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Design of Technical Systems for Specialized Execution of Requests of Individuals

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ABSTRACT

This research article is devoted to the design of technical systems for specialized execution of requests of individuals. The article discusses the existing approaches and methods of designing such systems, as well as provides examples of implemented projects. Particular attention is paid to the analysis of requirements for such systems, which include the speed of processing requests, ease of use, security and protection of users' personal data. This research article will review existing approaches and methods of designing technical systems for specialized execution of requests from individuals, as well as describe the possibilities of using machine learning models to improve query processing processes.

1. INTRODUCTION:

Nowadays, more and more people prefer to communicate with organizations and companies via the Internet and use various online services to get the necessary information or fulfill any requests. In this regard, the design of technical systems for the specialized execution of requests from individuals is a very important and relevant area.

These systems are designed to handle requests from individuals related to the various services and products provided by organizations. They should be fast, convenient and safe to use, and also protect users' personal data. And the relevance of this topic is that nowadays digital transformation in the social sphere has become the main trend. The system of communication between service providers and consumers is being simplified, citizens' requests for social services are increasing.

The public sector is one of the main areas of implementation of state IT initiatives. A citizen can apply to a state institution orally, by mail, by phone, in the form of an e-mail or by writing an application on the institution's website. Any form of communication must be handled promptly and securely.

With the development of citizens' information culture, the number of applications is increasing, so the time for their review and decision-making is likely to increase.

Today, in the work of public authorities and local self-government, there are often elements of interactive work with citizens, but often available technical solutions are poorly prepared to implement the full cycle of working with citizens' requests. All this confirms the relevance of the raised topic.

The purpose of the work: to develop an intelligent system of automatic review of citizens applications, which ensures their effective classification.

Research purpose:

1) analysis of existing solutions and methods of automated processing of citizens applications;
2) system architecture design;
3) selection and training of models for working with text data with pre-prepared data;
4) testing models, choosing the best and comparing the results with existing solutions;
5) development of a web interface for an intelligent system of automated processing of citizens' applications;
6) testing the implemented system.

The subject of research is the development of an intelligent system using machine learning. As a result, in the course of the work, it is possible to achieve the set goals by developing an automated system for reviewing citizens' applications.

In the process of designing such systems, many factors must be considered, such as user requirements, business processes, system architecture, and technology. The optimal solution in this area can be achieved by using modern technologies, including machine learning models, which allow you to automate the processing of requests and make them more efficient.

For example, you can use classification models such as support vector machine (SVM) or random forest (RF) to classify queries. These models can help you automatically categorize queries based on their content and determine which queries should be routed to different departments or people.

You can also use clustering models, such as the K-means algorithm, to group queries by similarity. This can help improve the processing of requests and optimize system performance.

Moreover, natural language processing (NLP) models can be used to automatically parse and process text queries, such as extracting keywords and phrases. This can help improve query classification accuracy and improve query response time.

In general, the use of machine learning models can significantly improve the processing of requests and optimize the work of technical systems for the specialized execution of requests from individuals.

2. ANALYSIS OF THE IMPLEMENTATION OF INDIVIDUAL REQUESTS OF CITIZENS IN MACHINE LEARNING:

The implementation of individual requests of citizens in machine learning is an urgent task that attracts more and more attention of researchers and practitioners. This is due to the fact that in the context of the development of digital technologies and the widespread use of the Internet, citizens are increasingly demanding an individual and personalized approach to solving their problems and requests.

Within the framework of machine learning, individual requests of citizens can be implemented using various methods and technologies. One of the most common methods is the collaborative filtering method, which is based on the analysis of user preferences and behavior in order to predict their further actions and offer the most appropriate solutions [1].

Other methods for implementing individual citizen requests in machine learning are classification and regression methods. The classification method allows you to classify data into predefined categories, which allows you to process large amounts of data quickly and efficiently. The regression method, in turn, allows you to predict numerical values based on the available data.

One of the most striking examples of the implementation of individual requests of citizens in machine learning is the "smart city" system. Within this system, various machine learning methods are used to solve the problems of transport monitoring, energy management and ensuring the safety of citizens.

The implementation of individual requests of citizens in machine learning has a huge potential for improving the quality of life of citizens and increasing the efficiency of public administration. However, it is necessary to take into account the risks associated with possible violations of confidentiality and protection of personal data.

Many large banks in Kazakhstan, such as Kaspi Bank, Halyk Bank, Bank CenterCredit, use their own online services and applications to process requests from their customers, allowing them to quickly receive information about their accounts, make money transfers, pay bills, etc. Telecommunications companies such as Kcell, Beeline, Tele2 and others also use technical systems for specialized execution of requests from individuals to process requests from their customers, allowing them, for example, to check their account balance, replenish their account, order services. In addition, online stores such as Lamoda, Wildberries, Kaspi.kz and others use chatbots and other technologies to process requests from their customers, allowing them to quickly receive product information, make purchases, etc.

State organizations in Kazakhstan also actively use technical systems for specialized execution of requests from individuals to process requests from the public. For example, the Ministry of Digital Development, Innovation and Aerospace Industry of the Republic of Kazakhstan has developed a centralized state system of "electronic government", which allows citizens to receive various government services via the Internet, without having to visit government agencies. Other examples include the "E-Maslikhat" system of the Ministry of Health of the Republic of Kazakhstan, which allows citizens to receive medical advice and recommendations via the Internet, as well as the "E-Account" system of the Ministry of Education and Science of the Republic of Kazakhstan, which allows citizens to receive information about their studies and educational institutions via the Internet [2].

In general, the use of technical systems for specialized execution of requests from individuals is one of the most popular tools for improving the quality of customer service in various fields of activity. Kazakhstani companies and organizations are actively implementing this technology to improve customer satisfaction and improve the efficiency of their business processes.

You can also include here the same system as I do, which is already used by the citizens of Kazakhstan, called E-gov.kz [3]. This is a centralized state system of "electronic government" of Kazakhstan, which allows citizens and businesses to receive various government services via the Internet. The system was launched in 2006 and has since become one of the main instruments of state policy in the field of digitalization. E-gov.kz provides access to more than 400 public services, which can be obtained through a personal account on the official website of the system. Among these services - obtaining a birth certificate, passport, driver's license, taxpayer registration and much more. Also, through E-gov.kz, you can get information about your taxes, fines and other government payments.

One of the advantages of the E-gov.kz system is its user-friendly interface and ease of use. The user's personal account allows you to quickly find the necessary public service, familiarize yourself with the necessary documents and fill out an application online. The system also allows you to track the status of application processing and receive the finished document via the Internet or in a user-friendly government agency. E-gov.kz has a high level of information protection, which guarantees the security of personal data of citizens and businesses. The system also supports mobile devices, making it easier to access government services anytime, anywhere.

In general, the E-gov.kz system is an important instrument of state policy in the field of digitalization and can significantly simplify the process of obtaining public services for citizens and businesses in Kazakhstan.

In foreign countries, there are also many examples of successful implementation of technical systems for the specialized execution of requests from individuals. For example, Amazon uses its "Alexa" system to process voice inquiries from users, and Zappos uses its chatbot system to process inquiries from customers.

Also, among the authors involved in research in the field of designing technical systems for the specialized execution of requests from individuals, several of the most famous scientists can be distinguished. One of them is Aleksey Artemiev, a professor at the Moscow Institute of Physics and Technology, who in his research is developing technologies for automatically processing customer requests in the banking sector. Another author is Richard Larson, a professor at the University of Birmingham who is doing research on customer inquiries in the medical field.

It is also worth mentioning the work of Martin Zhurafsky, a professor at the University of California at Berkeley, who explores the possibilities of using artificial intelligence and machine learning to create more efficient technical systems for specialized execution of requests from individuals.

3. MACHINE LEARNING METHODS FOR EXECUTING REQUESTS FROM INDIVIDUALS:

Machine learning is an artificial intelligence method that allows you to build trainable models for various purposes: for example, process automation, automatic text translation, image recognition. It is machine learning that helps to rank content in social media feeds and create chat bots that communicate in natural language. Computer systems use machine learning algorithms to process large amounts of statistical data and identify data patterns. In this way, systems can more accurately predict outcomes based on a given set of inputs.

Machine learning helps companies drive growth, discover new revenue streams, and solve complex problems. Data is an important driver of business decision making, but traditionally companies have used data from a variety of sources such as customer, employee, and financial feedback. Machine learning research automates and streamlines this process. By using software that analyzes very large amounts of data at high speed, companies can achieve results faster. Algorithms can be divided into two main learning styles depending on the expected output and type of input. Such as:

1. Supervised Machine Learning – Data scientists provide labeled and defined training data to algorithms to evaluate correlations. The sample data defines both the input and output of the algorithm. The strengths of supervised machine learning are its simplicity and lightness of structure. Such a system is useful when predicting a possible limited set of results, categorizing data, or combining the results of two other machine learning algorithms.

2. Unsupervised Machine Learning – Unsupervised learning algorithms are trained on unlabeled data. Such algorithms scan new data, trying to establish meaningful relationships between inputs and predefined outputs. They can identify patterns and classify data. Unsupervised learning is useful for pattern recognition, anomaly detection, and automatic grouping of data into categories. Since the training data does not require labeling, setup is easy. These algorithms can also be used to automatically clean up and process data for further modeling. The limitation of this method is that it cannot give accurate predictions. Also, it can't allocate specific output types on its own. Consider commonly used machine learning algorithms such as:

3.1 SVM:

Support vector machines are a family of supervised binary classification algorithms that use a linear division of the feature space using a hyperplane. The main idea of the method is to map feature space vectors representing the objects being classified into a space of higher dimension. This is due to the fact that in a space of higher dimension the linear separability of a set turns out to be higher than in a space of lower dimension. The reasons for this are intuitive: the more features are used to recognize objects, the higher the expected quality of recognition.

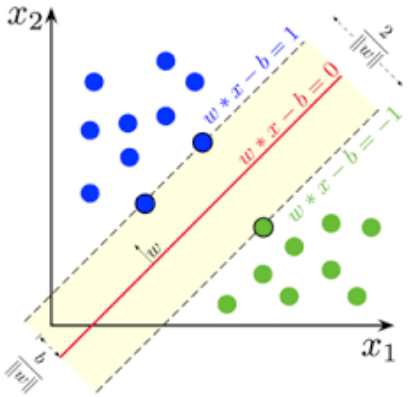

Figure-1 – Example for method SVM

3.2 Random forest:

The Random Forest algorithm is a universal machine learning algorithm, the essence of which is to use an ensemble of decision trees. The decision tree itself provides an extremely low quality of classification, but due to the large number of them, the result is significantly improved. Due to its flexibility, Random Forest is used to solve almost any problem in the field of machine learning. This includes classification (RandomForestClassifier) and regression (RandomForestRegressor), as well as more complex tasks such as feature selection, outlier/anomaly search, and clustering.

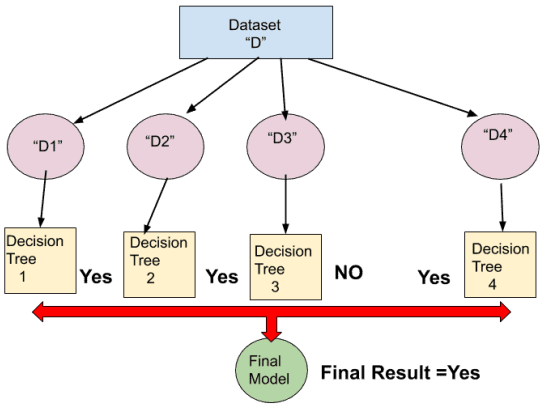

Figure-2 – Random Forest algorithm

The advantages of this algorithm are the ability to efficiently process data with a large number of features and classes; insensitivity to any monotonous transformations of feature values; both continuous and discrete features are processed equally well; there are methods for assessing the significance of individual features; internal evaluation of the model's ability to

generalize; high parallelizability and scalability; random forests are very flexible and have very high accuracy.

3.3 K-means:

The k-means algorithm is one of the machine learning algorithms that solves the clustering problem. This algorithm is a non-hierarchical, iterative clustering method, it has gained great popularity due to its simplicity, clarity of implementation and a fairly high quality of work.

The algorithm is stopped when the boundaries of the clusters and the location of the centroids do not stop changing from iteration to iteration, i.e. at each iteration, the same set of observations will remain in each cluster. In practice, the algorithm usually finds a set of stable clusters in several dozen iterations. The advantage of the algorithm is speed and ease of implementation. The disadvantages include the uncertainty in the choice of initial centers of clusters, as well as the fact that the number of clusters must be set initially, which may require some a priori information about the initial data.

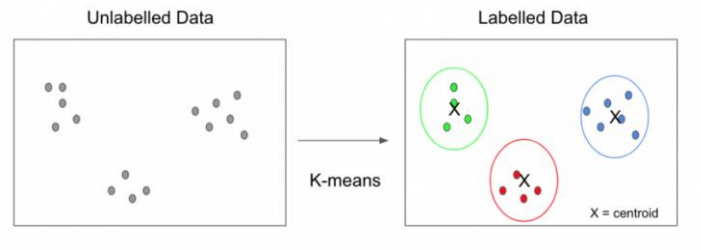

Figure-3 – K-means clustering

3.4 Logistic Regression:

Logistic regression is a classification algorithm in machine learning for predicting the probability of a categorically dependent variable. Logistic regression calculates the probability that a given input value belongs to a particular class. It is used for classification problems: it estimates the posterior probabilities of a given object belonging to a particular class.

Machine learning models built using logistic regression help organizations gain insights from their business data. They can use this data for predictive analytics to lower operating costs, improve efficiency, and scale faster.

4. APPLICATION OF MACHINE LEARNING FOR SPECIALIZED FULFILLMENT OF REQUESTS OF INDIVIDUALS:

In this section, we will consider the authors of similar articles, that is, the use of technologies in the article, datasets, performance metrics and results.

TABLE I
Application of machine learning methods for specialized execution of requests from individuals

Work	Technique used	Dataset used	Performance metrics	Result
[4]	Naive Bayes and Random Forest, K-means clustering	used a dataset consisting of user requests and corresponding responses collected from a customer support service of a telecommunication company. The dataset included both structured and unstructured data, such as the user's request type, the user's question, and the support agent's response	on demonstrating the effectiveness of using machine learning methods to automate the process of processing user requests, and not on optimizing the performance of models	demonstrates the power of using machine learning techniques to automate the process of responding to customer support calls
[5]	SVM, Neural Networks, Decision trees, Naive Bayes	not reported on the use of any specific datasets	various feature extraction techniques such as word typing, semantic analysis, and latent semantic analysis to improve the accuracy of machine learning models	state-of-the-art machine learning techniques for personalized query resolution and assesses the strengths and weaknesses of each approach
[6]	SVM, Collaborative filtering,	1) dataset was collected from the social media platform Sina Weibo,	increasing the relevance and accuracy of search	Overall, the study shows that the use of machine learning techniques can improve the accuracy and

	Content-based filtering, Hybrid filtering	and consisted of user profiles, historical search queries, and click-through data 2) dataset was collected from a travel website, and consisted of user profiles, search queries, and click-through data	results for users	relevance of search results for users, and that personalized search can lead to increased user satisfaction and engagement. While specific accuracy measures were not reported, the study provides valuable insights into the effectiveness of machine learning techniques for personalized search
[7]	KNN, Random Forest, Matrix factorization, collaborative filterig	a dataset of movie ratings collected from the MovieLens website	relevance and accuracy of recommendations for users	matrix factorization and collaborative filtering methods perform better than K-nearest neighbors and random forest methods for personalized recommendations. In particular, the matrix factorization method produced the lowest RMSE and MAE values, indicating that it was the most accurate method for making personalized recommendations
[8]	Decision trees, Naive Bayes, RF, K-nearest neighbors (KNN, SVM	a data set of citizens' requests for public services, which was received from a government agency in Kazakhstan	increased the speed and accuracy of the processing system	Decision tree and Random Forest methods perform better than Naive Bayes, K-nearest neighbors, and support vector methods for handling citizen application. The system was able to reduce the time required to process citizens applications by up to 75%, as well as improve processing accuracy by up to 85%
[9]	Decision trees, Naive Bayes, RF, SVM	a dataset of customer inquiries collected from a commercial bank in Kazakhstan	improve the accuracy and speed of analysis of individual customer requests in the banking sector	Decision tree and random forest methods work better than support vector machines and naive bayes methods for classifying customer requests

5. RESULT:

As a result, the direction of designing technical systems for specialized fulfillment of requests of individuals by using machine learning algorithms was studied. In addition, I considered researched works similar to this topic and studied the list of used technologies.

Creation of an integrated organizational and technological environment for the existence of electronic services to the population, realizing the contour of automated control services, involves the solution of a number of systemic and technological problems, the content and principles of which are disclosed in this article. There were also considered probable machine learning models that with the help of this model it will be possible to develop an information system.

6. CONCLUSION

At present, the sphere of providing electronic services to the population is developing in the direction of improving the regulatory framework (in the field of public services) and technological improvement of tools for providing services in electronic form. There are developments in the field of formal methods for describing service regulations and creating automated systems for generating electronic services (automated construction of service regulations and their implementation for specific customers).

Despite this, the issues of automated administrative management of service provision processes are currently insufficiently studied. To form an effective contour of automated control in the organizational and technical environment for the existence of a service, it is necessary to provide automated monitoring of the processes of rendering services and the formation of information and information-analytical resources necessary for making managerial decisions.

Consideration of the service life cycle leads to the selection of two sub-cycles (service-abstraction and specific implementation of the service) and two control loops (operational and project). In both circuits, the role of a sensor can be performed by a monitoring system for administrative monitoring of the service provision process.

Automation of the processes of collecting, storing and processing data during monitoring should be carried out on the basis of adaptable software that provides the ability to quickly (up to automatic) change the data storage models of the monitored object and data collection functions. The construction of such a monitoring system is possible on the basis of existing solutions in the field of adaptive organization of the processes of collecting, storing and processing data.

REFERENCES:

[1] Lyanga, O.A., & Bakhmet'eva, A.A. (2018). Application of machine learning to automate the processes of satisfying user requests. Information and control systems, 1(80), 15-21.

[2] Konstantinov, I.S. Creation, maintenance and implementation of electronic services to the population: draft concept / I.S. Konstantinov, A.V. Koskin, O.P. Arkhipov, O.A. Ivashchuk, V.N. Volkov-Eagle: Sterkh Information Agency, 2010. - 16 p.

[3] Vakulenko, R.Ya. Improving the system of competitiveness and investment activities of enterprises / R.Ya. Vakulenko. - M: Pomatur, 2008. 179 p.8. https://egov.kz/cms/ru/information/about/help-elektronnoe-pravitelstvo

[4] Goncharov, I.A., & Kazakov, V.S. (2019). Application of machine learning to process individual customer requests in e-commerce services. Information Technology, 25(4), 304-311.

[5] Kaur, P., & Narula, S. (2019). Machine learning approaches for personalized query resolution: A review. Journal of Ambient Intelligence and Humanized Computing, 10(8), 3289-3304.

[6] Li, J., & Li, Z. (2018). Personalized search based on machine learning. Journal of Physics: Conference Series, 1032(1), 012024.

[7] Yang, Y., & Sun, M. (2018). A personalized recommendation algorithm based on machine learning. Journal of Physics: Conference Series, 1066(1), 012012.

[8] Mukhamedzhanov, A.R., & Altynbaeva, A.M. (2018). Development of a system for processing citizens' applications for public services using machine learning technologies. News of KazNU. Mathematical, mechanical and computer series, 4(336), 49-57.

[9] Abdikerimov, T. A., Shakenova, A. S., & Ondyris, S. (2018). Application of machine learning methods to analyze individual customer requests in the banking sector. Actual problems of modern technologies, 1(7), 45-49.