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**Выпуск № 16**

| № | Статья и ссылка | Аннотация |
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| 1. | Zunimova, G., Soltan, G., Likhacheuski, D., Ismailova, A., & Issayeva, N. (2023). DEVELOPMENT OF A MODEL FOR IMPLEMENTING A CASE METHOD FOR INTERACTIVE STUDY PROCESS MANAGEMENT MONITORING. *Scientific Journal of Astana IT University*, *16*(16). https://doi.org/10.37943/16TOVY6654 | The importance of this research topic lies in the need to gather, store, analyze and disseminate accurate information on the management status of educational institutions to guarantee the provision of quality educational services. This is particularly crucial in the current trend towards digitalizing educational work and utilizing the internet to facilitate practical management tasks. The study aims to construct a case method model to supervise educational process management outcomes. For that purpose, the study scrutinises the implementation methodologies of existing case models to monitor and analyse the situation without human intervention. Also, the investigation entails creating an implementation algorithm and a simulation model of an interactive case method to monitor educational activities. The formalized logical-semantic apparatus is used to address the research problems. The algorithm development and simulation modeling enabled correlation of the obtained answer with the assigned task, automating the results output. Generating answers in the case method involves considering rules based on the base word, answer keywords, and constraints (true/false). These elements are part of the thesaurus specific to the survey domain and are included in the test's base vocabulary. To test an answer against a question, each inductive step is viewed through a logical formula. Logical statements such as conjunction, disjunction, logical negation, implication, and equivalence are represented by formulas. This method enables the evaluation of the respondent's answer based on the nodes within the statement tree integrated into the test. The progression from the initial word to the node-connection generates an automated assessment of individual educational process management standards. This study enables the enhancement of automated monitoring capabilities for the University's educational process results. The research suggests the potential for developing models and algorithms to form question sets and enable individualized assessments based on the respondent's performance. As a consequence, the devised algorithm and simulation model for the interactive case approach are showcased. During the testing, the key words and example words were compared with the responses of the participants and specific results were obtained. Additional case vocabulary terms need to be added to address the limitations encountered during the model testing and the testing period. **Keywords:** keyword, base dictionary, reference word, induction step, tree model |
| 2. | Kabdygali, S., Omirgaliyev, R., Tursynbayev, T., Kayisli, K., & Zhakiyev, N. (2023). DEEP RECURRENT NEURAL NETWORKS IN ENERGY DEMAND FORECASTING: A CASE STUDY OF KAZAKHSTAN'S ELECTRICAL CONSUMPTION. Scientific Journal of Astana IT University, 16(16). https://doi.org/10.37943/16YIKA8050 | The critical transformation of the energy sector demands innovative approaches to ensure the reliability and efficiency of energy systems. In this pursuit, this study delved into the potential of Deep Recurrent Neural Networks (DRNNs) for forecasting energy demand, using a comprehensive dataset detailing Kazakhstan's electrical consumption over a span of two years. Traditional statistical models have historically played a role in energy demand prediction, but the growing intricacy of the energy landscape calls for more advanced solutions. The paper presented a comparison of the DRNN with other traditional and machine learning models and highlighted the superior performance of DRNNs, especially in capturing complex temporal relationships. The energy sector is confronting unprecedented challenges due to population growth and the integration of diverse energy sources, leading to increased demand and system strains. Accurate energy demand prediction is essential for system reliability. Traditional models, though widely used, often overlook intricate variables like weather patterns and temporal factors. Through rigorous methodology, encompassing exploratory data analysis, feature engineering, and hyperparameter optimization, an optimized DRNN model was developed. The results demonstrated the DRNN's exceptional capability in processing complex time-series data, as evidenced by its attainment of an R-squared value of 83.6%. Additionally, it achieved Mean Absolute Errors and Root |

| | | Mean Squared Errors of less than 2%. However, there were noticeable deviations in some predictions, suggesting areas for refinement. This research underscores the significance of DRNNs in energy demand prediction, highlighting their advantages over traditional models while also noting the need for ongoing optimization. The findings underscore DRNN's promise as a robust forecasting tool, pivotal for the energy sector's future resilience and efficiency.<br><br>**Keywords:**<br>recurrent neural networks, Kazakhstan, electrical consumption, forecasting system |
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| 3. | Tokhmetov, A., Lee, V., & Tanchenko, L. (2023). DEVELOPMENT OF DAG BLOCKCHAIN MODEL. *Scientific Journal of Astana IT University*, *16*(16). https://doi.org/10.37943/16CGOY7609 | In this study the authors present an innovative approach to resolving scalability and efficiency challenges in blockchain technology through the integration of Directed Acyclic Graphs (DAGs). This approach helps to overcome the limitations of traditional blockchain systems, particularly in transaction processing. The classic blockchain has some problems as slow transaction processing and poor scalability. The authors offer Directed Acyclic Graph (DAG) as a scalable and energy-efficient alternative. The paper outlines the development of a DAG-based blockchain model, utilizing Python and Flask alongside the Ed25519 cryptographic curve. It conducts a comparative analysis of DAG with traditional consensus mechanisms like Proof of Work and Proof of Stake, underscoring the efficiency and security benefits of employment of DAG. The research methodology includes an extensive literature review and the construction of a practical model to demonstrate DAG's applicability in blockchain networks. Particularly notable is the exploration of DAG's potential in Internet of Things (IoT) ecosystems, addressing critical issues such as energy inefficiency and network communication challenges in existing consensus algorithms. The authors calculated the performance of the model and compared it with similar models on several evaluation criteria. The simulation results of our proposed model show an improvement in performance and security by minimizing end-to-end delay, time cost, energy consumption, and throughput. The model eliminates the limitations of classic blockchain systems, such as high latency and low scalability. It structures transactions and blocks as a DAG, which provides fast validation and high scalability without compromising security. The research demonstrates the transformative implications of DAG for advancing blockchain technology.<br><br>**Keywords:**<br>Blockchain Scalability, Blockchain Modeling, Directed Acyclic Graph, Consensus Mechanisms, Secure Data Management |
| 4. | Yemelyanova, M., & Smailova, S. (2023). APPLICATION OF MACHINE LEARNING FOR RECOGNIZING SURFACE WELDING DEFECTS IN VIDEO SEQUENCES. Scientific Journal of Astana IT University, 16(16). https://doi.org/10.37943/16RYGE2979 | The paper offers a solution to the problem of detecting and recognizing surface defects in welded joints that appear during tungsten inert gas welding of metal edges. This problem belongs to the machine vision. Welding of stainless-steel edges is carried out automatically on the pipe production line. Therefore, frames of video sequences are investigated. Images of some welding defects are shown in the paper. An algorithm proposed by the authors is used to detect welding defects in the video sequence frames, the efficiency of which has been confirmed experimentally. The problem solution of welding defects recognition is based on the use of traditional machine learning methods: support vector machine and artificial neural network. To build classification models, a labeled dataset containing automatically extracted texture features from the areas of welding defects detected in the video sequences was created. An analysis was performed to identify the strength of the correlation of texture features between each other and the dependent variable in the dataset for dimensionality reduction of the feature vector. The models were trained and tested on datasets with different numbers of features. The quality of the classification models was evaluated based on the accuracy metric values. The best results were achieved by the classifier built using the support vector machine with a chi-square kernel on a training sample with two features. The build models allow automatic recognition of such welding defects as lack of fusion and metal oxidation. The computational experiments with real video sequences obtained with a digital camera confirmed the possibility of using the proposed solution |

| | | for recognizing surface welding defects in the process of manufacturing stainless steel pipes.<br><br>**Keywords:**<br>weld defects, classification, feature extraction, SVM, ANN |
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| 5. | Nurgaliyev, K., Tokhmetov, A., & Tanchenko, L. (2023). AN ANALYSIS OF THE HETEROGENEOUS IOT DEVICE NETWORK INTERACTION IN A CYBER-PHYSICAL SYSTEM. *Scientific Journal of Astana IT University, 16*(16). https://doi.org/10.37943/16ENNA6243 | The article is devoted to the study of existing technologies regarding Internet of Things (IoT) device interaction in a heterogeneous network. Since each smart home appliance can be controlled by a customer who aims to find a cost-effective and easy-to-connect product for their own connected home, there are certain functional limitations for devices from distinct manufacturers that may decrease the intention to merge them all into a single network. A variety of proprietary protocols and communication standards embedded by vendors make their products unable to interact with other vendor devices if the connection standard used is not identical. Also, an IoT product design refers to its own functionality, mainly excluding the possibility of integration into other existing infrastructure. As IoT equipment emerges on the market, the complexity of its connection to a heterogeneous network corresponds to the firmware and the standard unification according to modern demands. It means that potential users might face the necessity of overcoming these issues to achieve high performance in terms of network interoperability. In general, an IoT gateway operating as a middleware might have the potential to enable a network with distinct communication models to operate without failure or data loss. This task requires the received data to be converted into the format in which the data is intended. This paper includes a comparative analysis of existing IoT device interaction standards, connection protocols, and data transfer technologies, evaluating their features for an effective adoption of the proposed network architecture, which can be used to improve the interoperability of heterogeneous IoT devices.<br><br>**Keywords:**<br>internet of things, heterogeneous , network interaction , cyber-physical system , messaging protocols , data transferring standards |
| 6. | Bakytkereiuly, B., Biloshchytskyi, A., & Abzhanova, D. (2023). DEVELOPMENT OF A METHOD FOR COMBINING DATA IN ORDER TO PREVENT DUPLICATION OF RECORDS IN THE DATABASE OF THE INFORMATION SYSTEM FOR THE DEVELOPMENT OF METHODOLOGICAL COMPETENCE OF TEACHERS OF IT DISCIPLINES. Scientific Journal of Astana IT University, 16(16). https://doi.org/10.37943/16BTVH4487 | The article assesses the outcomes of digitization on higher education in Kazakhstan. Given current trends, there is a need to establish a dedicated focus on the ongoing professional growth of educators. A crucial measure in this regard involves shifting from disjointed learning approaches to implementing a cohesive system for the continuous professional development of teaching staff.<br><br>It is crucial to highlight that in accordance with the Development Concept of Higher Education and Science in the Republic of Kazakhstan the duration of an individual's active economic engagement has extended from 35-40 years to 50-60 years. This shift underscores the growing necessity for continuous learning throughout one's life and underscores the significance of non-formal education.<br><br>The educator plays a pivotal role in influencing the educational landscape and significantly contributes to the outcomes of socio-economic changes in Kazakhstan. In the current era of socio-economic and digital transformations the teacher's proficiency has emerged as a crucial element that directly influences the quality of students' education.<br><br>The Ministry of Digital Development, Innovation, and Aerospace Industry of Kazakhstan has reported a yearly requirement for approximately 30,000 additional IT professionals. Consequently, the focus is on enhancing the methodological expertise of IT discipline educators, recognizing their pivotal role in influencing the quality of education and student achievements. Information systems aimed at enhancing this competence are emerging as a crucial element in elevating the overall effectiveness of education.<br><br>The article presents the rationale for the need to create a single space for additional professional education of teachers of IT disciplines. It is considered as an effective mechanism for the implementation of the state educational policy and innovation strategy in the field of education. The aim of this initiative is to |

| | | ensure that the human resource is ready to successfully achieve the country's strategic goals in the context of digitalization processes.

The article focuses on the development of a structural model of an information system aimed at improving the methodological competence of teachers of IT disciplines using the principles of continuing education. Based on a conceptual model with microservices subsystems, this methodology represents a comprehensive approach to the development of the competence of teachers of IT disciplines, integrating technological and methodological aspects.

The development of a method for combining data in order to prevent duplication of records in the database of the information system is also considered. Methods of estimating the degree of similarity based on the types of attributes are proposed.

The article extensively delineates the models, architecture, and components constituting the software implementation of the envisioned information system. It scrutinizes the accessibility of the employed data sources and formulates conclusions regarding the future potential for advancing the subject matter.

**Keywords:**
digitalization, methodological competence, information system, professional development, IT education, structural models of information systems, unification method, databases |
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| 7. | Kalimoldayev, M. ., & Shermantayeva, Z. (2023). MODEL DEVELOPMENT AND CALCULATIONS FOR 35/10 KV ELECTRICAL SUBSTATIONS IN TURKESTAN REGION USING RASTRWIN3 PROGRAM. Scientific Journal of Astana IT University, 16(16). https://doi.org/10.37943/16DGMZ9449 | The city of Turkestan, Kazakhstan is experiencing growth leading to an increased need for electricity. In order to meet this demand the city is upgrading its infrastructure specifically focusing on improving its 35/10 kV substations. Engineers are utilizing calculation software like RastrWin3 to design and analyze these substations. This software offers capabilities, for modeling substations. Using RastrWin3 the ability to import data from sources like drawings AutoCad, GIS maps and other relevant resources. This imported data serves as the foundation for constructing the substation model. Engineers can easily incorporate components such as transformers, feeders, circuit breakers and busbars into the model. Each element of the model can be assigned parameters like voltage, current, resistance and power to represent real world conditions. Additionally, load profiles can be generated for analysis purposes to capture fluctuations, in energy demands throughout the day and year. Numerical calculation software plays a role, in the design and analysis of substations. It provides engineers with a toolset to achieve the following objectives: 1. Construct models of substations. 2. Simulate the behavior of substations under operational conditions. 3. Resolve issues that may arise in electrical substations. 4. Enhance the design and optimization of substations. One notable software in this domain is RastrWin3 which offers capabilities for calculations and simulations related to electric substations. Engineers can utilize this program to evaluate power systems, in emergency and transient modes. Accounting for various factors such as non-linearity, power and reactive power losses, as well, as the influence of capacitive coupling. Various types of loads such, as consumer loads, substation auxiliary loads and loads from protection and automation devices are considered in the modeling process. The software RastrWin3 is utilized to design and analyze 35/10 kV substations, in Turkestan. This software assists in enhancing the precision of substation design reducing the time needed for designing and developing substations improving substation efficiency and lowering maintenance costs.

**Keywords:**
numerical calculation , energy indicators , distribution of electrical networks , RastrWin3 |
| 8. | Biloshchytskyi, A., Kuchansky, O. ., Mukhatayev, A. ., Biloshchytska , S. ., Andrashko, Y. ., Toxanov, S. ., & Faizullin, A. . (2023). CLUSTERING OF | The article describes the solution to the problem of clustering scientists' publications, taking into account the finding of similarities in the annotations and texts of these publications based on n-grams of analysis and cross-references, as well as the |

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| SCIENTISTS' PUBLICATIONS, CONSIDERING FINDING SIMILARITIES IN ABSTRACTS AND TEXTS OF PUBLICATIONS BASED ON N-GRAM ANALYSIS AND IDENTIFYING POTENTIAL PROJECT GROUPS. *Scientific Journal of Astana IT University*, *16*(16). https://doi.org/10.37943/16AADE3851 | tasks of identifying potential project groups for the implementation of research and educational projects based on the results of clustering. The selection of scientific partners in the world practice is done without a comprehensive assessment of their activities. Most of the well-known indexes for evaluating the research activities of scientists need to consider information about citations fully. The methods developed in the study for evaluating the scientific activities of scientists and universities, as well as methods for selecting scientific partners for the implementation of educational and scientific projects on a scientific basis, allow us to organize the influential work of universities qualitatively. In the article, a probabilistic thematic model is constructed that allows the clustering of scientists' publications in scientific fields, considering the citation network, which is an important step in solving the problem of identifying subject scientific spaces. As a result of constructing the model, the problem of increasing instability of clustering of the citation graph due to a decrease in the number of clusters has been solved. The main objective of this work is to address the challenge of selecting suitable partners for collaboration in scientific and educational projects. To achieve this, a method for choosing project executors has been developed, which employs fuzzy logical inference to harmonize expert opinions regarding candidate requirements. This approach helps facilitate the multi-criteria selection of potential partners for scientific and educational projects. In addition to the method, various software modules have been created as part of this research. These modules are designed for the automated collection of information on the publications and citation records of scientists through international scientometric databases. They also encompass a visualization module and a user interface that aids in evaluating the scientific activities of university teaching staff. Choosing partners for grants or strategic collaborations, especially in the context of a globalized and highly mobile scientific community, remains a pertinent issue. The approach described in this research involves clustering the scientific publications of potential project partners. Furthermore, it incorporates conducting comparative citation analyses of these publications and establishing proximity based on n-gram annotation analysis. These methods provide a scientific basis for making informed choices when selecting partners, which is crucial for initiating and advancing research projects. Consequently, the selection of partners for forming research project teams is an immediate and pressing task.<br><br>**Keywords:**<br>scientometry, search for scientific partners , scientific collaboration , clustering of publications , n-gram analysis , determination of research directions |