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№	Статья и ссылка	Аннотация
1.	<p>Kabdiyev, A., &amp; Kabdiyev, A. (2023). PERFORMANCE COMPARISON OF NEURAL NETWORKS IN GRAVITATIONAL LENSING DETECTION. <i>Scientific Journal of Astana IT University</i>, 13(13), 5–15.  <a href="https://doi.org/10.37943/13PQRV7503">https://doi.org/10.37943/13PQRV7503</a></p>	<p>Abstract: A gravitational lens is a distribution of matter, such as dark matter halos, galaxies, or quasars, between a distant light source and an observer that can bend the light from the source as the light travels toward the observer. Nowadays, it is slightly complicated to identify gravitational lenses without powerful computing devices and groups of scientists working together. In addition, future surveys will have orders of magnitude more data and more lenses to find. With up-to-date algorithms such as neural networks, detecting and classifying them for a single human being will be possible. The neural networks described in this paper make the first steps in that direction. The primary purpose of this work was to develop three different neural networks and determine which one could detect gravitational lensing more quickly and precisely. For training, testing, and validation we used a dataset of 2000 images. Half of these images were downloaded from Bologna Lens Factory, a database of simulated gravitational lenses based on galaxies lensed by galaxies (i.e., no clusters and no quasars). We simulated the second half of the images using Python-based code to simulate mock strong lensed galaxies. We used Python-based code to mock strong lensing with different source parameters. Next, we built three types of artificial neural networks and compared their efficiency. Firstly, we developed a fully convolutional neural network (CNN) and a fully connected neural network (FCNN). The third neural network was a combination of these two approaches. In this algorithm, the FCNN layer replaced the last layer of CNN. Next, we compared the learning rates of these algorithms and applied all neural networks to validation images. As a result of the study, we determined which of the developed neural networks fit better for searching gravitational lenses.</p>
2.	<p>Dospanova, A., KUSDAVLETOV, S., &amp; Kalikova, A. (2023). AN EFFICIENT APPROACH FOR THE IMPLEMENTATION OF THE GOBANG GAME USING ARTIFICIAL INTELLIGENCE METHODS. <i>Scientific Journal of Astana IT University</i>, 13(13), 16–23.  <a href="https://doi.org/10.37943/13XCFG1746">https://doi.org/10.37943/13XCFG1746</a></p>	<p>Abstract: Gobang is one of the most ancient abstract strategy games for two players. The game is traditionally played on a board with black and white stones, where players take turns placing a colored stone on an empty intersection. The winner is the first player to form an unbroken chain of five stones, either horizontally, vertically, or diagonally. Although the rules of Gobang seem pretty straightforward, the game tree complexity is enormous since the board state is more intuitive than in other games. In this paper, we will implement an algorithm that will solve the Gobang game using artificial intelligence (AI) methods. The program will begin learning from scratch, then use self-play to produce training data, and eventually steadily build up its strength. The present work first focuses on the implementation of the supervised learning algorithm in the identification procedure in order to identify the position of the current fallen piece. This will be achieved by utilizing image processing and a convolutional neural network. Then a Gobang game procedure will be implemented using a game search algorithm, in which the state of the game is judged by means of a human-set function. After that, the function of judging the game state in the above game search algorithm will be changed to an artificial neural network (ANN) model, since it is convenient to train a model with a small dataset. Finally, the reinforcement learning algorithm will be applied to learn the artificial neural network model so that the playing level of the Gobang game program can be continuously improved.</p>
3.	<p>Mekebayev, N., Altybay, A., &amp; Darkenbayev, D. (2023). A GPU IMPLEMENTATION OF THE</p>	<p>Abstract: In this paper, we consider numerical simulation and GPU (graphics processing unit) computing for the two-dimensional non-linear tsunami equation, which is a fundamental equation of tsunami propagation in shallow water areas. Tsunamis are highly destructive natural disasters that have a significant impact on coastal regions. These events are typically caused by undersea earthquakes, volcanic eruptions, landslides, and possibly an asteroid</p>

	<p>TSUNAMI EQUATION. <i>Scientific Journal of Astana IT University</i>, 13(13), 24–31.  <a href="https://doi.org/10.37943/13SCQO3041">https://doi.org/10.37943/13SCQO3041</a></p>	<p>impact. To solve numerically, firstly we discretized these equations in a rectangular domain and then transformed the partial differential equations into semi-implicit finite difference schemes. The spatial and time derivatives are approximated by using the second-order centered differences following the Crank-Nicolson method and the calculation method is based on the Jacobi method; the computation is performed using the C++ programming language; and the visualization of numerical results is performed by Matlab 2021. The initial condition was given as a Gaussian, and the basin profile has been approximated by a hyperbolic tangent. To accelerate the sequential algorithm, a parallel computation algorithm is developed using CUDA (Compute Unified Device Architecture) technology. CUDA technology has long been used for the numerical solution of partial differential equations (PDEs). It uses the parallel computing capabilities of graphics processing units (GPUs) to speed up the PDE solution. By taking advantage of the GPU's massive parallelism, CUDA technology can significantly speed up PDE computations, making it an effective tool for scientific computing in a variety of fields. The performance of the parallel implementation is tested by comparing the computation time between the sequential (CPU) solver and CUDA implementations for various mesh sizes. The comparison shows that our parallel implementation gives significant acceleration in the implementation of CUDA.</p>
4.	<p>Tyulepberdinova, G., &amp; Myrzabek, B. (2023). APPLYING MACHINE LEARNING TO IDENTIFY COUNTERFEIT FOODS. <i>Scientific Journal of Astana IT University</i>, 13(13), 32–41.  <a href="https://doi.org/10.37943/13TFMT6695">https://doi.org/10.37943/13TFMT6695</a></p>	<p>Abstract: Currently, the shelves of shops and supermarkets are filled with food that people consume daily, with many products coming from abroad. However, are all these products useful for the human body, and do they meet the standards? In this article, we will talk about how to identify low-quality products using modern machine learning. Recognition and classification of images and text based on machine learning can be a key technology in the fight against low[1]quality food. Automatic image and text recognition and classification of product information enable end customers to identify counterfeit products accurately and quickly by comparing them to trained templates. However, it is clear that this does not apply to all food processing enterprises. In food production, low-quality and non-standard products are used to reduce the cost of the product. Manufacturers can change their products by replacing higher quality products with lower quality ones. They may use confusing terms on the label to mislead you. When buying and serving counterfeit products, consumers suffer in different ways. First, they may not be getting the nutrients they need, adulterated foods may not be safe for their health, and may also be an economic loss for consumers. We evaluate the technical feasibility of the components of this food fraud detection architecture using a real-world scenario, including machine learning models to distinguish multiple products from each other. It allows you to control the circulation of food products at the state level, thereby protecting the end consumer from purchasing low-quality and potentially dangerous goods. In this article, we used the MobileNetV2 model and multiclass classification and evaluated the model we received from different angles.</p>
5.	<p>Bissengaliyeva, D., Amanzholov, T., Rakhimkul, A., &amp; Yedilkhan, D. (2023). DETERMINATION OF THE RELIABILITY OF AIR POLLUTION MEASUREMENT DATA BASED ON VEHICULAR EMISSION RECOGNIZED AS CONCOMITANT IN ASTANA. <i>Scientific Journal of Astana IT University</i>, 13(13), 42–51.  <a href="https://doi.org/10.37943/13QOJG5081">https://doi.org/10.37943/13QOJG5081</a></p>	<p>Abstract: Air pollution is a primary global concern due to its adverse effects on human health and the environment. Accurate air pollution measurement is crucial for developing effective control strategies and evaluating their impact. In Astana, vehicular emissions are recognized as a significant contributor to air pollution. This study aims to determine the reliability of air pollution measurement data in Astana by examining the impact of vehicular emissions on air quality to establish the accuracy of air pollution measurement methods in the city. The study will use a combination of monitoring and modeling techniques to quantify the contribution of vehicular emissions to air pollution in Astana. The monitoring component will involve the deployment of air quality monitoring stations throughout the city to measure levels of pollutants such as particulate matter (PM). The modeling component will use air dispersion models to simulate the dispersal of pollutants from vehicular emissions and predict their concentration levels in different parts of the city. The results of this research will provide insights into the</p>

		<p>effectiveness of existing air pollution control strategies and may inform future efforts to improve air quality in Astana. Based on the collected data for a certain period, a comparative table is built describing the difference between the actual data from the collection points of air emission indicators. The article will likely interest researchers and policymakers concerned with air pollution and its effects on human health and the environment. The critical point of the article is that air quality is affected not only by transport but also by other emissions.</p>
6.	<p>Ziro, A., Gnatyuk, S., &amp; Toibayeva, S. (2023). INVESTIGATION OF THE METHOD OF EVALUATING THE EFFECTIVENESS OF THE INFORMATION SECURITY SYSTEM BASED ON FUZZY INFERENCE. <i>Scientific Journal of Astana IT University</i>, 13(13), 52–63.  <a href="https://doi.org/10.37943/13DZEV3953">https://doi.org/10.37943/13DZEV3953</a></p>	<p>Abstract: As organizations increasingly rely on digital technology to operate, protecting their information and data has become a critical concern. Information security systems are designed to safeguard digital assets against unauthorized access, use, disclosure, disruption, modification, or destruction. However, evaluating the effectiveness of an information security system can be challenging due to the complexity of the system and the diversity of threats it faces. In recent years, researchers have proposed using fuzzy inference to evaluate the effectiveness of information security systems. Fuzzy inference is a mathematical approach that can handle uncertain and imprecise information, making it well-suited for evaluating the effectiveness of information security systems. This research aims to develop a method for evaluating the effectiveness of an information security system based on fuzzy inference. The proposed method uses a set of performance indicators to measure the effectiveness of the system, such as the number of security incidents detected, the response time to security incidents, and the number of false positives and false negatives [1]. These indicators are then combined using fuzzy inference to generate an overall effectiveness score for the system. The proposed method will be evaluated using a real-world case study of an information security system deployed in an organization. The effectiveness score generated by the fuzzy inference method will be compared to the results obtained using traditional evaluation methods, such as the cost-benefit analysis or the return-on-investment analysis. The results of the study will demonstrate the effectiveness and usefulness of the proposed method for evaluating information security systems.</p>
7.	<p>Nam, D., &amp; Pak, A. (2023). OVERVIEW OF TRANSFORMER-BASED MODELS FOR MEDICAL IMAGE SEGMENTATION. <i>Scientific Journal of Astana IT University</i>, 13(13), 64–75.  <a href="https://doi.org/10.37943/13BKBF2003">https://doi.org/10.37943/13BKBF2003</a></p>	<p>Abstract: Premedical diagnostics is the process of examining survey results. Correct premedical diagnostics can improve the process of patient management and reduce the burden on the medical sector. Diagnostics of medical images such as computed tomography and X-ray are obligatory steps for further treatment. However, the shortage of clinicians causes delays in this step. We observed two state-of-the-art algorithms proposed for medical image segmentation: TransUnet and Swin-Unet. We conducted a theoretical comparison of algorithms in terms of the applicability of pre-hospital diagnostics according to quality and speed of training. The comparison is based on the original source of code provided by the authors of the original articles. We chose these two algorithms because they have similar U-form architecture, a high level of citation, and show competitive DICE scores on pictures of various human organs. Some architectural features were also important. Both models inherit key elements of U-net. TransUnet is a hybrid Transformer and CNN model. It consists of Transformer encoder and a convolutional decoder. Some additional computations are required in the bottleneck. Swin-Unet is a fully Transformer-based model. These architectural differences give rise to a difference in the number of trainable parameters. Generally, deeper architectures with a bigger number of parameters usually show better performance, however, according to our review, Swin-Unet has a smaller number of parameters and shows better DICE and Hausdorff Distance. It should be noted that the distribution between false positive and false negative predictions is important in medical image processing. It is crucial to avoid overloading the medical sector while also not missing any sick patients. Precision and recall can be used to evaluate the ratio of incorrect predictions. Therefore, we also observed the results of caries segmentation where precision and DICE were provided. In this specific case, TransUnet shows better DICE and recall values but worse precision.</p>

8.	<p>Kyzyrkanov, A., Atanov, S. A., Aljawarneh, S., Tursynova, N., Otarbay, Z., &amp; Khairoshva, K. (2023). METHOD OF COORDINATION OF MOTION OF SWARM ROBOTIC SYSTEMS. <i>Scientific Journal of Astana IT University</i>, 13(13), 76–85.  <a href="https://doi.org/10.37943/13FEUH2535">https://doi.org/10.37943/13FEUH2535</a></p>	<p>Abstract: Maintaining a specific geometric pattern is essential in various applications where groups of autonomous robots must follow a given path. Proper organization of the geometric pattern can lead to several benefits such as cost reduction, increased system reliability, and efficiency while providing a reconfigurable and flexible structure of the system. Military missions and traffic systems are examples where maintaining certain geometric patterns are widely used. However, little is known about how to develop an effective algorithm that guarantees collision avoidance and obstacle avoidance while maintaining the geometric pattern. This paper presents an algorithm for movement with a certain geometric structure of a group of autonomous mobile robots that maintains the required geometric pattern and ensures the avoidance of collisions and obstacles. The proposed algorithm is behavior-based and utilizes a set of rules that allow the robots to navigate around obstacles and avoid collisions. The algorithm's performance is demonstrated through simulations in a variety of scenarios with different numbers of robots and geometric patterns. The algorithm proposed in this paper provides an effective solution for controlling a group of autonomous mobile robots to maintain a certain geometric pattern. The proposed algorithm has the potential to be utilized in numerous applications where multiple robots must work together to achieve a common goal while maintaining a specific formation. The use of behavior-based approach and obstacle avoidance rules ensures that the robots avoid collisions and obstacles while maintaining the required pattern.</p>
9.	<p>Bekarystankyzy, A., &amp; Mamyrbayev, O. (2023). END-TO-END SPEECH RECOGNITION SYSTEMS FOR AGGLUTINATIVE LANGUAGES. <i>Scientific Journal of Astana IT University</i>, 13(13), 86–92.  <a href="https://doi.org/10.37943/13IMII7575">https://doi.org/10.37943/13IMII7575</a></p>	<p>Abstract: With the improvement of intelligent systems, speech recognition technologies are being widely integrated into various aspects of human life. Speech recognition is applied to smart assistants, smart home infrastructure, the call center applications of banks, information system components for impaired people, etc. But these facilities of information systems are available only for common languages, like English, Chinese, or Russian. For low-resource language, these opportunities for information technologies are still not implemented. Most modern speech recognition approaches are still not tested on agglutinative languages, especially for the languages of Turkic group like Kazakh, Tatar, and Turkish Languages. The HMM-GMM (Hidden Markov Models - Gaussian Mixture Models) model has been the most popular in the field of Automatic Speech Recognition (ASR) for a long time. Currently, neural networks are widely used in different fields of NLP, especially in automatic speech recognition. In an enormous number of works application of neural networks within different stages of automatic speech recognition makes the quality level of this systems much better. Integral speech recognition systems based on neural networks are investigated in the article. The paper proves that the Connectionist Temporal Classification (CTC) model works precisely for agglutinative languages. The author conducted an experiment with the LSHTM neural network using an encoder-decoder model, which is based on the attention-based models. The result of the experiment showed a Character Error Rate (CER) equal to 8.01% and a Word Error Rate (WER) equal to 17.91%. This result proves the possibility of getting a good ASR model without the use of the Language Model (LM).</p>
10.	<p>Ibraeva, Z., Bektemyssova, G., &amp; Ahmad, A. R. (2023). FUZZY MODEL FOR TIME SERIES FORECASTING. <i>Scientific Journal of Astana IT University</i>, 13(13), 93–102.  <a href="https://doi.org/10.37943/13EOTU7482">https://doi.org/10.37943/13EOTU7482</a></p>	<p>Abstract: In 2007, in Kazakhstan, there was a transition of TDM (Time Division Multiplexing) circuit-switched technologies to IP (Internet Protocol) packet technology, which created a modern infrastructure for the ICT (information communication technologies) sphere. The advent of the IoT (Internet of Things) concept has led to the growth of a functioning network at a faster rate. It is currently developing in the direction of a cognitive infocommunication network. Its evolutionary development is characterized by a change in the volume of transmitted information, types of its presentation, methods of transmission and storage, the number of sources and consumers, distribution among users, and requirements for timeliness and reliability (quality) [1]. Types of traffic and their structure are changing; therefore, data processing becomes more complicated. For this reason, the tasks of analyzing and predicting network traffic remain relevant. In this work, the prediction of the measured traffic on</p>

		<p>a real network is performed. The series under study shows the totality of packets transmitted over the backbone network for each second. Forecasting of a one-dimensional time series is carried out on the basis of fuzzy logic methods. This class of models is well suited for modeling nonlinear systems and time series forecasting. The use of fuzzy sets is based on the ability of fuzzy models to approximate functions, as well as on the readability of rules using linguistic variables. The results of the software algorithm of fuzzy inference models were obtained using the Python environment. Membership functions and predictive graphs were built, and their evaluation was carried out. The numerical values of the root mean square error (MSE) are calculated. As a result, it was found that the Cheng fuzzy prediction model has higher forecast accuracy than the Chen forecasting method.</p>
11.	<p>Bushuyev, S., Bushuyeva, N., Bushuieva, V., &amp; Bushuiev, D. (2023). THE ARCHITECTURE OF DYNAMIC INTEGRATED INTELLIGENCE MODEL FOR MANAGING INNOVATION PROJECTS. <i>Scientific Journal of Astana IT University</i>, 13(13), 103–116.  <a href="https://doi.org/10.37943/13ZXMG1447">https://doi.org/10.37943/13ZXMG1447</a></p>	<p>Abstract: Existing Intelligence Models for managing innovative projects and programs have been explored. The competency-based approach is considered the basis for building a Dynamic Integrated Intelligence Model for managing innovative projects and programs. The proposed architecture of two groups of competence at a high level and five groups of Competencies lower level of the Dynamic Integrated Intelligence Model for Managing Innovation Projects. The Dynamic Integrated Intelligence model has two groups of high levels – Fluid intelligence and Crystallized intelligence. The lower-level model is presented by seven groups of interrelated competencies: strategic, managerial, emotional, social, cognitive, business, and technical. Each group of competencies of the Dynamic Integrated Intelligence Model is defined. The Dynamic Integrated Intelligence Model (DIIM) is a framework that helps individuals and organizations develop and enhance their ability to adapt to change and uncertainty. It is based on the idea that intelligence is not a fixed trait but rather a dynamic set of skills and abilities that can be developed and improved over time. By developing and enhancing these four components of intelligence, individuals, and organizations can become more adaptable, innovative, and resilient in the face of change and uncertainty. The dynamic integrated intelligence model can be applied in an Agile environment to enhance the cognitive and social-emotional skills of Agile team members. Applying the dynamic integrated intelligence model in an Agile environment can lead to better teamwork, enhanced problem-solving abilities, and improved project outcomes. The organization competence-based IPMA Delta model was used to assess the project team’s competence level. As an example of the application, the Dynamic Integrated Intelligence Model to the implementation of the double degree project of the Kyiv National University of Civil Engineering and Architecture and the Dortmund University of Applied Sciences.</p>