its customers.
- **Better Budget Management:** CLV aids in allocating budgets to specific activities based on data about what a new customer actually brings to the company. This understanding helps in deciding where to spend money to acquire the most valuable customers.
- **Effective Planning of Marketing Expenses:** By focusing on customer segments that bring the highest profit, companies can optimize their marketing expenses for better results.
- **Building Customer Loyalty:** Data on customer lifetime value data can be utilized to create strategies for maintaining long-term customer satisfaction, not just for short-term sales.
- **Better Customer Retention:** Knowing the value of a customer enables companies to make more effective decisions on how to allocate funds to retain specific customer segments.





Fraud Detection

Fraud and financial misconduct have become pervasive issues in the modern business world. In the era of digitalization and globalization, where transactions occur in the blink of an eye, the risk of fraud is escalating at an alarming rate. New threats continually emerge, with fraudsters attempting bolder extortion not only in the physical realm but also in the virtual world. Consequently, enterprises are increasingly turning to new technologies to combat this problem, and AI has become a paramount weapon in this battle.

For many years, the use of simple rule-based systems was the sole, although often ineffective, approach to detecting various types of fraud. However, as digital crime evolved rapidly, employing more advanced methods that outsmart even complex rule systems, the need for a more sophisticated approach became apparent. To effectively prevent and detect financial fraud, relying solely on a set of predetermined scenarios is no longer sufficient. AI, utilizing historical data and machine learning, proves instrumental in detecting unusual events more effectively. Furthermore, AI systems based on new technologies can continuously learn and recognize entirely new criminal behaviors as digital crime patterns evolve over time.

While AI is often deemed a “black box” with operating logic challenging to describe in formulas understandable to humans, XAI (eXplained AI) offers a solution. Various methods currently enable obtaining explanations for decisions or recommendations generated by AI algorithms. These explanations, presented in an accessible and understandable form, assist analysts responsible for tracking potential fraud and financial abuse.

AI can be leveraged to create models that, based on historical data, accurately determine the probability of a specific fraud event occurring. This significantly enhances the effectiveness of detecting suspicious events, expanding the range of solutions beyond classic rules. AI applications can detect various forms of fraud, including money laundering, credit card crimes, loyalty program crimes, telecommunications and insurance fraud, as well as cybercrime.

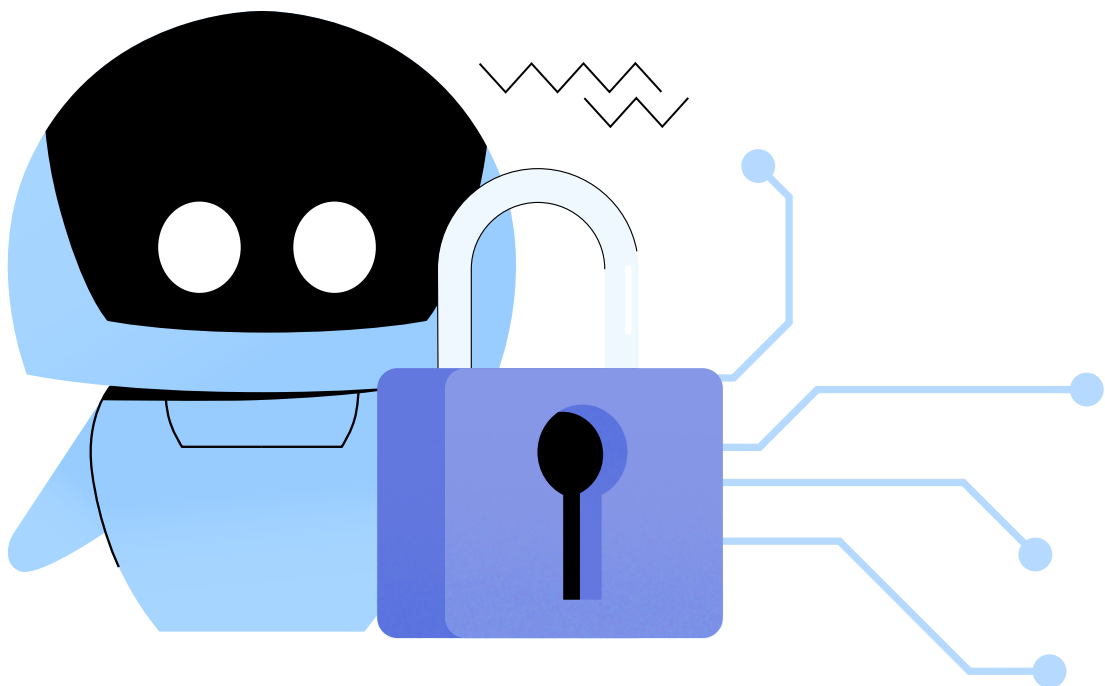
The negative impact of fraud on an organization’s reputation can lead to substantial costs. However, by implementing AI-based solutions, enterprises and government institutions stand to gain tangible benefits. Interestingly, companies that



have adopted these solutions report a significant increase in productivity. Integrating AI into fraud detection eliminates the burden of routine tasks, ultimately reducing the time needed for analysis. This enables employees to focus on more demanding and complex challenges.

While AI won't replace humans in solving complex problems quickly, its effectiveness in addressing routine tasks and clearly defined problems is undeniable. AI application allows teams to alleviate the influx of "worthless" alerts, freeing up time for more detailed analysis or other tasks. Crime fighting, security, and anti-money laundering teams can benefit greatly from the new opportunities offered by technology today, achieving better protection against fraudsters and the ability to respond faster to suspected criminal activity.

The primary benefit of employing advanced analytics and AI methods is the quicker and more precise identification of suspicious cases, resulting in a significant reduction in false alarms. This directly impacts sales and customer satisfaction. When evaluating risk, enterprises strive to balance between minimizing financial losses and unused sales potential while ensuring a positive customer experience. The effectiveness of models in this area requires exceptional precision and control. Depending on the context, various analytical techniques, including predictive models using ML techniques, anomaly detection models, network analysis, text analysis, and natural language processing, may be employed.





Advanced Customer Segmentation

Artificial intelligence is revolutionizing the way companies communicate with their customers and enhance marketing strategies. A prime example of AI's impact on customer analysis is undoubtedly advanced customer segmentation.

Customer segmentation is the process of dividing the customer base into distinct groups or segments based on specific characteristics or criteria. The most prevalent customer segmentation methods include:

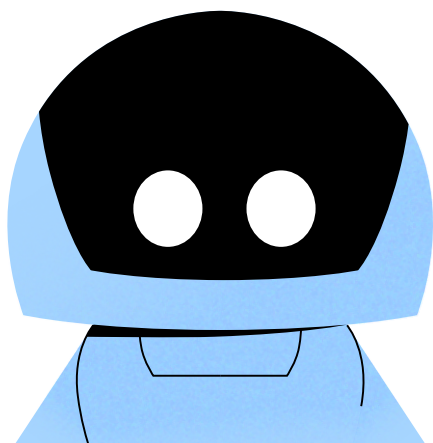
- Demographic
- Geographic
- Behavioral
- Psychographic

The primary objective of customer segmentation is to tailor marketing activities and business strategies to different customer groups. By employing AI to refine segmentation strategies, companies can deliver more personalized and relevant marketing messages, thereby generating increased revenue from product sales.

In the modern business landscape, enterprises collect vast amounts of data about customer transactions daily, often unable to fully unlock its potential. AI mechanisms facilitate the processing of immense data volumes with unprecedented speed and accuracy. Companies can identify patterns and trends in customer behavior that traditional methods might miss. With AI, companies can segment customers more precisely, enabling targeted and personalized marketing campaigns.

Moreover, AI-driven customer segmentation allows the analysis of unstructured data, such as social media posts, customer reviews, and call center transcripts, using NLP technology. By integrating unstructured data into segmentation strategies, companies gain a comprehensive view of their customers, better predicting their needs and purchasing preferences.

Another advantage of AI-based customer segmentation lies in its adaptability and learning capabilities over time. Artificial intelligence algorithms continuously refine their models with additional data flowing into the enterprise daily. This ensures companies stay ahead of changing customer preferences and market trends, keeping their marketing strategies accurate and effective.



Popular AI algorithms for advanced customer segmentation include:

- **K-means Algorithm:** Segments customers with similar attributes, such as product preferences or purchasing behavior.
- **Support Vector Method (SVM):** Groups customers based on various characteristics like demographics or purchase history, identifying features that differentiate segments.
- **Random Forest:** Analyzes features important for customer profiling, determining factors influencing a customer's segment.
- **Logistic Regression:** Predicts a customer's belonging to a segment based on characteristics and purchasing preferences.
- **Gradient Boosting Algorithm:** Builds predictive models considering complex relationships between various customer characteristics.

AI also aids in identifying the most effective communication channels and strategies for reaching each customer segment. By analyzing customer engagement data and response rates across marketing channels, AI algorithms determine methods most likely to influence each segment. This efficient allocation of marketing resources ensures efforts focus on channels and strategies producing desired results.

In summary, key benefits of utilizing AI mechanisms in customer segmentation include:

- **Increased Segmentation Precision:** ML algorithms detect subtle patterns and differences in customer behavior, creating more relevant and tailored segments.
- **Dynamic Adjustment:** Analysis of changes in customer behavior over time, crucial for evolving seasonal preferences or market trends.
- **Deeper Data Insight:** Detailed data analysis, considering transaction history, purchasing habits, website interaction, and more for a holistic approach to segmentation.
- **Automation and Time Saving:** Automated segmentation processes save time and resources compared to traditional, labor-intensive methods.

Investing in AI-powered customer segmentation technologies is not just a smart move for companies seeking to enhance marketing efforts; it is essential in today's data-driven world. As consumer data continues to grow exponentially, companies not leveraging AI technology risk falling behind competitors and losing valuable information.



Preventing Customer Churn with AI

The cost of acquiring a new customer is significantly higher – ranging from 5 to as much as 25 times than the cost of maintaining an existing one, as indicated by research published in the Harvard Business Review. Moreover, a modest 5% increase in the retention rate can translate into a remarkable 25% boost in profits. How, then, can companies effectively prevent customer loss and enhance retention? How can data analytics contribute to this process?

Customer churn is an inevitable phenomenon; it cannot be completely eliminated, as some customers leave for independent reasons such as changing their place of residence or no longer aligning with the company's target group. However, appropriate actions can retain the remaining customers who might choose a competitor's offer. The key to retaining at-risk customers lies in identifying them, understanding the factors influencing their decisions, and taking suitable action. A solution to this challenge is the use of AI tools in data analysis, aiding companies in better understanding their customers and identifying trends in their behavior. By leveraging advanced technologies, companies can more effectively predict and recognize when a customer may leave.

One of the most common applications of AI in preventing customer churn is Predictive Analytics, allowing companies to understand future customer behavior by identifying patterns and trends in historical data. Predictive analytics can forecast future customer needs, utilizing AI to analyze customer data such as purchase history and behavioral data, providing insight into customer needs and preferences. This enables companies to offer personalized product recommendations, content, and targeted promotions for specific customer groups. The most popular algorithms used for predicting churn include decision trees, logistic regression, support vector machines, and neural networks.

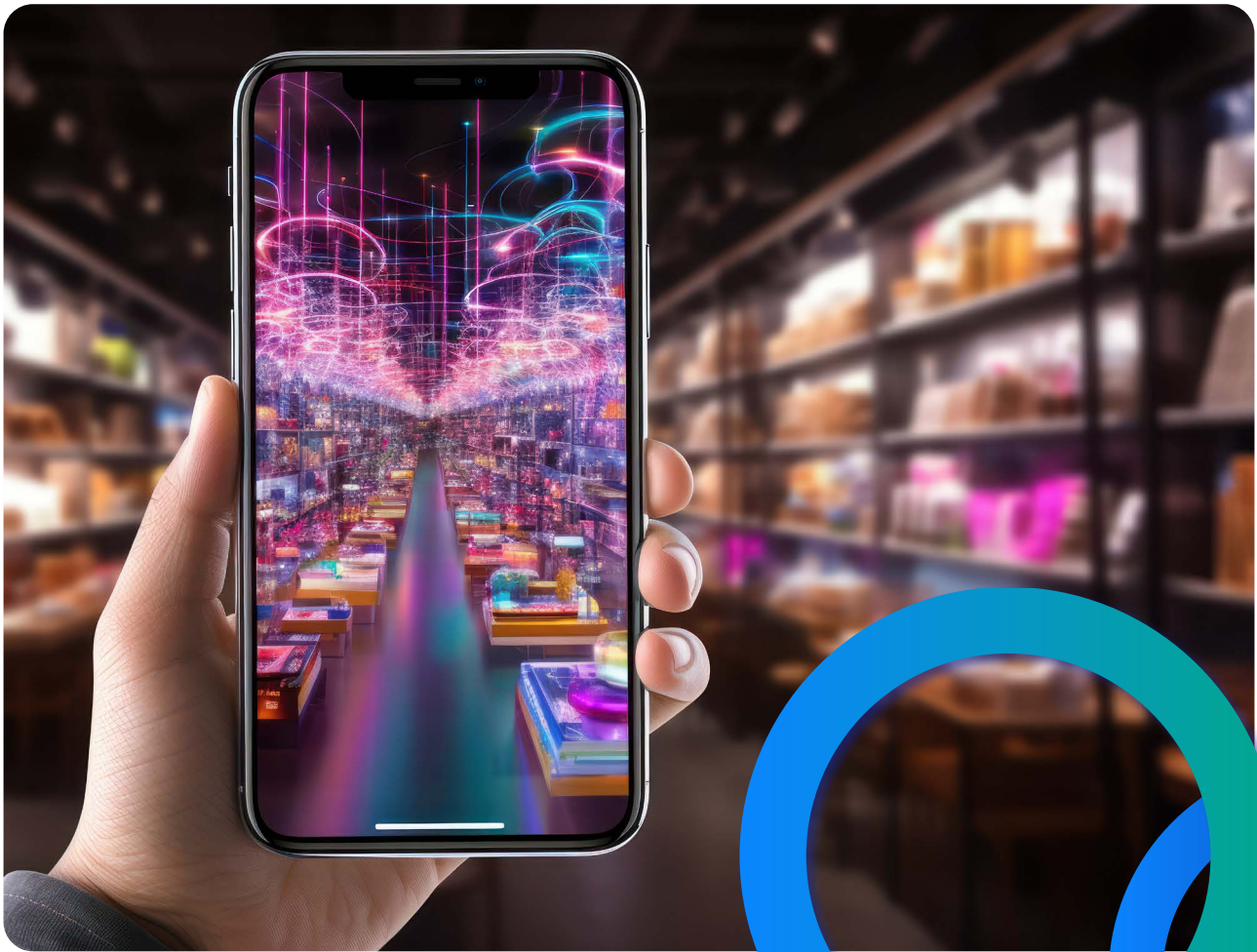
Artificial intelligence also plays a pivotal role in sentiment analysis, involving the processing of texts to automatically recognize the emotions expressed within them. Sentiment analysis aims to understand customers' emotions, opinions, and attitudes towards a product, brand, or company, classifying text as positive, negative, or neutral. This analysis allows companies to learn even more about opinions regarding their products, maintaining high product quality and, consequently, increasing customer satisfaction.

The use of AI to prevent customer churn brings numerous benefits, including:

- **Saving Time and Resources:** Identifying potential customers who may leave before they actually do enables proactive measures rather than reactive responses.
- **Detecting Patterns and Trends:** Uncovering customer behavior patterns that may be challenging to observe otherwise helps companies better understand their clientele and identify areas for improvement.
- **Predicting Customer Departure Probability:** Providing the ability to make more accurate decisions about retaining customers and preventing them from leaving.
- **Creating Personalized Marketing Campaigns:** Tailoring campaigns to individual customer needs fosters customer loyalty and reduces the risk of losing customers.

In summary, AI and predictive analytics are essential tools for organizations seeking advanced customer retention strategies. The use of AI in data analysis empowers companies to discover non-obvious patterns in customer behavior, enhancing their understanding of customers and proactively preventing customer loss.





Tailor-Made Offers: Recommendation Engines

The continuous evolution of our online interactions, purchasing behaviors, and content consumption compels companies to explore innovative ways to engage customers with their offerings. Gone are the days when delivering the same content and a uniform product and service offering to all users, without considering individual preferences, yielded measurable results. The future of online platforms, particularly those facilitating online shopping, revolves around a personalized approach to each consumer, implemented by recommendation engines. These engines, utilizing advanced algorithms, empower users by suggesting products in context and tailoring experiences to their individual interests.

Recommendation engines are robust tools grounded in advanced data analytics, encompassing AI and ML. They scrutinize our past activities, preferences, purchase history, social media engagement, and even our ratings and comments across the Internet. Leveraging this information, along with profiles of customers similar to us, these systems predict assortments that may pique our interest. They offer personalized content, products, films, or music aligned with our individual tastes or

group preferences, to which we have been categorized. These engines emerge as powerful tools that not only streamline the discovery of relevant offers but also enhance our everyday experiences in the online realm.

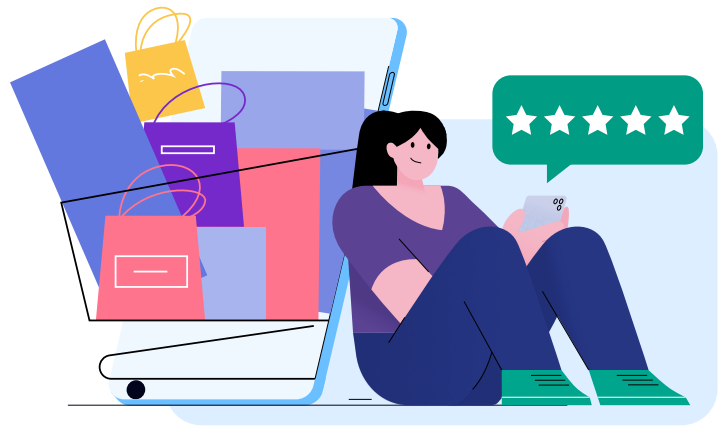


Data is the Driving Force

Modern black gold – data that companies collect and process – is exceptionally valuable in the context of developing recommendation mechanisms. The algorithms responsible for recommending products to users thrive on data, and the larger and more comprehensive the information we possess, the better the selection of proposals and their alignment. Information about the client that is particularly crucial for potentially improving recommendation results includes:

- History of previous purchases by a given customer
- Belonging to a specific customer segment
- Geographical location, age, gender
- Search and browsing history
- Interests, activities
- Purchase of products from specific categories
- Preferences regarding patterns, cuts, colors
- Sentiment towards specific brands or stores
- Opinions from social networking sites, comments, reviews

An equally important aspect, no less vital than the availability and quality of the source data for recommendations, is the automated method of obtaining, collecting, cleaning, and subsequent processing. Among the numerous technologies available, it is worthwhile to use solutions based on data warehouses and Business Intelligence tools for this purpose. These solutions enable the extraction of data from various company systems, unifying it, and enriching it with additional elements, thereby creating a central data repository. The primary goal of a data warehouse is to furnish business users, analysts, and decision-makers with tools for making knowledge-based decisions. Additionally, such a database can serve as an excellent source of data on which advanced algorithms can build tailored recommendations. So, why are recommendation engines so necessary?



Let's Talk About the Benefits

A well-built recommendation mechanism, powered by an appropriate amount of data, allows companies that decide to implement this type of solution to achieve a number of benefits. The potential advantages of using this type of mechanisms include:

- **Increasing Turnover:** Better-selected products are products that customers buy more often and willingly. This translates directly into the size of the shopping basket, which affects the company's turnover and profit.
- **Better Conversion:** Thanks to precisely tailored products, the probability that customers will decide to finalize their purchases increases significantly.
- **Customer Loyalty and Retention:** Customers who find the products they are interested in more easily are more likely to come back and commit to shopping in one place.
- **Better Marketing:** An individualized approach to the customer allows you to prepare personalized marketing communication, including offers or discounts, as well as more precise targeting of communication.
- **Improved User Experience:** Content personalization makes online experience more personalized and rewarding. Users receive content tailored to their tastes, which translates into higher levels of satisfaction.



Comarch BI Managed Services for Advanced Analytics

Managed services are specialized and comprehensive services, tailored to meet the individual needs of the businesses. They are designed to optimize performance and allow organizations to focus on their core competencies while external experts manage specific areas of their operations.

One of the areas, where managed services can be effectively employed is advanced analytics. Such services enable organizations to harness the power of artificial intelligence and machine learning while minimizing risks, reducing costs, and optimizing operational efficiency. Key advantages of managed services for advanced analytics are listed below:

Access to specialized skills:

Advanced analytics managed services provide access to a team of skilled data scientists, analysts, and experts in advanced analytics. This ensures that organizations can tap into a pool of specialized talent without the need to hire and train an in-house team, overcoming the shortage of data science skills.

Cost savings and predictable expenses:

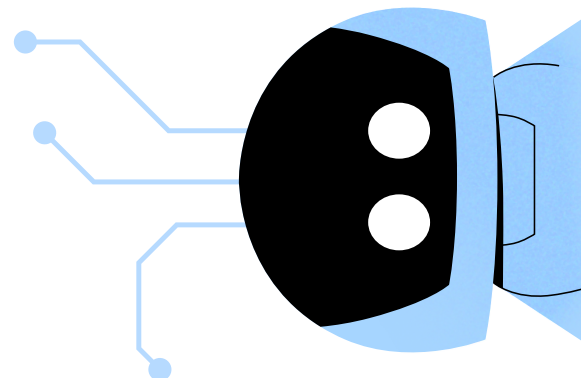
Advanced analytics managed services allow businesses to access advanced AI and machine learning capabilities without the need for heavy upfront investments in infrastructure, hardware, and specialized talent.

Focus on core business activities:

By offloading the responsibility of managing advanced analytics to a third-party service provider, organizations can concentrate on their core business functions. This allows for better focus on strategic initiatives and core competencies, while analytics experts handle the complexity of data processing.

Scalability and agility:

Advanced analytics managed services offer scalability, allowing organizations to scale their analytics capabilities based on changing requirements. Whether handling increased data volumes or expanding the scope of analytics projects, businesses can easily adapt to dynamic demands without the need for significant infrastructure investments.



It's important to assess the specific needs of the organization and choose a managed services provider that aligns with its goals and industry requirements. Comarch has a very strong data scientist team, which focuses on providing advanced analytics services based on big data sets and AI tools. Comarch BI' specialists possess industry-specific knowledge gained through projects in various sectors, facilitating the project realization process regardless of the industry. They have been providing advanced systems for analyzing customer data for over 17 years, including data based on artificial intelligence algorithms. To build AI models, our data scientists use a number of mathematical and statistical techniques, such as:

- Regression techniques (linear, non-linear)
- Time series modelling
- Classification and regression tree
- Neural networks (MLP, RBF)
- Support vector machines
- Naive buyers
- K-nearest neighbors
- Other

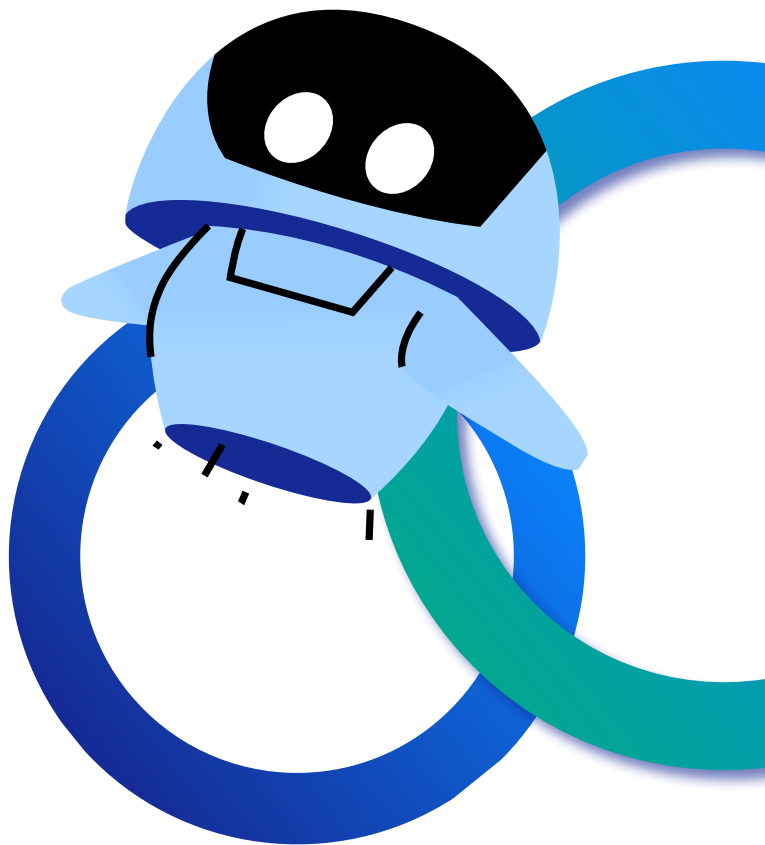
Advanced analytics managed services

Determining regulatory compliance requirements for machine learning (ML)

- **Regulatory landscape analysis:** Conducting a thorough analysis of relevant regulations and compliance standards that apply to the specific domain and geographic location where the ML service will be deployed.
- **Data governance and privacy assessment:** Evaluating data governance practices to ensure compliance with regulations governing the collection, storage, and processing of sensitive information.
- **Security and model robustness:** Conducting vulnerability assessments to identify and address potential threats to the ML system, aligning with regulations that mandate robust cybersecurity practices.

Machine learning model development

- **Data preprocessing:** Cleaning, transforming, and organizing the raw data to make it suitable for training a machine learning model.
- **Feature selection:** Choosing the most relevant features from the dataset that contribute the most to the predictive power of the model.
- **Model selection/architecture design:** Selecting the appropriate machine learning algorithm or model architecture for the problem at hand. Choosing between different types of models (e.g. decision trees, neural networks) and tuning hyperparameters to optimize model performance.
- **Model training:** Training the selected model on the preprocessed data and evaluating its performance using appropriate metrics (e.g., accuracy, precision, recall, F1-score).
- **Model deployment and monitoring:** Integrating the model into existing systems, setting up monitoring to track its performance over time, and implementing mechanisms for model updates and maintenance.



Audit of existing AI/ML environment

- **Data governance and quality assessment:** Examining the quality, completeness, and accuracy of the training and testing datasets used in the machine learning models. Evaluating data governance policies and practices, including data access controls, encryption, and data lineage.
- **Model performance:** Checking the performance of machine learning models, considering metrics such as accuracy, precision, recall, and F1 score.
- **Algorithmic fairness and bias assessment:** Verifying the AI/ML models for biases in predictions and outcomes. Implementing fairness metrics and assessing the fairness of model outputs across different demographic groups.
- **Security and privacy analysis:** Conducting a security audit to identify vulnerabilities in the AI/ML infrastructure, including model deployment, API endpoints, and data storage. Ensuring that proper encryption measures are in place for data both at rest and in transit.
- **Monitoring and maintenance procedures:** Implementing monitoring procedures to ensure ongoing performance and identify issues promptly. Verifying the existence and effectiveness of mechanisms for model versioning, updates, and retraining to adapt to evolving data patterns.

Development of custom AI solutions

- **Problem definition and requirement analysis:** Understanding the problem domain, defining clear objectives for the AI solution, and gathering requirements from stakeholders.
- **Data collection:** Collecting relevant data from various sources, such as databases, APIs, or sensors. It also includes data preprocessing tasks, such as cleaning, filtering, and transforming the data into a format suitable for training machine learning models.
- **Algorithm selection and model design:** Designing the architecture of the AI model, including the selection of layers, nodes, and activation functions. Optimizing hyperparameters and considering factors like model interpretability, scalability, and resource requirements.
- **Implementation and integration:** Developing APIs or libraries for model inference, integrating the model with existing software infrastructure, and ensuring compatibility with other components of the system.

Predictive modelling

- **Exploratory data analysis (EDA):** Conducting a thorough exploration of the data to understand patterns, relationships, and potential insights. Identifying potential variables that may have significant impact on the predictive modelling task.
- **Model selection:** Selecting the most suitable predictive modelling techniques based on the problem at hand and the nature of the data. Common techniques include linear regression, logistic regression, decision trees, random forests, support vector machines, neural networks, etc.
- **Model validation:** Splitting the data into training and testing sets, cross-validation, and using metrics such as accuracy, precision, recall, F1-score, ROC curve to evaluate the model's performance.
- **Model monitoring:** Implementing monitoring systems to track the model's performance over time and identifying any degradation in predictive accuracy.

AI – solutions advisory

- **Strategic AI roadmapping:** Formulating an AI strategy that aligns with the enterprise's goals and objectives. This encompasses the identification of potential AI use cases, assessment of the feasibility and impact of AI adoption, and the creation of a roadmap for its implementation.
- **Governance frameworks:** Setting up policies, guidelines, and best practices for the management of data, model development, and deployment. This facilitates the implementation of mechanisms ensuring transparency, accountability, and compliance.
- **AI processes optimization:** Reviewing existing processes and workflows to create opportunities for effective AI integration. Providing recommendations on optimizing processes, streamlining data pipelines, and fostering a culture of continuous learning and improvement.





AI Implementation at Oriflame: Case Study

Oriflame, a prominent cosmetics company operating in over 60 countries with its roots in Sweden and headquarters in Switzerland, is listed on the Stockholm Stock Exchange. Offering a diverse range of high-quality cosmetic products, Oriflame relies on approximately 3 million independent consultants worldwide, generating an annual turnover of approximately 1.5 billion EUR.

The Situation Before Implementation

Oriflame, like many global companies, recognized the imperative need for digital transformation to meet evolving customer needs. Given the unique importance of consultants in Oriflame's business model, understanding and effectively communicating with them in a personalized manner were deemed crucial. The company identified the optimization of internal processes for analyzing consultant-related data as the starting point for its digital transformation. With data collected on around 3.5 million consultants, Oriflame aimed to enhance segmentation precision to align with the ambition of each consultant to become an entrepreneur and develop their business, following the principle "Good segmentation is the key to digitalization."

Project Goals

The primary goals of the project included:

- Implementation of a customer data-driven approach throughout the company.
- Enabling an individualized approach by using analytical segments as the basis for creating personas and mapping their paths.
- Adapting communication and content strategy for each segment.
- Increasing overall revenues and activity within the consultant network.



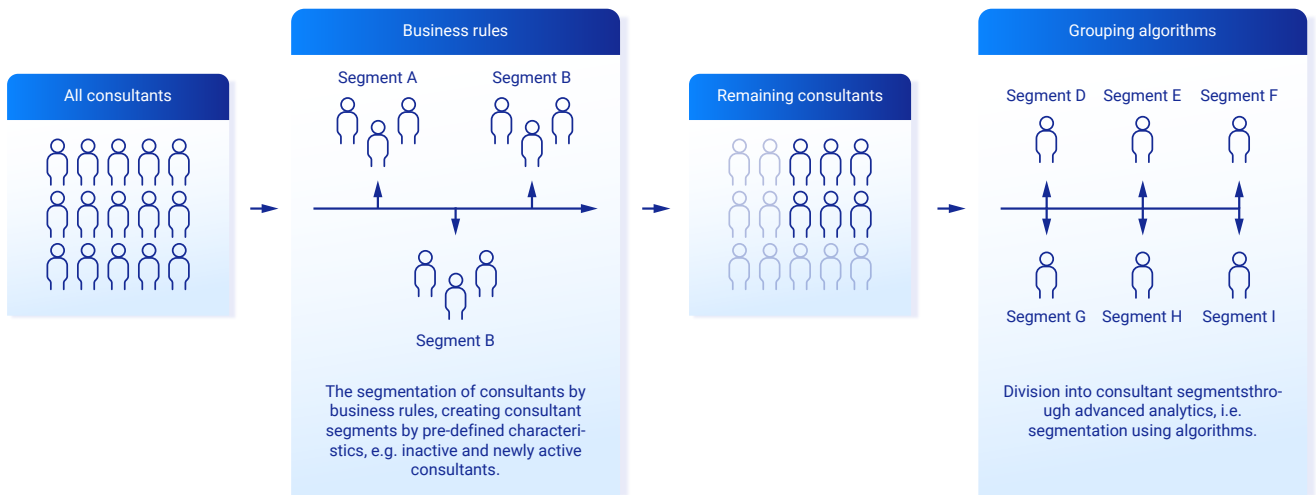
The project aimed to utilize data on consultant basic information, orders, and sales structures. Automatic segmentation focused on building universal segments to maximize business value and improve the understanding that consultants managed to build. The functioning of these sales networks is one of the key elements taken into account by the automatic segmentation process. The priority was to construct the most universal segments to bring the greatest possible business value and enhance understanding and communication with consultants.

Properly conducted analysis and identification of homogeneous groups influenced the definition of a set of the most promising sellers or consultants who primarily focus on developing their sales networks or make purchases solely for their own use. Segmentation also intended to facilitate greater precision in customizing products, offers, and sales tools. One of the key aspects was to better understand the behavior of consultants to strengthen relationships with them and increase sales efficiency in a given segment.

The advanced segmentation platform has also been planned as a tool for conducting additional analyses and visualization of statistics regarding the potential of consultants, classification into subsegments or special groups, activity research, and continuous monitoring and comparison of key performance indicators (KPIs) of individual segments.

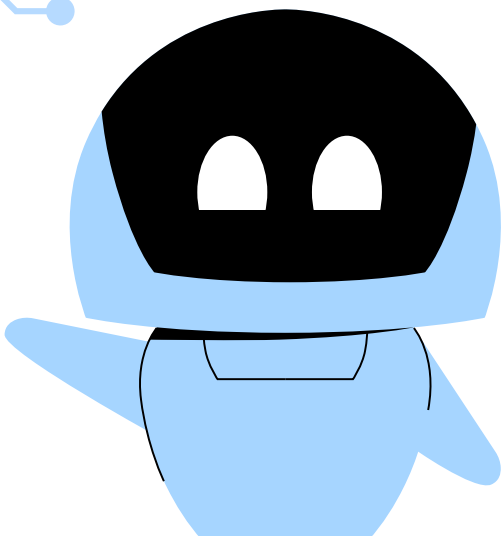
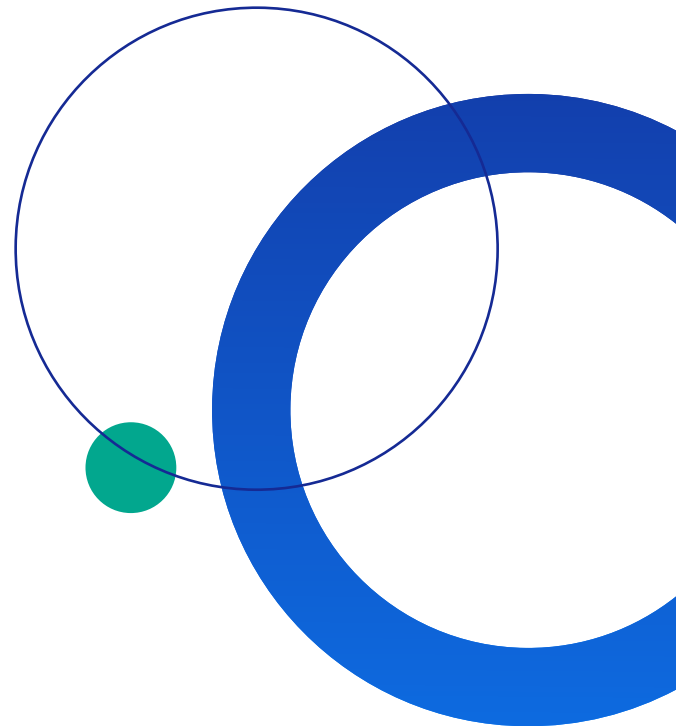
Solution

The project utilized an enterprise data warehouse and advanced statistical tools to support the segmentation process of network consultants. Prototyped with commercial tools and later transferred to open-source software, the solution addressed the challenge of selecting features to identify homogeneous groups effectively. After reducing the initial set of over 500 metrics to approximately 50 key features through business analysis and statistical verification, advanced AI segmentation algorithms, including two-stage clustering, were employed. This approach allowed for more efficient cluster formation, simplifying the process.



Project Development

Following the successful implementation of the project in Poland, Oriflame expanded its solution to 8 other countries where the company operates, including China. Each subsequent implementation required tuning the segmentation model to accommodate factors such as database sizes and differences in the importance assigned to various features, specific to each country. The positive results demonstrated the scalability and adaptability of the solution across diverse operational landscapes.



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