Project name: IRN No.AP09259657 "Research and development of an automated proctoring system for monitoring students' knowledge in a distance learning environment".

Relevance: Today, the defining task of universities is to train specialists who are able to constantly improve their knowledge and skills, who are able to quickly navigate the growing flow of information and make decisions in non-standard situations. The possibility of obtaining mass, affordable education opens up with the implementation of distance learning. However, shortcomings in the systematic organization of the distance learning process, the lack of clear regulated control procedures often lead to a decrease in the quality of student training, and cause a negative attitude towards distance education in general. This problem dictates the need for each university implementing distance learning to solve a set of tasks to create a system for evaluating the quality of education.

In this regard, the issue of research of innovative technologies in the organization of the educational process, namely, the control of students' knowledge based on information and communication technologies in the context of distance learning is especially relevant. The proctoring system, developed on the basis of neural networks, provides an effective organization for monitoring and evaluating student learning outcomes at the university. The introduction of proctoring systems increases the reliability of evaluating educational outcomes online. Despite the presence of a rich arsenal of tools for solving identification problems and many successfully solved practical problems, interest in this topic does not weaken. This is explained by the variety of new formulations, the individuality of the complexity of real tasks, and the need to build increasingly improved models that would adequately describe these real tasks.

Purpose: The purpose of the project is to research and develop an automated proctoring system for monitoring students' knowledge in a distance learning environment.

Expected results:

- scientific and methodological foundations for the organization of the educational process using distance learning technologies in universities will be developed;

- structural and logical schemes for monitoring and evaluating the results of students' educational activities will be prepared;

- algorithms and face image recognition models will be built;

- algorithms and models of visual image recognition will be developed; - algorithms and models of speech recognition will be developed;

- a software product of the proctoring system will be developed;

- reports on testing the software product of the proctoring system will be completed;

- reports on the trial operation of the software product will be completed; - technical documentation will be developed.

Members of the research group:

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3. Chief Researcher – **Nurpeisova Ardak Adanyshovna** – PhD, Senior lecturer at the Department of Information Systems of the Kazakh Agrotechnical University named after S.Seifullin (https://orcid.org/0000-0002-1245-8313, Researcher ID AAV-3919-2020, Scopus Author ID – 57220128907);

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5. Scientific adviser - **Nurzhanov Kuanysh Zhankeldinovich**-IP EC Development Group, Director;

6. Researcher – **Orazbayeva Balausa Abduvalievna** – Engineer of the Department of Informatics of the L.N. Gumilev Eurasian National University;

7. Researcher – **Zhumasseitova Samal Duisenbaevna** – Senior lecturer of the Department of Computer Science, Kazakh Agrotechnical University named after S.Seifullin (https://orcid.org/0000-0001-8210-5022, Researcher ID ADB-2288-2022, Scopus Author ID – 57403214300).

List of publications and patents published within the framework of this project: (with links to them):

4 articles have been prepared and published, which are part of the unified bibliographic and abstract database of peer-reviewed scientific literature Scopus, Web of Science:

1. Nurpeisova, A.; Shaushenova, A.; Mutalova, Z.; Zulpykhar, Z.; Ongarbayeva, M.; Niyazbekova, S.; Semenov, A.; Maisigova, L. The Study of Mathematical Models and Algorithms for Face Recognition in Images Using Python in Proctoring System. Computation 2022, 10, 136. https://doi.org/10.3390/computation10080136 (Scopus, 71 процентиль, CiteScore 2021= 3.3, SJR 2021=0.389; Web of Science Q2, JCI 2021=0,7)

2. Nurpeisova, A.; Shaushenova, A.; Mutalova, Z.; Ongarbayeva, M.; Niyazbekova, S.; Bekenova, A.; Zhumaliyeva, L.; Zhumasseitova, S. Research on the Development of a Proctoring System for Conducting Online Exams in Kazakhstan. Computation 2023, 11, 120. https://doi.org/10.3390/computation11060120 (Scopus, 71 процентиль, CiteScore 2021= 3.3, SJR 2021=0.389; Web of Science Q2, JCI 2021=0,7)

3. Shaushenova, A., Zulpykhar, Zh., Zhumasseitova, S., Ongarbayeva, M., Akhmetzhanova, Sh, Mutalova, Zh, Niyazbekova, Sh, Zueva, A. The Influence of the Proctoring System on the Results of Online Tests in the Conditions of Distance Learning. AD ALTA. Journal of Interdisciplinary Research. Vol. 11, issue 2. https://doi.org/10.33543/1102 (Web of Science Q3, JCI 2021=0,14)

4. Zulpykhar Zh., Ongarbayeva M., Tungatarova A., Altynbekova Zh. Online examinations with proctoring: features, students' preferences and related factors, academic honesty// World Transactions on Engineering and Technology Education, 2023 WIETE Vol.21, No.4, - P.238 (Scopus 53 процентиль).

7 articles have been published in journals included in the RSCI database:

1. Шаушенова А.Г., Жумасеитова С.Д., Онгарбаева М.Б. Методические основы контроля знаний студентов в системе дистанционного обучения. Вопросы устойчивого развития общества. №9, 2021 г. стр. 206-211 URL: http://www.nauka20-35.ru

2. Шаушенова А.Г., Жумасеитова С.Д., Ахметжанова Ш.Е. Особенности современных биометрических методов идентификации. Вопросы устойчивого развития общества. №9, 2021 г. стр. 212-224 URL: http://www.nauka20-35.ru

3. Зулпыхар Ж.Е., Шындалиев Н.Т. Методические основы организации учебного процесса с использованием дистанционных технологий обучения в ВУЗах. Инновации. Наука. Образование. №40, 2021 г. стр. 660-664 https://drive.google.com/file/d/1q3ni4XeYGOhFdKOUipkVV94qrOg6fxra/view

4. Nurpeisova A., Shaushenova A., Dosalyanov D.B., Olzhabayeva R.Zh. About some aspects of facial recognition technology. Сборник материалов XI международной научно-практической конференции «Вызовы современности и стратегии развития общества в условиях новой реальности» г. Москва 25 октября 2022 года. https://doi.org/10.34755/IROK.2022.40.69.064

5. Nurpeisova A., Shaushenova A., Dosalyanov D.B., Olzhabayeva R.Zh. Development and future trends of facial recognition. Сборник материалов XI международной научно-практической конференции «Вызовы современности и стратегии развития общества в условиях новой реальности» г. Москва 25 октября 2022 года. https://doi.org/10.34755/IROK.2022.40.69.064

6. Нурпейсова А.А., Шаушенова А.Г., Смаилова Л.К., Муталова Ж.С. Существующие способы распознавания образов. Военно-экономический вестник. №1. - 2023.- С. 206-211.

7. Нурпейсова А.А., Шаушенова А.Г., Нурмуханова К.Ж., Онгарбаева М.Б. Распознавание объектов с помощью YOLO. экономический вестник. - №1- 2023. - С. 212-224.

5 articles have been prepared in journals recommended by the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan:

1. Shaushenova A.G., Akhmetzhanova M.B., Ongarbayeva M.B. Comparison of Russian and Kazakhstan proctoring systems. Bulletin of the Karaganda University. №4- 2021. p. 83-91. https://doi.org/10.31489/2021Ped4/83-91

2. Зұлпыхар Ж.Е., Шындалиев Н.Т., Оразбаева Б.А. Қашықтықтан оқыту кезіндегі білімгерлердің сынақ емтихандарында қолданылатын бағдарламаларды талдау. Л.Н. Гумилев атындағы Еуразия ұлттық университетінің Хабаршысы. №4- 2021. p. 115-122. URL: https://bulpedps.enu.kz/article/archive/series?number=137

3. Шаушенова А.Г., Нурпейсова А.А., Муталова Ж.С., Досалянов Д.Б., Онгарбаева М.Б. Особенности зарубежных систем видеомониторинга и идентификации обучающегося в дистанционном обучении. Известия НАН РК. Серия Физика и Информатика. №3, 2022. https://doi.org/10.32014_2518- 1726_2022_343_3_247-259

4. Зулпыхар Ж.Е., Оразбаева Б.А. Қашықтан оқыту жағдайында білім алушыларды идентификациялау және тану технологиялары. Л.Н. Гумилев ат. ЕҰУ Хабаршысы №3, 2022 https://doi org/10.32523/2616-6895-2022-140-3-401- 411

5. Шаушенова А.Г., Нурпейсова А.А., Досалянов Д.Б., Мауина Г.М. Прокторинг автоматтандырылған жүйесінде сөйлеуді танудың нейрондық желілері. ҚР ҰҒА Хабарлары. Физика және Информатика сериясы. №4, 2022. https://doi.org/10.32014/2022.2518-1726.163

Information for potential users: The developed scientific and methodological basis for the organization of the educational process in distance learning and a software product for taking online exams is applicable to all universities of the Republic of Kazakhstan.

The results obtained:

1. The scientific and methodological foundations of the organization of the educational process using distance learning technologies at universities have been developed.

2. Structural and logical schemes for monitoring and evaluating the results of students' educational activities based on artificial intelligence have been developed.

3. A system for monitoring and evaluating the results of educational activities based on artificial intelligence has been developed.

4. Mathematical models of informative features of the object are proposed.

5. Classification algorithms have been implemented to reduce the time needed to identify a person's face.

6. Identification algorithms are proposed that take into account such interferences as portrait shift, different photo scales and tilt of the identified person to enhance authentication of the recognized object.

7. Mathematical models, methods and algorithms are implemented in the form of a program.

8. The automated proctoring system Proctor SU has been developed.

The study, collected during the analysis of commercial proctoring systems, shows that many systems combine innovative technologies and capabilities that give an idea of the effectiveness of conducting online exams.

Adherence to the principles of academic integrity is the most important factor in students achieving the target learning outcomes of training programs. Respecting the principles of academic integrity at the university teaches time management, proper prioritization, organization and efficiency, as well as provides solid knowledge and skills that cannot be obtained by cheating. It is the absorption of the traditions of academic honesty from the student years, and preferably earlier, that helps to establish ethical standards for life and gives a sense of achievement. Supervised exams reduce the risks associated with reputation and organizational costs, as well as improve the quality of competence of staff and students.

The obtained results of the scientific research will allow solving the most important innovative issues in the system of control of students' knowledge in the context of distance learning and improve the quality of education.

Software Registration

The computer program "Proctor SU kashyktan okytu jagdayinda bilim alushylardyn bilimin bakylauga arnalgan proctoring bagdarlama" is registered in the state register of rights to objects protected by copyright No. 38728 dated 08/28/2023, entered into the software registry and recommended for use in the territory of the Republic of Kazakhstan.