

№	Статья и ссылка	Аннотация
1.	<p>Sapakova, S., & Yilibule, Y. (2022). DEEP LEARNING-BASED FACE MASK DETECTION USING YOLOV5 MODEL. <i>Scientific Journal of Astana IT University</i>, 12(12), 5–13. https://doi.org/10.37943/12TXQS9259</p>	<p>Based on the background of rapid transmission of novel coronavirus and various pneumonia, wearing masks becomes the best solution to effectively reduce the probability of transmission. For a series of problems arising from crowded public places and collective units, where face recognition is difficult to increase target density, a deep convolutional neural network is used for real-time mask detection and recognition. This paper presents the method based on YOLOv5 model for deep learning and mask detection in image recognition as well as a live camera to label the pedestrians without masks in time. This experiment will use LabelImg software to preprocess 5003 images and make lightweight improvements based on the original YOLOv5 model to generate the final face mask recognition model. The Mosaic method is added to merge the images effectively and process the images in batch, and secondly, the GIOU loss function is selected to calculate the bounding box regression loss by comparison, which improves the localization accuracy even more. According to the experimental detection results, analogized with the original model YOLOv5, the recall and accuracy are effectively improved. In this paper, YOLOv3, SSD, Fast-R-CNN detection algorithms are used for comparison, the detection results of this model have a high mAP value which is equal to 92.9, which are higher than the detection results of other models. Real-time target recognition based on this model combined with practical applications can be applied in hospitals and crowd-gathering places to achieve effective reduction of epidemic transmission probability in a short period of time.</p>
2.	<p>Temirgazyeva, S., & Omarov, B. (2022). TRAFFIC SIGN RECOGNITION WITH CONVOLUTIONAL NEURAL NETWORK. <i>Scientific Journal of Astana IT University</i>, 12(12), 14–23. https://doi.org/10.37943/12YZFG6952</p>	<p>Recognizing road signs is one of the most important steps drivers can take to help prevent accidents. The purpose of the research work is to develop a recognition system, increasing the classification accuracy of the model, using deep learning methods of the road sign recognition system for drivers in real time on the road. Stages of road sign image classification were carried out, and other authors' solutions were analyzed. In addition, in this work, a convolutional neural network (CNN) was used for an autonomous traffic and road sign detection and recognition system. The proposed system works in real-time on the recognition of road signs images. In this paper, a model is trained using deep learning of 43 different road signs using existing datasets and collected local road signs. A traffic sign detection and recognition system is presented using an 8-layer convolutional neural network, which acquires different functions by training different types of traffic signs.</p> <p>In previous studies, models were trained using simple machine learning algorithms, but the relevance of this study is that a CNN model was trained for a classification task based on convolutional neural networks using deep learning. As a result of the study, classification accuracy of 95% was obtained using deep learning methods. As a novelty of the work, it is possible to note the diversity of the convolutional network methods used to increase the efficiency of the used data set and model training algorithms, the variety of received road signs and algorithms for its recognition, as well as the achievement of a high accuracy rate. This allowed the system to overcome the limited accuracy and performance issues caused by environmental factors, and to be more versatile and accurate than most modern systems.</p>

3.	<p>Barabash, O., Ziuziun, V., & Kubiavka, L. (2022). ON THE DEVELOPMENT OF MANAGEMENT MODELS FOR REGIONAL PROGRAMS OF ENVIRONMENTALLY SAFE OPERATION AT CRITICAL TRANSPORT INFRASTRUCTURE FACILITIES. <i>Scientific Journal of Astana IT University</i>, 12(12), 24–33. https://doi.org/10.37943/12SWCH3968</p>	<p>The objects of the critical transport infrastructure are located in all regions of Ukraine, and the question of the safety of these objects is extremely relevant. A functional approach should be used to form an effective safety management unit for critical transport objects. Therefore, in order to achieve an acceptable level of safety of the critical transport infrastructure, it is necessary to have an effective mechanism for achieving this result, which can be achieved through the formation and efficient management of regional programs for the safe operation of critical transport infrastructure objects. Management models for regional safety programs at critical transport infrastructure facilities based on the existing approaches to construction of models of program and project management are proposed in the article. Critical transport infrastructure includes highways, state-owned transport enterprises, subway facilities, gas stations, bridges, sea and river ports, airports, and pipelines. These facilities are strategic for the state, and as a consequence, vulnerable, so they require special protection. To form an effective apparatus for environmental safety management in critical transport infrastructure facilities, the application of a program approach is proposed in the article. To assess the life cycle of regional environmental safety programs of critical transport infrastructure facilities based on the Deming cycle, a spiral model was developed, which is the environment for the operation of schematic, system, and service models of the environmental safety management program. Development of approaches to the management of regional programs for the environmentally safe operation of critical transport infrastructure facilities, based on the formation of strategic objectives and their decomposition, will be aimed not only at solving existing problems of critical transport infrastructure in the region but factors related to the occurrence of dangerous events for them and the elimination of the causes leading to these problems. A system model for managing regional safety programs for objects of critical transport infrastructure is proposed.</p>
4.	<p>Tleubayeva, A., Maidanov, A., & Kantayeva, A. (2022). A MODEL OF AN AUTONOMOUS SMART LIGHTING SYSTEM USING SENSORS. <i>Scientific Journal of Astana IT University</i>, 12(12), 34–44. https://doi.org/10.37943/12UICC8045</p>	<p>Traditional street lighting systems receive data about daylight levels and adjust lighting. However, in such conditions, energy consumption increases since the sensors of such systems receive data on only one indicator which is daylight. Therefore, a suitable automated intelligent lighting system model is needed. Intelligent lighting systems can adjust the brightness of the light not only based on natural data, but also based on the movement of vehicles and people. This paper describes the development, implementation, and testing of a smart lighting system model to increase energy efficiency and high reliability. This system is controlled by a micro-controller programmed to control the lighting and receive data from sensors for processing with good efficiency. Distributed sensors record environmental conditions such as daylight and traffic. Photo-resistors change resistance in daylight to light up the streets at night. The HC-SR501 infrared motion sensor detects objects emitting infrared radiation (heat) in the controlled motion zone and sends a signal to the micro-controller. The intelligent lighting system uses LED's, which consume less energy and achieve high efficiency. Calculations show that the efficiency of using these lamps is almost 70%, compared to what is used in conventional street lighting systems.</p>
5.	<p>Uskenbayeva, R., Nalgozhina, N., & Berkaliyeva, M. (2022). INTRODUCTION AND EVALUATION PROBLEM OF BPM AND RPA APPROACHES IN MODERN LOGISTIC SYSTEMS. <i>Scientific Journal of Astana IT University</i>, 12(12), 45–54. https://doi.org/10.37943/12UXAN3708</p>	<p>Every modern business system tends to a reduction of production and management costs. There are many ways of upgrading and automatization however most common is introducing Business Process Management. Although BPM is a holistic approach to optimizing and automating business processes from start to finish, this article represents Robotic Process Automation as a new form of workflow automation technology. From the construction of a consistent overview that allow the comparative analysis of the methodologies, to select the one that suits better its specificities it can be verified that, although they share the same objective, each notation has its specific characteristics. According to those representational analyses, the introduction methodology of the robotic solution technique is represented within the framework of a logistic business process. The author provides</p>

		the work with a detailed description of BPM and RPA models integration highlighting their main features. Along with that, the literature analysis was conducted to define the problems of the logistic business automatization's current condition. The paper is a consequent comparison of BPM and RPA, especially in logistic systems. The author provides methodological recommendations on the adoption of management and automation tools in logistic systems.
6.	<p>Kaibassova, D., Nurtay, M., Tau, A., & Kissina, M. (2022). SOLVING THE PROBLEM OF DETECTING PHISHING WEBSITES USING ENSEMBLE LEARNING MODELS. <i>Scientific Journal of Astana IT University</i>, 12(12), 55–64. https://doi.org/10.37943/12OYRS4391</p>	<p>Due to the popularity of the easiest way to obtain personal information among attackers, phishing detection is becoming a popular area for research aimed at countering the implementation of such attacks. Malicious website detection is essential to prevent the spread of malware and protect end users from victims. Unfortunately, malicious URL detection still needs to be better understood due to a lack of features and inaccurate classification. Possible sources were examined in order to investigate the subject. Based on the collected information from previous studies, this study is devoted to solving the problem of detecting phishing websites using Ensemble Learning. The aim of the work is to choose the most optimal algorithm for classifying phishing websites using gradient boosting algorithms. AdaBoost, CatBoost, and Gradient Boosting Classifier were chosen as Ensemble Learning algorithms and were used to improve the efficiency of classifiers. Practical studies of the parameters of each algorithm for finding the optimal classification model are given. Research and experiments were carried out on a dataset containing information extracted from the contents of a URL: main URL, domain, directory, and file. A thorough Exploratory Data Analysis (EDA) was carried out, as a result of which the main dependencies and patterns of determining phishing resources were identified using correlation analysis. ROC AUC Score was chosen as an evaluation metric for the algorithms. The best result for predicting phishing websites was demonstrated by the AdaBoost Classifier algorithm, with an average ROC AUC score of 99%. The results of the experiments were illustrated in the form of graphs and tables.</p>
7.	<p>Balginbayeva, K., & Mubarakov, A. (2022). EXPERIENCE IN USING DISTANCE LEARNING TOOLS IN PROFESSIONAL DEVELOPMENT PEDAGOGICAL CORPS. <i>Scientific Journal of Astana IT University</i>, 12(12), 65–80. https://doi.org/10.37943/12TUVU9953</p>	<p>The article presents and describes a tool for the professional development of teachers. Special attention is paid to the subject-methodical section, the implementation of which since 2020 has been taking place in an online form with the use of distance educational technologies. The article describes and presents the concepts of «e-learning» and «distance learning technologies,» and briefly presents the history of the development of distance education in the world. The article contains a description of the advantages of distance learning, as well as an analysis of the difficulties experienced by students of training courses and seminars, and advanced training of distance courses. In the post-industrial world, one of the main qualification requirements is professional mobility, determined by readiness for continuous retraining and advanced training. The education system, designed to ensure the increase of human capital, and increase the efficiency and competitiveness of the economy, should, first of all, prepare people for life in rapidly changing conditions. Therefore, the system itself must keep up with the changes taking place. The main challenge of 2020 was the emergency transfer of the educational process to a remote form using e-learning technologies. The education system did not have time to «group up» and prepare. The implementation of educational programs in a remote format required careful coordination of pedagogical activities and thoughtful administration of the process. The crisis exposed serious substantive and organizational problems in the industry and identified professional-pedagogical difficulties in the field of ICT competence: both at the level of the general user and the level of the general pedagogical component. The pedagogical community has an objective need to master new competencies. We can assume that the current situation will inevitably entail changes in the standards of training and retraining, as well as the emergence of new training programs.</p>

8.	<p>Khomysh, A., Kapalova, N., Algazy, K., & Sakan, K. (2022). STUDY OF THE CRYPTOGRAPHIC STRENGTH OF THE S-BOX OBTAINED ON THE BASIS OF EXPONENTIATION MODULO. <i>Scientific Journal of Astana IT University</i>, 12(12), 81–88. https://doi.org/10.37943/12DZLQ4553</p>	<p>This article presents one of the main transformations of symmetric block ciphers used to protect confidential information, a new method for obtaining a non-linear S block, and an analysis of the results obtained. The S-box obtained by this method can be used as a non-linear transformation in block cipher algorithms to protect confidential data transmitted over an open channel. In most well-known works in the field of analysis and synthesis of modern block symmetric ciphers, S-box is used as a mathematical apparatus for cryptographic Boolean functions. In this case, each S-box is represented by a set of composite Boolean functions whose properties characterize the efficiency of the nonlinear substitution node. Substitution nodes for modern symmetric primitives, including key unfolding functions, are usually implemented as replacement tables. Considering that in most modern block symmetric ciphers for introducing round keys, the encryption algorithm uses a linear operation (bitwise addition modulo 2), S-blocks are the only elements responsible for the cryptographic stability of block encryption algorithms. The required number of rounds of block symmetric ciphers is selected taking into account the results of the cryptographic analysis performed, provided that the properties of S-boxes are specified. As the main criteria and performance indicators, the balance and nonlinearity of composite Boolean functions are used; strict avalanche criterion (SAC), propagation criterion; algebraic degree; the value of the autocorrelation function. In this article, a study was made of the nonlinearity and strict avalanche criterion (SAC) of the S-box used in the block symmetric encryption algorithm. The results of the study were compared with the S-boxes of modern cryptographic algorithms and showed good results.</p>
9.	<p>Uvaliyeva I., Belginova, S., & Sovetbekov, S. (2022). MATHEMATICAL AND COMPUTER MODELS OF THE COVID-19 EPIDEMIC. <i>Scientific Journal of Astana IT University</i>, 12(12), 89–100. https://doi.org/10.37943/12QWEH5166</p>	<p>The COVID-19 epidemic has gone down in history as an emergency of international importance. Currently, the number of people infected with coronavirus around the world continues to grow, and modeling such a complex system as the spread of infection is one of the most pressing problems. Various models are used to understand the progress of the COVID-19 coronavirus epidemic and to plan effective control strategies. Such models require the use of advanced computing, such as artificial intelligence, machine learning, cloud computing, and edge computing. This article uses the SIR mathematical model, which is often used and simple to model the prevalence of COVID-19 infection. The SIR model can provide a theoretical basis for studying the prevalence of the COVID-19 virus in a specific population and an understanding of the temporal evolution of the virus. One of the main advantages of this model is the ease of adjusting the sampling parameters as the study scale increases and the most appropriate graphs between the data and the resulting assumptions. Computer models based on the mathematical SIR model of the spread of the COVID-19 epidemic make it possible to estimate the number of possible deaths in the future. In addition, on the basis of the proposed models, it will be possible to assess the effectiveness of measures taken to prevent infection by comparing published data with forecasts. Computer models in Python are created on the basis of the proposed mathematical apparatus of SIR. The following libraries were added in the Python high-level programming language for the numerical solution of the system of differential equations for the SIR model: NumPy, Matplotlib PyPlot and the Integrate module from the SciPy library.</p>
10.	<p>Myrzakerimova, A., Kolesnikova, K., & Nurmaganbetova, M. (2022). DEVELOPMENT OF THE STRUCTURE OF AN AUTOMATED SYSTEM FOR DIAGNOSING DISEASES. <i>Scientific Journal of Astana IT University</i>, 12(12), 101–112. https://doi.org/10.37943/12AVGE4585</p>	<p>Today, the importance of information support for various medical technologies has increased significantly. The use of modern information technologies is becoming a critical factor in the development of most branches of knowledge and areas of practice, so the development and implementation of information systems is an urgent task. The clinical decision support system provides clinicians and stakeholders with individualized patient assessments and recommendations to assist in the clinical decision-making process.</p>

		<p>Knowledge-based information systems are widely used in medicine around the world. Modern technical capabilities make it possible to reach a qualitatively new level of presentation of the course of the disease, namely, based on appropriate mathematical models, to model the typical development of the pathological process in a particular disease, to speed up the process of diagnosing and receiving recommendations on treatment protocols.</p> <p>In Kazakhstan, there is no variety of decision support systems in medicine, especially in the process of diagnosing diseases. The purpose of this study is to develop the structure of an automated system for diagnosing diseases. The Unified Modeling Language (UML) is used as a design tool. The structure of the automated system is presented; the main components and key terms are considered. A mathematical model of diagnostics is shown (in the example of diseases of intestinal and pancreatic insufficiency) based on decision-making methods with fuzzy initial data. A diagram of the data flows of the system is presented. Thus, the paper proposes the structure of an automated system that will contribute to high-quality diagnostics due to an effective method of system organization and the use of fuzzy set theory methods.</p>
11.	<p>Shaidulov, R., & Kenzhegalieva, Z. (2022). BLOCKCHAIN AS DATA PROTECTION IN FINANCE. <i>Scientific Journal of Astana IT University</i>, 12(12), 113–121. https://doi.org/10.37943/12ZATX3943</p>	<p>Five years ago, it would have been difficult to describe Kazakhstan’s economy as highly digitized. However, the country is currently implementing state programs aimed at improving the socio-economic conditions of its citizens, with a focus on digitalization and the streamlining of financial monitoring systems for budget expenditure. The process of introducing digital technologies, in various forms, serves to increase transparency in state reporting, which in turn helps to control budget expenditures and investments. The goal of these efforts is to improve economic indicators within the state budget system and to allocate public funds more efficiently in order to achieve the best results across all sectors of Kazakhstan’s economy. In addition, the adoption of blockchain technology can address various security threats and problems, such as phishing attacks, server hacking, and compromised accounts, by allowing users to reclaim control of their data. The use of blockchain, which offers a high level of security and privacy, has the potential to revolutionize industries that rely on trust. In the long term, it is expected that blockchain will become a widely accepted and integral part of society, similar to the internet. The digitalization of finance in Kazakhstan is necessary to simplify and automate accounting, financial monitoring, and various banking and tax operations. It also makes it possible to improve the transparency of financial reports and increase the efficiency of budget management. The digitalization of finance can also reduce the risks of errors in working with accounting documentation, simplify accounting, and improve cost control. With the use of digital technologies, the process of data collection, processing, and storage becomes more efficient, saving time and resources.</p>

12.	<p>Omirbayev, S., Mukhatayev, A., Biloshchytskyi, A., Toxanov, S., Faizullin, A., & Biloshchytska, S. (2022). STRUCTURAL MODEL OF THE SYSTEM OF DEVELOPMENT OF METHODOLOGICAL COMPETENCE OF IT-DISCIPLINE TEACHERS ON THE BASIS OF CONTINUING EDUCATION. <i>Scientific Journal of Astana IT University</i>, 12(12), 122–138. https://doi.org/10.37943/12TYUY5628</p>	<p>The article considers the creation of structural model for the system of development of methodological competence of IT-discipline teachers based on continuing education with the description of the structure of microservices subsystems. To implement the proposed conceptual model the paper proposes a software architecture based on the use of classical service-oriented design pattern "Model-View Separation" (separation of model objects from the graphical interface objects with the user) and provides for interaction with the database, the composition of its main packages is detailed. Logical and physical service-oriented models of basic classes of objects of subject area and auxiliary objects (services) have been developed. The article also proposes a relational database structure based on the use of metadata tables, directories, and operational data in a relational database management system environment. Methods and mechanisms for data protection and replication are proposed and justified, considering the specifics of system operation in higher education institutions. The article aims to develop insurgents and mechanisms of creation of information technology improvement of the system of higher education and creation and operation of integrated flexible software tools to support the mixed system of organization of educational process, as well as increasing the effectiveness of the introduction of a mixed system for the organization of the educational process on the basis of the use of the latest technical means of training and documentation, ensuring free access of students to teaching and methodological resources, content and criteria for the assessment of knowledge in disciplines and modules, data recording, and partial compensation for the increased workload of teachers and staff through the automation of assessment, registration and assessment processes. A task-oriented model for managing technical problems in the implementation of the information system for the development of teachers' methodological competence is also proposed, and a conceptual framework for managing these problems has been developed from the perspective of considering projects as a set of objects and subjects. Technical problems in projects are shown to be obstacles to moving in the right direction, created by random events, uncertainties, and changes. A mathematical model of the change in resistance value caused by technical problems has been developed and methods to counteract these problems have been proposed.</p>
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