

№	Статья и ссылка	Аннотация
1.	<p>Seksembayeva, M., Tashatov, N., Ovechkin, G., Satybaldina, D., & Seitkulov, Y. (2023). MODELING OF A DIGITAL COMMUNICATION SYSTEM WITH INTERFERENCE-RESISTANT CODING OVER DELAYED MULTIPATH CHANNELS FOR A FIXED WIRELESS ACCESS SYSTEM. <i>Scientific Journal of Astana IT University</i>, 14(14), 5–15. https://doi.org/10.37943/14IFNS2422</p>	<p>In this study, an analysis of the performance of a digital communication system was conducted to improve the efficiency of the communication channel. The system was de- signed and evaluated in the MatLab/Simulink environment, specifically for the transmission of binary data in a multipath channel with static fading. One of the main advantages of this system is its ability to provide high noise immunity, even in the presence of noise, interference, and signal delays. The performance of the system was investigated in terms of bit error rate (BER) over both an additive white Gaussian noise (AWGN) channel and a multipath Rayleigh fading channel. The study also considered the impact of inter-symbol interference (ISI) and explored different parameters for a static channel, resembling a wireless LAN system based on IEEE 802.11 (as defined by Rec ITU-R M.1225). This study uses a solution to suppress inter-symbol interference using cascading coding (convolutional turbo codes with Reed Solo- mon code), Fast Fourier Transform (FFT) and Inverse Fast Fourier Transform (IFFT), amplifiers at the transmitter side and normalizer at the receiver side, by regulating the amplification ratios of transmitter and receiver sides. Modeling of a digital communication system for a wide-band fixed wireless LAN system (for Indoor office and Outdoor to indoor systems) has been performed. The modeling outcomes show that the applied method provides a good per- formance improvement in channels with ISI with static fading. The application of cascading coding (turbo code together with RS code), amplifiers, and FFT on the transmitter side, and IFFT on the receiver side will eliminate the effects of inter-symbol interference on digital signals in a multipath channel with static fading (as defined by Rec. ITU-R M.1225 for internal and external transmission systems) for wireless fixed systems.</p> <p>Keywords: Rayleigh, Fast Fourier Transform, Inverse Fast Fourier Transform, Turbo Convolu- tional Codes, Reed-Solomon code, intersymbol interference</p>
2.	<p>Sagadatova, N., Talas, B., Nugumanova, A., & Zhakiyev, N. (2023). FORECASTING ELECTRICITY CONSUMPTION: CASE STUDY IN ASTANA. <i>Scientific Journal of Astana IT University</i>, 14(14), 16–25. https://doi.org/10.37943/14TRMF1662</p>	<p>This paper presents time series forecasting models Forecaster Autoreg and Neural Network for predicting electricity consumption in the city of Astana. Given the limited natural resources and the need to reduce the impact on the environment due to global climate change, energy efficiency remains an urgent problem requiring the search for scientifically sound and effective solutions. One of the ways to address this problem is the use of machine learning methods to predict electricity demand. In this study, a time series dataset was explored containing data on electricity consumption (measured in MW) in the city of Astana during the period from January 1, 2020 to December 31, 2020 in an hourly interval. These data were used to utilize a model that predicts the electricity demand for the next day with an accuracy of every hour. To improve the accuracy of forecasting, additional factors such as air temperature and wind speed were included. This is since Astana experiences a sharply continental climate and high windiness. Including these factors allows for accounting for their influence on the electricity demand and thus achieving more accurate forecasting. A neural network model was utilized for this purpose, as it can uncover complex dependencies and patterns in the data, thereby aiding in achieving more precise predictions of electricity consumption. The accuracy and reliability of forecasts were evaluated by error indicators such as Average Absolute Error (MAE) and Average Absolute Percentage Error (MAPE), and the results showed that the models can provide accurate forecasts with low errors.</p> <p>Keywords: Machine learning, time series, prediction, electricity, consumption</p>
3.	<p>Burbekova, S., & Zhussipkaliyeva, S. (2023). USING IT TOOLS IN SOCIOLOGICAL SURVEYS FOR DETERMINING THE SOCIAL PROFILE OF ASTANA IT UNIVERSITY STUDENTS. <i>Scientific Journal of Astana IT University</i>, 14(14), 26–41. https://doi.org/10.37943/14EOIM1961</p>	<p>The article gives an overview of Astana IT University's (AITU) experience in using IT tools in sociological study to determine the social profile of an AITU student based on the data of sociological surveys. The purpose of the study is aimed at summarizing the experience how IT tools can be used in gathering and processing data and survey result analysis. In this article the features of various software and hardware tools, the process of applying information technologies at different stages of sociological research that affect the effectiveness of sociological research are discussed. The aim of the study is to determine the effectiveness of various software (from word processors to statistical packages) and hardware (from cell phones to modern computers) tools at different stages of conducting a sociological survey.</p>

		<p>The most common problems the sociologist may run into when looking for a survey tool are technical, design, legal, and expertise one as well as problems with length, survey fatigue and interpreting respondents' mood. It is highly likely in the case of long, confusing, or complicated surveys the questions can be skipped or responded mindlessly by respondents and be resulting in confusing results and inaccurate responses. Long surveys more than 10-15 minutes can cause respondents mind fatigue which can lead and result the dishonest responses and survey dropout. The respondents can be tired with especially open-ended questions which require careful and deep thinking. The problem of selecting adaptive tools for conducting sociological research for obtaining the most reliable and high-quality information lies in the lack of a universal IT tool for implementing sociological research at its all stages.</p> <p>The model of the university efficiency promotion for sustainable development is presented to compare the progress of university efficiency in learner recruiting, hiring of local and international staff, the number of staff participated in the program of professional development, the number of laboratories and IT technologies, the range of national and international partners, etc. Stages of a Data-driven decision-making approach in university efficiency promotion are presented in detail.</p> <p>Keywords: IT tools, sociological study, sociological survey, social activity, youth groups, educational services, social life, social environment.</p>
4.	<p>Assanova, N., Khaimuldin, A., Khaimuldin, N., Alshynov, S., & Mukatayev, T. (2023). REALISATION OF MPC ALGORITHM FOR QUANSER QUBE-SERVO. <i>Scientific Journal of Astana IT University</i>, 14(14), 42–56. https://doi.org/10.37943/14EIYP9373</p>	<p>This paper offers an in-depth look into the design and implementation of a Model Predictive Control (MPC) algorithm for the QUANSER QUBE-SERVO system. The QUBE-SERVO is a sophisticated laboratory experimental setup consisting of a servo motor, an encoder, and a rotary module. This combination provides a robust platform for investigating and testing various control strategies. In particular, the central focus of this study is the usage of the MPC algorithm for controlling the position of the QUBE-SERVO's rotary disc load module.</p> <p>The MPC algorithm plays a pivotal role in this application by predicting the future behaviors of the system, and controlling the system by minimizing an objective function over a defined finite horizon. This makes it a versatile and effective tool for controlling complex systems.</p> <p>One of the key challenges in practical control applications is maintaining system stability in the presence of disturbances and uncertainties. To this end, we propose a MPC algorithm designed specifically to stabilize the QUBE-SERVO under such conditions. The functionality of this algorithm is not limited to the QUBE-SERVO system alone, and can be extended to other control systems exhibiting similar characteristics.</p> <p>The effectiveness of the proposed MPC algorithm is rigorously tested through simulation studies. These studies involve subjecting the QUBE-SERVO to various reference signals and disturbances. The results of the simulations provide strong evidence of the algorithm's capability to effectively track reference signals, while also rejecting disturbances and uncertainties, thereby corroborating its efficacy for the QUBE-SERVO application.</p> <p>Moreover, the original MPC algorithm was enhanced to improve its performance for trajectory tracking tasks. We also discuss the integration of the MPC algorithm within the MatLAB and LabVIEW programming environments, which served as the base platforms for designing and running the simulations in this project.</p> <p>This paper, therefore, presents a comprehensive and practical approach for the successful implementation of the MPC algorithm in the QUANSER QUBE-SERVO system, and demonstrates its potential for wider application in similar control systems.</p> <p>Keywords: Model-Based Predictive Control, MPC, trajectory tracking, Dual-mode MPC, receding horizon control, Hessian Matrix, Lyapunov function, simulation, trajectory vector, inverted pendulum, state-feedback controller</p>
5.	<p>Zunimova, G., Soltan, G., Likhacheuski, D., & Issayeva, N. (2023). INFORMATION-LOGICAL MODEL OF EDUCATION OPTIMIZATION IN REMOTE MODE. <i>Scientific Journal of Astana IT</i></p>	<p>The educational optimization process is widely researched in the theoretical aspect. Analyzing existing sources made it possible to highlight the research issues: the need to create an optimizing distance studying model, in which work with weaker students becomes possible both within the educational process and in individual or group independent work. The study aims to develop an information-logical model for optimizing distance</p>

	<p>University, 14(14), https://doi.org/10.37943/14ZEXL9869</p>	<p>57–70.</p> <p>studying. This model should provide for the learning process organization in such a way as to strengthen the weaknesses of students, reveal their potential and focus on the comprehensive development of knowledge and skills. The task formalization is carried out using the Hungarian algorithm and Boolean variables. The main work limitation is the operation with integers. Discreteness manifests itself already at the modelling stages in many problems, for example, when working with Boolean variables. An example with the most straightforward information model construction using the logical functions "true/false" with the transition to a chain of matrices is given. It demonstrates the studying optimization algorithm and presents an expanded information-logical model. The presented model was preliminary tested in one of the academic groups of the S. Seifullin Kazakh Agro Technical Research University. Students' knowledge inspections were carried out at the approbation beginning. Then a student group working on a student project was divided into subgroups according to the algorithm. The knowledge inspection showed an 11.3% improvement in results at the work's end. Further research on this topic may consist of expanding the presented model's capabilities and developing appropriate modules for knowledge control and algorithmization of related tasks.</p> <p>Keywords: knowledge management technology; integers set; Hungarian algorithm; Boolean variable; discreteness; logical function; educational process optimization model.</p>
6.	<p>Mussiraliyeva, S., Bolatbek, M., Zhumakhanova, A., Medetbek, Z., & Sagynay, M. (2023). COMPARATIVE ANALYSIS OF MACHINE LEARNING ALGORITHMS TO IDENTIFY EXTREMIST TEXTS IN THE KAZAKH LANGUAGE. <i>Scientific Journal of Astana IT University</i>, 14(14), 71–90. https://doi.org/10.37943/14DKRN4681</p>	<p>The article explores various models and methods employed in classifying text content with the aim of identifying destructive information within social networks. The study focuses on utilizing machine learning techniques, such as support vector machines, naive Bayes classifiers, random tree methods, decision tree, k-Nearest Neighbors algorithm, logistic regression, gradient boosting to identify extremist texts. The research findings showcase the effectiveness of these methodologies in the identification process.</p> <p>The article also offers an overview of existing research, methodologies, and software products in the analysis of extremist texts, emphasizing the importance of case-based learning, deductive learning models, and automated data collection and analysis. Additionally, the article provides an overview of existing research, methods, and software products within the field of analyzing extremist texts. It highlights the significance of case-based learning and the use of deductive learning models, as well as automated data collection and analysis techniques. These approaches contribute to the overall understanding and detection of extremist content.</p> <p>The article further discusses the relevance and future prospects of the presented research. It emphasizes the need to expand the corpus of documents studied, enabling a more comprehensive analysis of texts, including those in photo, audio, and video formats. The development of complex models for recognizing hidden extremist propaganda is also identified as a key direction for future work.</p> <p>By addressing these areas of focus, the research presented in the article aims to advance the field of identifying and combating extremist content within social networks. The incorporation of advanced techniques and technologies is crucial to effectively detect and address the presence of such content in various forms and formats.</p> <p>Keywords: machine learning model, classification, extremist text.</p>
7.	<p>Omarov, B., & Bazarkulova, I. (2023). A DEEP LEARNING MODEL FOR PNEUMONIA DETECTION FROM X-RAY IMAGES. <i>Scientific Journal of Astana IT University</i>, 14(14), 91–103. https://doi.org/10.37943/14ASWX8861</p>	<p>The World Health Organization estimates that more than four million deaths occur annually due to pneumonia and other diseases associated with air pollution, and the latest COVID-19 virus has dramatically increased the percentage of pneumonia cases. Over 150 million people get infected with pneumonia on an annual basis, especially children under 5 years old. There's also a global shortage of radiologists in both developing and developed countries. Over 2/3 of people on earth do not have access to radiologists. According to the Association of American Medical Colleges, the U.S. is projected to have a shortage of 17,000 to 42,000 radiologists by 2033. Currently, the development of artificial intelligence and machine learning technologies, as well as the accumulation of large volumes of medical images, make it possible to create automated systems for analyzing medical images. The article presents a simple sequential model based on deep learning methods (convolutional neural networks) that helps detect pneumonia. X-ray images of the Women's and Children's Medical Center in Guangzhou were used for the model. The development of the pneumonia diagnostic program was carried out in Python. Training the neural network took 26 minutes and 12 epochs. The results obtained in the test data are:</p>

		<p>recall: 96%; precision: 92%; accuracy: 92%; and f1: 94% for pneumonia cases. This is no less than the result proposed in many popular works. The model significantly reduces the burden on radiologists, helps them make decisions and save time, allows them to evaluate the quality of their work, and reduces the likelihood of medical errors.</p> <p>Keywords: neural network, deep learning, pneumonia, medicine, X-ray images</p>
8.	<p>Bushuyev, S., Bushuyeva, N., Murzabekova, S., & Khussainova, M. (2023). INNOVATIVE DEVELOPMENT OF EDUCATIONAL SYSTEMS IN THE BANI ENVIRONMENT. <i>Scientific Journal of Astana IT University</i>, 14(14), 104–115. https://doi.org/10.37943/14YNSZ2227</p>	<p>The rapid advancement of technology and the ever-changing global landscape have presented unique challenges and opportunities for educational systems worldwide. The introduction of the BANI (Brittle, Anxious, Nonlinear, Incomprehensible) framework as a response to the volatile and unpredictable nature of contemporary environments has further emphasized the need for innovative approaches to education. This paper explores the innovative development of educational systems within the BANI environment, focusing on the integration of emerging technologies, pedagogical strategies, and learner-centred approaches. The paper begins by providing a comprehensive overview of the BANI framework and its implications for educational systems. It highlights the key characteristics of the BANI environment, including its inherent brittleness, anxiety-inducing nature, nonlinearity, and incomprehensibility. The formal model of interaction between projects and the BANI environment can assess innovation project value for future optimisation. Furthermore, it elucidates the potential consequences of neglecting to adapt educational systems to these volatile conditions, emphasizing the importance of innovation in education. Drawing upon recent research and theoretical frameworks, the paper explores various innovative approaches to educational development in the BANI environment. It discusses the integration of emerging technologies, such as artificial intelligence, virtual reality, and augmented reality, into teaching and learning processes. Moreover, it investigates the implementation of learner-centred development strategies that foster critical thinking, problem-solving skills, creativity, and adaptability. The paper addresses the role of educators and institutions in supporting innovative development within the BANI environment. It emphasizes the need for professional development programs that empower educators to leverage emerging technologies and implement learner-centred approaches effectively. Key management of innovative project principles in the BANI environment is defined in the paper. Additionally, it highlights the significance of collaboration among educational stakeholders, including policymakers, administrators, teachers, students, and parents, to foster an ecosystem that nurtures innovation in education. The paper discusses potential challenges and ethical considerations associated with the innovative development of educational systems in the BANI environment. It explores issues related to equity, privacy, data security, and the digital divide, emphasizing the importance of responsible and inclusive approaches to educational innovation. Contributes to the existing literature by providing insights and recommendations for the innovative development of educational systems within the BANI environment. By embracing emerging technologies, learner-centred pedagogies, and collaborative efforts, educational systems can better prepare learners to thrive in uncertain and rapidly changing contexts.</p> <p>Keywords: innovation, development trends, education establishments, VUCA and BANI environment, the model for interaction projects and BANI, the algorithm for managing projects</p>
9.	<p>Amirgaliyev, Y., Merembayev, T., & Omarova, P. (2023). MATHEMATICAL MODELING OF WATER MOVEMENT DURING A DAM BREAK USING THE VOF METHOD. <i>Scientific Journal of Astana IT University</i>, 14(14), 116–126. https://doi.org/10.37943/14NEBW7927</p>	<p>River valleys in mountainous areas are often subject to heavy rains and melting glaciers, resulting in the risk of mudflows and the destruction of hydraulic protective structures. In order to minimize the potential risk and negative outcomes of a disaster, both on an individual and environmental scale, it is crucial to possess essential information. This includes understanding the timing, location, and extent of flooding, as well as comprehending the force of water flow impact on protective structures. In the research, the numerical process of the movement of the water flow caused by the breakthrough of the dam is investigated. A two-dimensional numerical model of water flow during a dam break was constructed using the VOF method to describe the described process. With the help of the VOF method, the movement of the water surface is captured, while maintaining the law of conservation of mass. The mathematical model consists of Reynolds-averaged incompressible Navier-Stokes equations and includes the interphase equation. The turbulent k-e model was used to close the system of equations. The numerical algorithm used is PISO (Pressure-Implicit with Splitting of Operators). The obtained numerical results agree with the experimental data, indicating the developed algorithm's reliability</p>

		<p>and accuracy. The results are presented as comparative graphs and images showing the contour of the free surface movement along the experimental reservoir. A numerical model that has been tested in this way can provide significant support in preventing the devastating consequences of a dam break and providing timely assistance during the evacuation of the population.</p> <p>Keywords: dam break, VOF method, PISO algorithm, numerical simulation</p>
10.	<p>Absadyk, A., & Absattar, Y. (2023). USING A VIRTUAL TWIN OF A BUILDING TO ENSURE SECURITY IN EDUCATIONAL INSTITUTIONS. <i>Scientific Journal of Astana IT University</i>, 14(14), 127–140. https://doi.org/10.37943/14LUQF6985</p>	<p>This research paper delves into the exploration of computer vision technology and digital twins as a means to enhance security measures in educational institutions. The study primarily focuses on the creation of a virtual replica of the first floor of a school and the integration of a person detection algorithm with the existing surveillance cameras. By leveraging the capabilities of the digital twin and real-time monitoring, comprehensive surveillance of the premises becomes feasible, resulting in simplified security operations. The paper sheds light on the significant potential of training neural networks for specific security tasks, such as the identification of weapons or the detection of anomalies in human behavior. These trained neural networks can be seamlessly integrated into the digital twin, thus ensuring public safety within the educational environment. The findings of this study provide substantial evidence for the effectiveness of computer vision technology and digital twins in bolstering security measures. The ability to create a virtual representation of the school's first floor enables comprehensive monitoring and surveillance, aiding in the prevention and prompt response to security incidents. The integration of person detection algorithms further enhances the system's capabilities by automatically identifying and tracking individuals within the premises. Additionally, the deployment of neural networks for specialized security tasks adds an extra layer of protection, enabling the identification of potential threats and the detection of abnormal behavior patterns. By employing computer vision technology and digital twins, educational institutions can establish an advanced security infrastructure that optimizes monitoring, enhances situational awareness, and ensures a safer environment for students, staff, and visitors. The research presented in this paper highlights the tremendous potential and practical implications of these technologies in the realm of educational security.</p> <p>Keywords: computer vision, digital twins, security, education institutions, machine learning, modeling</p>