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An E-Commerce Recommendation Systems Based on Analysis of Consumer Behavior Models
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Introduction

An e-commerce recommender system (ECRS) based on artificial intelligence (AI) is a **sophisticated software application** that leverages AI techniques and algorithms to suggest products or services to online shoppers. Its primary goal is to enhance the user experience, increase sales, and drive customer satisfaction by providing personalized and relevant product recommendations. The components and functionality of ECRS : Data Collection, Data Processing, Recommendation Algorithms (Collaborative Filtering, Content-Based Filtering, Hybrid Methods, Matrix Factorization, etc), Real-time User Profiling, Product Catalog, Personalization, Contextual Recommendations, User Feedback, Scalability and Performance, Integration, Security and Privacy, Monitoring and Maintenance, etc.

An e-commerce recommender system based on AI leverages user data and advanced algorithms to provide personalized and context-aware product recommendations, enhancing the shopping experience, increasing user engagement, and driving sales for e-commerce businesses.

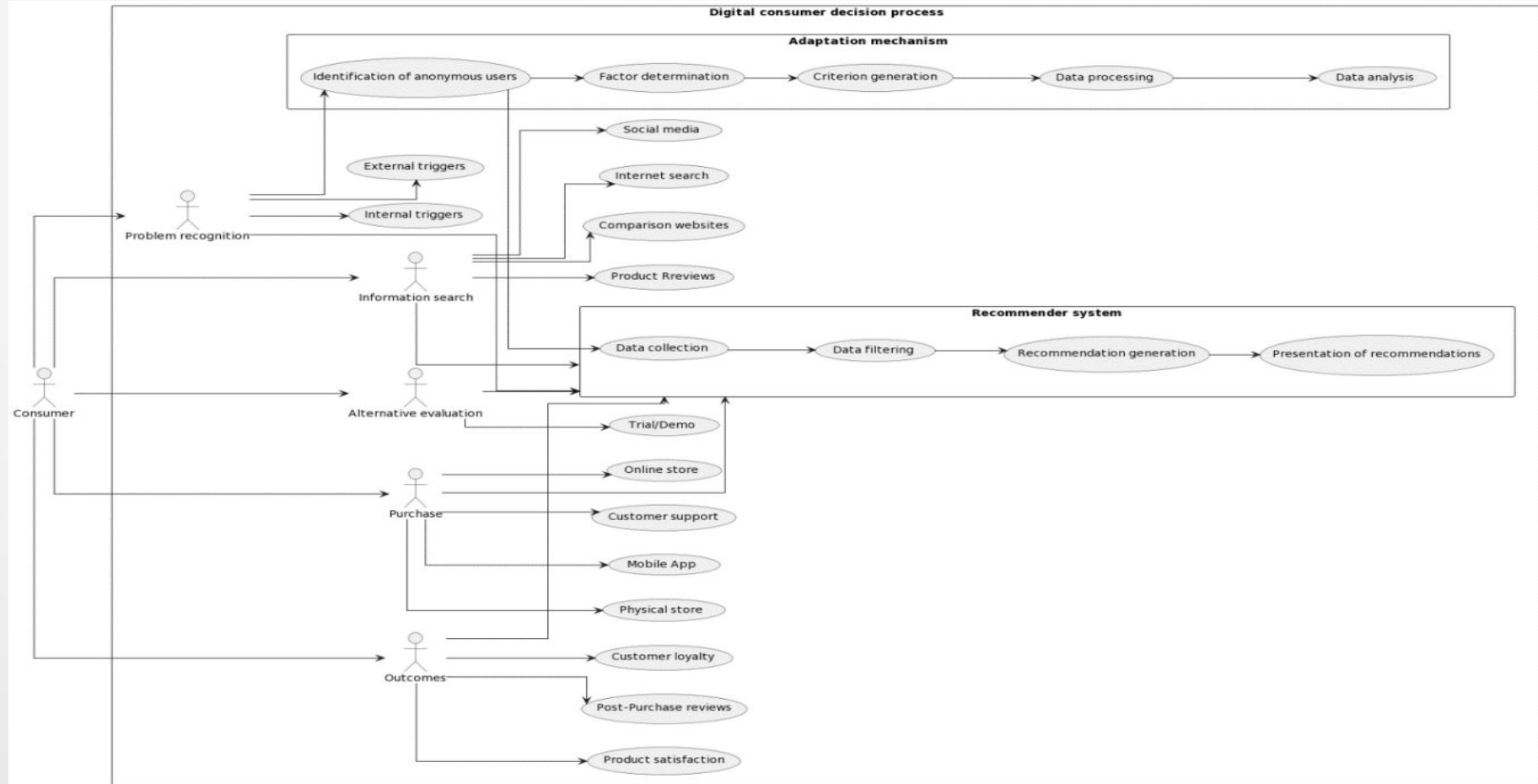
Role of consumer behavior models in using recommender systems of e-commerce

Consumer behavior models play a crucial role in modern e-commerce systems. These models help companies understand how consumers make decisions and interact with online platforms, enabling them to adapt their products, services, and marketing strategies according to consumer needs. One of the most widely used consumer behavior models is the buyer decision-making process model, which consists of **five** stages:

- 1) problem recognition,
- 2) information search,
- 3) evaluation of alternatives,
- 4) purchase decision, and 5) post-purchase evaluation and follow-up.

E-commerce systems can use this model to guide consumers through each stage of the decision-making process, providing relevant information and recommendations at each step.

Electronic Consumer Decision Process Model



Several types of e-commerce recommender systems

Content-based filtering recommends items to users based on item characteristics and user preferences.

Collaborative filtering recommends items based on similar users' preferences. It has two subtypes: user-based (using similar users' interests) and item-based (using item-user interactions).

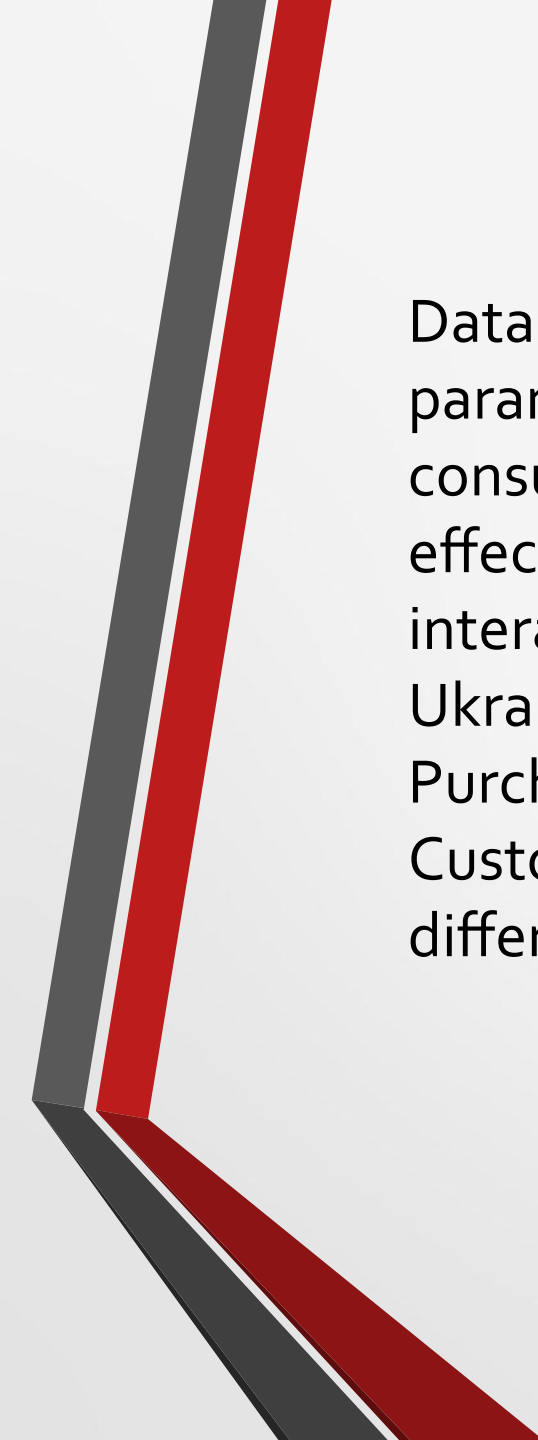
Hybrid recommender systems. These systems combine multiple recommendation techniques, such as content-based filtering and collaborative filtering, to provide more accurate and diverse recommendations. Hybrid approaches aim to leverage the strengths of different methods and overcome their individual limitations.

Knowledge-based recommender systems use domain-specific knowledge and rules to generate recommendations.

Demographic-based filtering recommends items based on demographic information such as age, gender, location, or occupation.

Context-aware recommender systems consider contextual factors like time, location, and user situations for personalized recommendations.

Data enrichment can include a variety of parameters that provide additional information about the context of transactions and the impact of external factors on consumers.



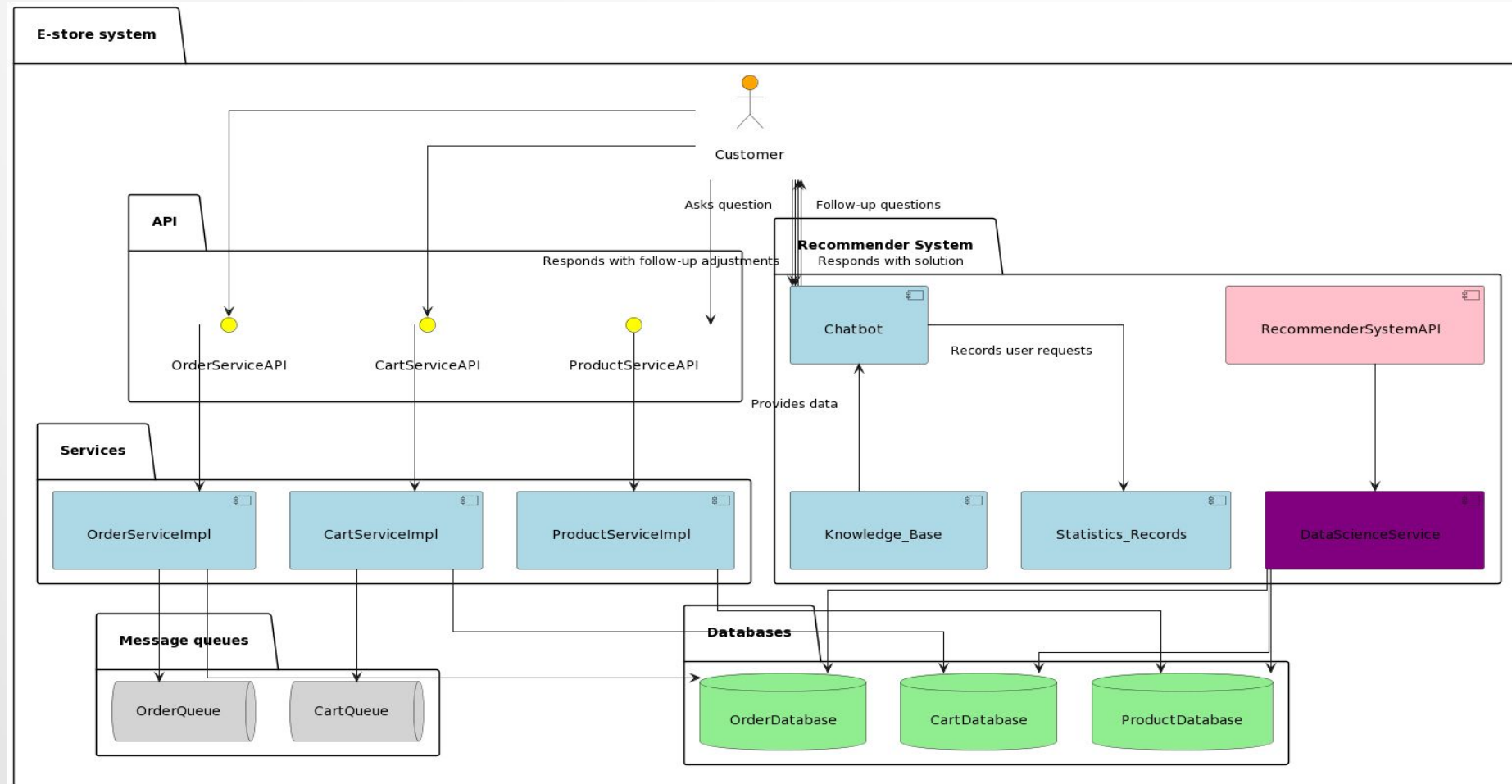
Data enrichment and analysis of correlations between various parameters allow increasing the level of understanding and prediction of consumer behavior. This provides opportunities to develop more effective marketing strategies personalize offers and improve customer interaction in e-commerce. An analysis was conducted by region in Ukraine, and the following parameters were determined: Average Purchase Value (APV), Average Purchase Frequency Rate (AP FR), Customer Value (CV). The study showed interesting results indicating different levels of customer value in different regions of Ukraine

Analysis by regions of Ukraine

| Region of Ukraine | APV | AP FR | CV |
|------------------------|--------|-------|---------|
| Odesa region | 622.26 | 2.69 | 1670.88 |
| Zaporizhia region | 574.86 | 2.88 | 1652.94 |
| Khmelnysky region | 704.58 | 2.32 | 1632.19 |
| Kyiv region | 608.45 | 2.64 | 1604.21 |
| Donetsk region | 641.18 | 2.45 | 1573.35 |
| Kharkiv region | 583.42 | 2.67 | 1558.51 |
| Chernivtsi region | 596.87 | 2.61 | 1558.14 |
| Dnipropetrovsk region | 606.99 | 2.55 | 1550.05 |
| Kirovohrad region | 611.29 | 2.51 | 1534.99 |
| Luhansk region | 640.54 | 2.35 | 1504.36 |
| Mykolaiv region | 600.74 | 2.46 | 1479.63 |
| Ivano-Frankivsk region | 600.60 | 2.44 | 1466.63 |
| Ternopil region | 630.96 | 2.32 | 1463.00 |
| Rivne region | 550.27 | 2.62 | 1441.66 |
| Poltava region | 598.11 | 2.41 | 1439.70 |
| Zakarpattia region | 634.79 | 2.25 | 1429.97 |
| Zhytomyr region | 595.70 | 2.31 | 1373.47 |
| Kherson region | 567.06 | 2.41 | 1367.96 |
| Lviv region | 581.70 | 2.34 | 1360.38 |
| Vinnytsia region | 636.21 | 2.13 | 1357.43 |
| Cherkasy region | 590.14 | 2.12 | 1249.69 |
| Sumy region | 561.29 | 2.09 | 1171.68 |
| Chernihiv region | 566.39 | 2.06 | 1168.19 |
| Volyn region | 594.89 | 1.94 | 1154.48 |

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The architecture of a system for an e-commerce platform, including recommendation system



CONCLUSION

In the field of recommender systems for e-commerce, several future trends and directions are emerging. These trends are as follows: personalization and contextualization, explainability and transparency, usage of hybrid approaches, context-aware recommendations, group and social recommendations, reinforcement learning, privacy and trust, multimodal recommendations, long-tail recommendations, online learning and real-time recommendations, etc.

The focus is shifting towards highly personalized recommendations that consider individual preferences, behaviors, and context. Advanced techniques such as deep learning, natural language processing, and reinforcement learning are being employed to capture nuanced user preferences and deliver tailored recommendations.