

ANNUAL REPORT

2023

JANUARY 2024

**Institute of Smart
Systems and Artificial
Intelligence (ISSAI)**

ISSAI

NAZARBAYEV
UNIVERSITY | Institute of Smart Systems
and Artificial Intelligence

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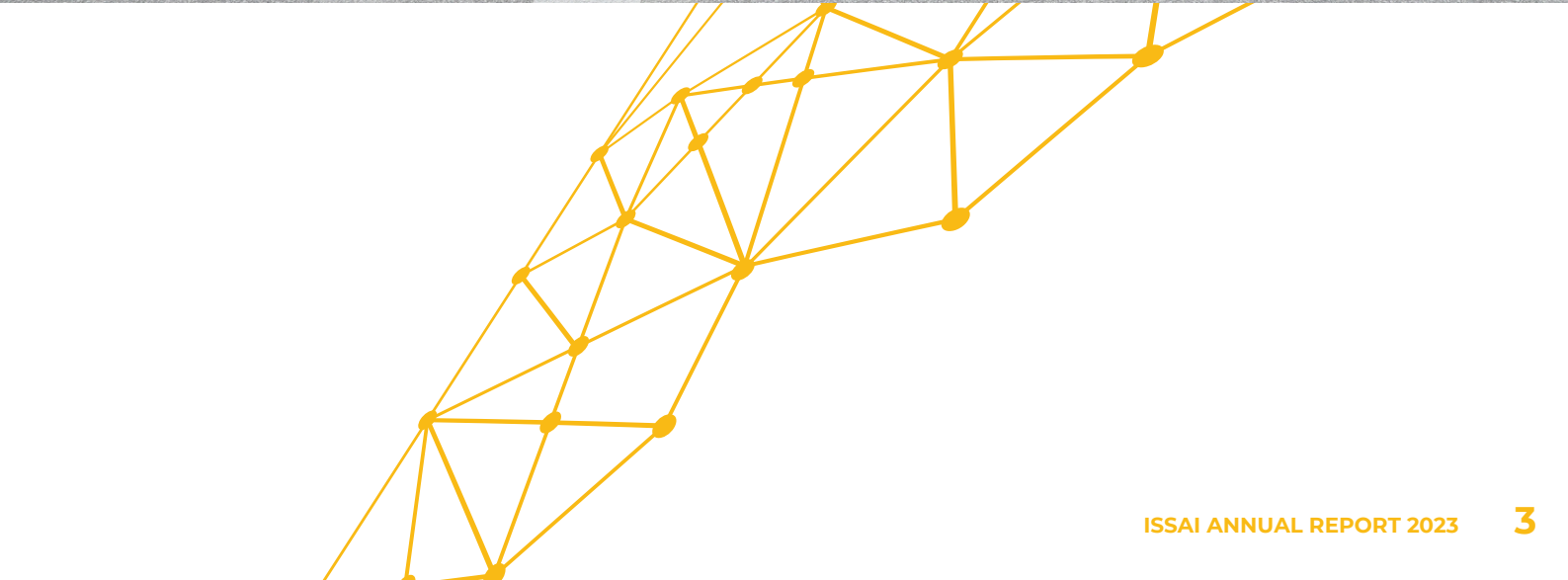
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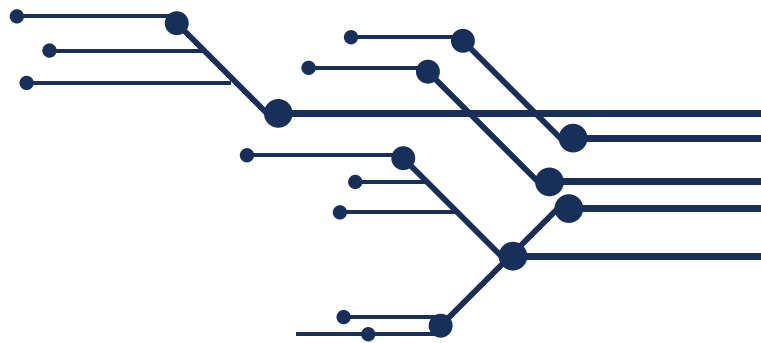
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FOUNDING DIRECTOR'S MESSAGE:



**PROF. ATAKAN
VAROL**

Founding Director of
ISSAI

In 2023, the realm of artificial intelligence has experienced surges in development, manifesting in the proliferation of large language models like OpenAI's GPT-4, which dramatically expanded AI's abilities in creative writing, coding, and problem-solving. The year has also been marked by ethical challenges surrounding AI-generated content, privacy concerns, and the need for equitable AI-driven employment opportunities. AI's impact has been felt across sectors, from healthcare's enhanced diagnostics to the finance industry's advanced fraud detection. Policy and regulation have attempted to keep pace, with nations investing heavily into AI for competitive and security advantages, while educational institutions are restructuring curricula to prepare for an AI-centric future.

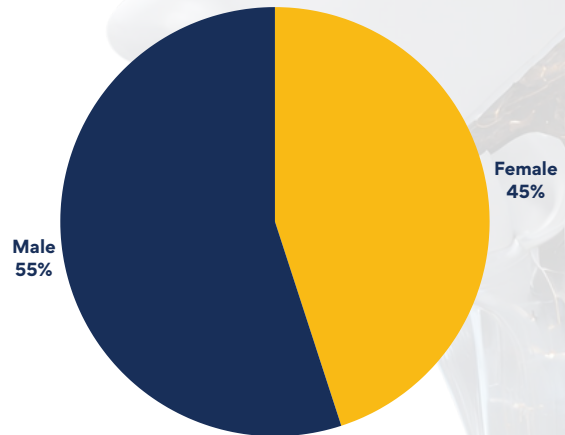
Over the past year, as the premier AI research organization of Kazakhstan, the Institute of Smart Systems and Artificial Intelligence (ISSAI) has been at the forefront of pioneering research in artificial intelligence and its applications. With publications in high-impact journals and prominent conferences, the institute's research outputs reflect its commitment to driving innovation in multiple areas of AI. Projects undertaken include enhancing multimodal person verification through generative thermal data augmentation, exploring augmented reality for assisting the cognitively impaired, developing deep learning models for multilingual speech recognition in Turkic languages, and creating datasets for personalized dietary interventions in Central Asia. Notably, the institute has also made headway with the neural machine translation model, Tilmash with its translation performance rivaling the products of industry giants.

High-quality research, open source models and datasets, participating in local and international events, and outreach programs have enabled ISSAI to become a hub for AI research in Central Asia. This was recognized by President Kassym-Jomart Tokayev who announced the transformation of ISSAI into a full-fledged research institute during the Astana Digital Bridge in October 2023. We are honored by the assignment of this new mission and will work relentlessly for the AI-based technological development of Kazakhstan. Our first objective for 2024 will be the development of a large-language model for the Kazakh language that will serve as a foundation of various products and services for the people of Kazakhstan.

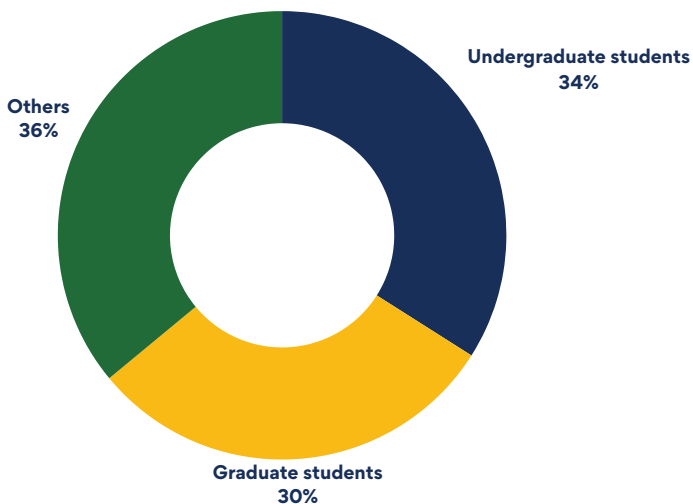
ISSAI TEAM

ISSAI is a place of diversity and inclusivity in the high-tech field, where opportunity knows no barriers and borders.

ISSAI is committed to empowering women to shine in the realm of technical and scientific pursuits.



There were a total of 84 Research Assistants in 2023:



ISSAI offers internship opportunities to students at both undergraduate and graduate levels from various fields of study.

Interns have the chance to work closely with data scientists and senior researchers on ongoing ISSAI projects, providing them with practical experience using cutting-edge computing resources.

On average, an internship lasts between six to eight weeks, but it can be as short as one month. To get an internship, applicants must go through a selection process that includes an interview.

ISSAI TEAM



Huseyin Atakan Varol
Founding Director



Yerbol Absalyamov
Deputy Director of
Operations



Askat Kuzdeuov
Senior Data Scientist



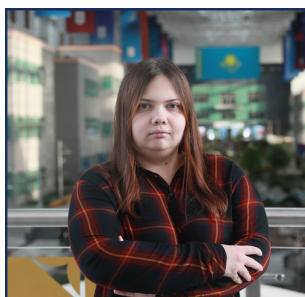
Aknur Karabay
Data Scientist



Rustem Yeshpanov
Data Scientist



Madina Abdrakhmanova
Data Scientist



Alina Polonskaya
Data Scientist



Shakh-Izat Nurgaliyev
Computer Engineer



Makat Tlebaliyev
Computer Engineer

ISSAI TEAM



Azamat Iskakov
Computer Engineer



Aliya Mukhidinova
Senior PR Coordinator



Gibrat Kurmanov
Senior Administrative
Manager



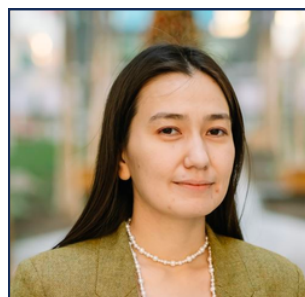
Tolegan Akhmetov
Postdoctoral Researcher



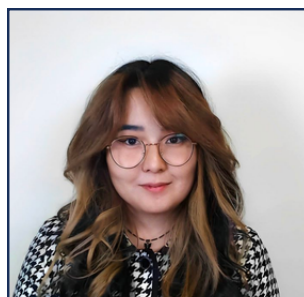
Zhanat Makhataeva
Postdoctoral Researcher



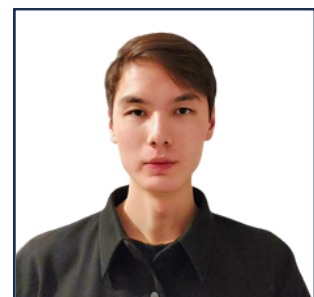
Gourav Morger
Research Assistant



Ulzhan Bissarinova
Research Assistant



Tomiris Rakhimzhanova
Research Assistant



Batyr Arystanbekov
Research Assistant



CONFERENCES

CONFERENCES

TWO ISSAI PAPERS WERE PRESENTED AT THE 3RD INTERNATIONAL CONFERENCE ON ROBOTICS, AUTOMATION, AND AI (RAAI 2023) IN SINGAPORE

During RAAI 2023, ISSAI presented two papers at the 3rd International Conference on Robotics, Automation, and AI (RAAI 2023) on 14-16 December, in Singapore:

1. Speech Command Recognition: Text-to-Speech and Speech Corpus Scraping Are All You Need by A. Kuzdeuov, Sh. Nurgaliyev, D. Turmakhon, N. Layik, and H. A. Varol;
2. Thermal Perception Using Augmented Reality for Industrial Safety by T. Akhmetov, G. Morger, I. Tursynbek and H.A. Varol.



During the RAAI 2023 conference ISSAI Senior Data Scientist Askat Kuzdeuov received the Best Presenter Award for his informative and dynamic presentation on speech common recognition. RAAI 2023, organized by the Beijing Institute of Control Robotics and Intelligent Technology and the IEEE Robotics and Automation Society, provides a platform for academics and industry professionals to share knowledge and innovative ideas in rapidly growing fields.

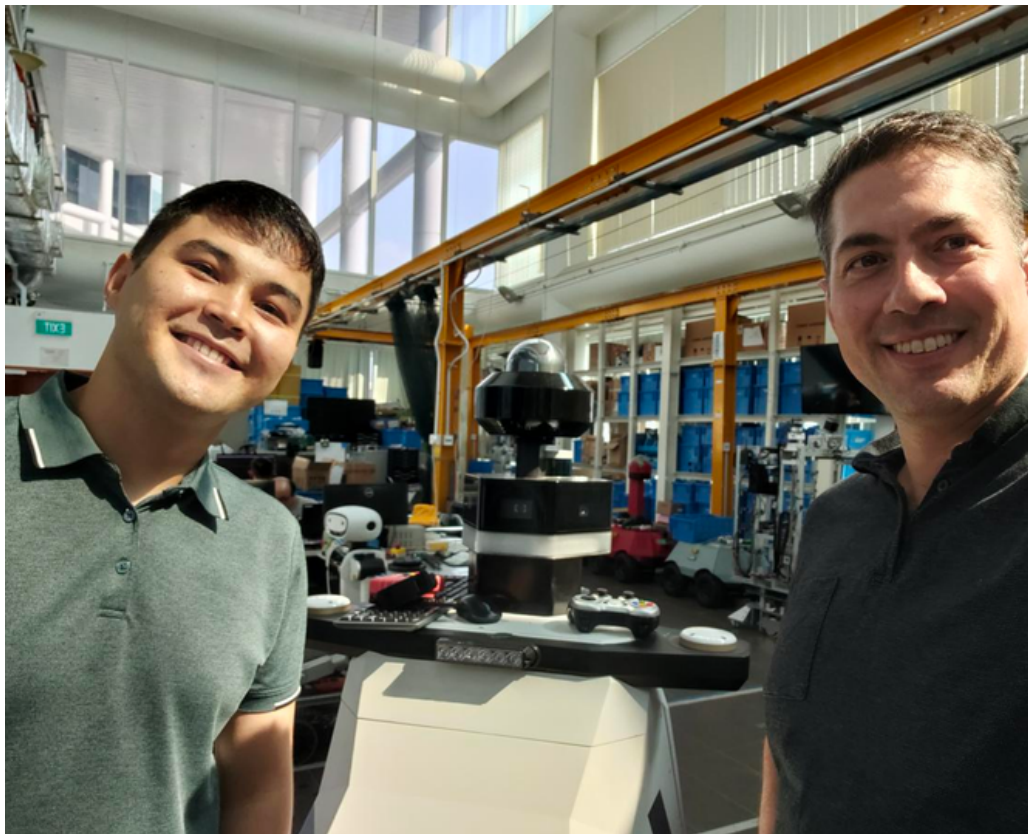
CONFERENCES

ISSAI AT THE IECON 2023 CONFERENCE IN SINGAPORE

Founding director of the ISSAI Prof. Atakan Varol and researcher Daniil Orel attended the 49th Annual Conference of the IEEE Industrial Electronics Society (IES) on 16-19 October, in Singapore. IECON 2023 focused on contemporary industry topics ranging from electronics, controls, manufacturing, to AI and computational intelligence.

At the conference Prof. Varol presented his joint work with ISSAI researchers Zarema Balgabekova and Muslim Alaran titled “A Data-Centric Approach for Object Recognition in Hemispherical Camera Images”. Daniil Orel gave a talk on his paper entitled “Noise-Robust Automatic Speech Recognition for Industrial and Urban Environments”.

Prof. Varol also chaired a machine learning session and visited the Institute for Infocomm Research (I2R), discussing the future of autonomous robots with research scientist and NU Robotics alumni and former ARMS Lab member Dr. Nursultan Imanberdiyev.



CONFERENCES

ISSAI PAPER WAS PRESENTED AT THE 24TH INTERSPEECH CONFERENCE 2023 IN DUBLIN

ISSAI's paper titled "Multilingual Text-to-Speech Synthesis for Turkic Languages Using Transliteration" by Rustem Yeshpanov, Saida Mussakhojayeva, and Yerbolat Khassanov was presented at the 24th Interspeech Conference, on 20-24 August in Dublin, Ireland. The paper provides a multilingual end-to-end text-to-speech system designed for ten Turkic languages. This system, encompassing Azerbaijani, Bashkir, Kazakh, Kyrgyz, Sakha, Tatar, Turkmen, Turkish, Uyghur, and Uzbek, leveraged Kazakh as the only source language for development. The approach adopted by the researchers attracted significant attention and received a warm reception from the speech processing community.



ISSAI members also joined the 2nd Annual Meeting on Under-resourced Languages, underscoring its focus on Turkic linguistic research. As the only representative from Kazakhstan, ISSAI emphasized its commitment to the advancement of speech processing at the world's premier speech technology event.

Interspeech is the world's largest and most prestigious event for the speech processing and application community. ISSAI proudly represented Kazakhstan as the sole organization from the country, showcasing its commitment to advancing research in the field.

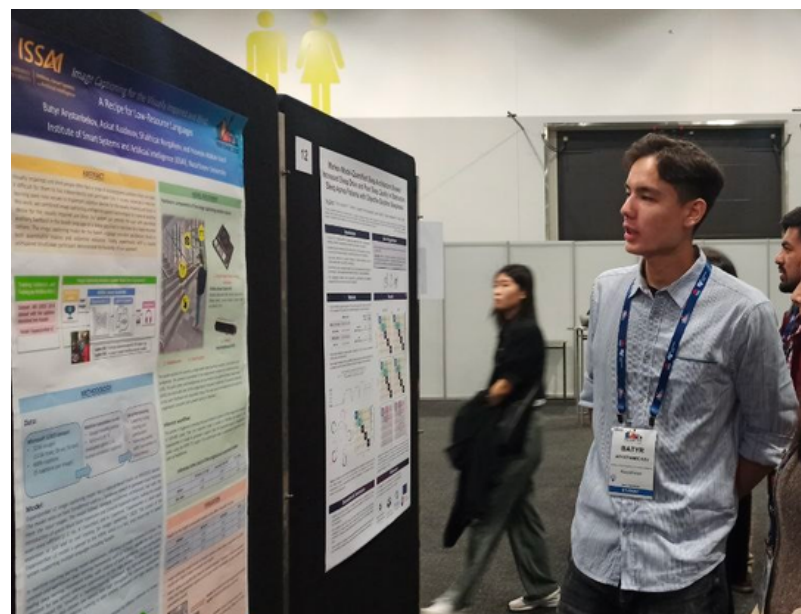
CONFERENCES

ISSAI PRESENTED A SERIES OF RESEARCH PAPERS AT THE 45TH ANNUAL INTERNATIONAL CONFERENCE OF THE IEEE ENGINEERING IN MEDICINE AND BIOLOGY SOCIETY (EMBC 2023)

ISSAI's research assistant, Batyr Arystanbekov with Technical Project Coordinator, Absalyamov Yerbol participated at 45th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2023), introducing their research work "Image Captioning for Individuals with Visual Impairments and Blindness: Strategies for Lower-Resourced Languages".

It should be noted that ISSAI had undertaken a number of research initiatives focused on leveraging AI and NLP to address challenges faced by the visually impaired community in the preceding year.

ISSAI's contribution to the field was well-received, drawing attention from prestigious institutions and universities, fostering dialogues about future collaborations. This participation opened doors to networking opportunities and potential partnerships, underlining the importance and relevance of work in the global scientific community.



CONFERENCES

ISSAI RESEARCHER ZHANAT MAKHATAEVA SHOWCASED HER RESEARCH WORK AT ACM CHI 2023 CONFERENCE IN HAMBURG

ISSAI researcher and NU PhD student Zhanat Makhataeva with Microsoft team presented a virtual reality prototype designed for blind users and those with low vision “Scene Weaver” at the Interactivity Session of the CHI 2023 Conference in Hamburg, on 23-28 April, in Germany.



Before the conference, Zhanat completed a 12-week research fellowship at Microsoft Research Cambridge, UK, where she started development of “Scene Weaver”. Zhanat was the first student who received this fellowship from Kazakhstan.

The ACM CHI Conference is the leading global event on Human-Computer Interaction (HCI), attracting researchers and practitioners from around the world with diverse backgrounds, united by the goal of improving the world through interactive digital technologies.

CONFERENCES

ISSAI'S TWO RESEARCH PAPERS WERE REPRESENTED AT THE 2023 INTERNATIONAL CONFERENCE ON BIG DATA AND SMART COMPUTING IN JEJU, KOREA

ISSAI Senior Data Scientist Askat Kuzdeuov and Founding Director Prof. Atakan Varol presented two research papers at the 2023 International Conference on Big Data and Smart Computing held in Jeju, Korea, on 13-16 February:

1. Speech Recognition for Turkic Languages Using Cross-Lingual Transfer Learning from Kazakh by Daniil Orel, Rustem Yeshpanov, and Huseyin Atakan Varol
2. AnyFace: A Data-Centric Approach for Input-Agnostic Face Detection by Askat Kuzdeuov, Darina Koishigarina, and Huseyin Atakan Varol.

Prof. Atakan Varol moderated the session on Understanding Multimodal Data, and Askat Kuzdeuov chaired the Image Processing session. The keynote speakers of the conference were C. Mohan (Distinguished Visiting Professor, Tsinghua University; Former IBM Fellow, IBM Research) and Yasushi Sakurai (Professor, Institute of Scientific and Industrial Research, Osaka University).



BigComp aims to be an international platform for the exchange of ideas and information on current studies, challenges, research results, system developments, and practical experiences among researchers, developers, and users from academia, business, and industry.



PUBLICATIONS

PUBLICATIONS

- * M. Abdrakhmanova, T. Unaspekov, and H. A. Varol, "Multimodal person verification with generative thermal data augmentation," IEEE Transactions on Biometrics, Behavior, and Identity Science, pp. 1-1, 2023.
doi: [10.1109/tbiom.2023.3346938](https://doi.org/10.1109/tbiom.2023.3346938)
- * Z. Makhataeva, T. Akhmetov, and H. A. Varol, "Augmented reality for cognitive impairments," Springer Handbooks, pp. 765-793, 2023.
doi: [10.1007/978-3-030-67822-7_31](https://doi.org/10.1007/978-3-030-67822-7_31)
- * S. Mussakhojayeva, K. Dauletbek, R. Yeshpanov, and H. A. Varol, "Multilingual speech recognition for Turkic languages," Information, vol. 14, no. 2, p. 74, Jan. 2023.
doi: [10.3390/info14020074](https://doi.org/10.3390/info14020074)
- * A. Karabay, A. Bolatov, H. A. Varol, and M.-Y. Chan, "A Central Asian food dataset for personalized dietary interventions," Nutrients, vol. 15, no. 7, p. 1728, Mar. 2023.
doi: [10.3390/nu15071728](https://doi.org/10.3390/nu15071728)
- * A. Kuzdeuov, D. Koishigarina, and H. A. Varol, "Anyface: A data-centric approach for input-agnostic face detection," 2023 IEEE International Conference on Big Data and Smart Computing (BigComp), Feb. 2023.
doi: [10.1109/bigcomp57234.2023.00042](https://doi.org/10.1109/bigcomp57234.2023.00042)
- * D. Orel, R. Yeshpanov, and H. A. Varol, "Speech recognition for Turkic languages using cross-lingual transfer learning from Kazakh," 2023 IEEE International Conference on Big Data and Smart Computing (BigComp), Feb. 2023.
doi: [10.1109/bigcomp57234.2023.00037](https://doi.org/10.1109/bigcomp57234.2023.00037)
- * Akhmetov, T., & Varol, H. A. (2023). An Augmented Reality-Based warning system for enhanced safety in industrial settings. IEEE Transactions on Industrial Informatics, 19(7), 7966-7977.
doi: [10.1109/tii.2022.3216009](https://doi.org/10.1109/tii.2022.3216009)

PUBLICATIONS

- * B. Arystanbekov, A. Kuzdeuov, Sh. Nurgaliyev, and H. A. Varol, "Image Captioning for the Visually Impaired and Blind: A Recipe for Low-Resource Languages," 2023, Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Sydney, Australia, 24-27 July, doi: [10.36227/techrxiv.22133894.v2](https://doi.org/10.36227/techrxiv.22133894.v2)
- * R. Yeshpanov, S. Mussakhojayeva, and Y. Khassanov, "Multilingual text-to-speech synthesis for Turkic languages using transliteration," INTERSPEECH 2023, Aug. 2023. doi: [10.21437/interspeech.2023-249](https://doi.org/10.21437/interspeech.2023-249)
- * Z. Makhataeva, T. Akhmetov, and H. A. Varol, "Augmented-reality-based human memory enhancement using artificial intelligence," IEEE Transactions on Human-Machine Systems, pp. 1-13, 2023. doi: [10.1109/thms.2023.3307397](https://doi.org/10.1109/thms.2023.3307397)
- * D. Orel and H. A. Varol, "Noise-robust automatic speech recognition for industrial and Urban Environments," IECON 2023- 49th Annual Conference of the IEEE Industrial Electronics Society, Oct. 2023. doi: [10.1109/iecon51785.2023.10312708](https://doi.org/10.1109/iecon51785.2023.10312708)
- * Z. Balgabekova, M. Alaran, and H. A. Varol, "A data-centric approach for object recognition in hemispherical camera images," IECON 2023- 49th Annual Conference of the IEEE Industrial Electronics Society, Oct. 2023. doi: [10.1109/iecon51785.2023.10311869](https://doi.org/10.1109/iecon51785.2023.10311869)
- * A. Shakerimov, T. Alizadeh, and H. A. Varol, "Efficient sim-to-real transfer in reinforcement learning through domain randomization and domain adaptation, IEEE Access, vol. 11, pp. 136809-136824, 2023. doi: [10.1109/access.2023.3339568](https://doi.org/10.1109/access.2023.3339568)



OPPORTUNITIES FOR STUDENTS IN KAZAKHSTAN

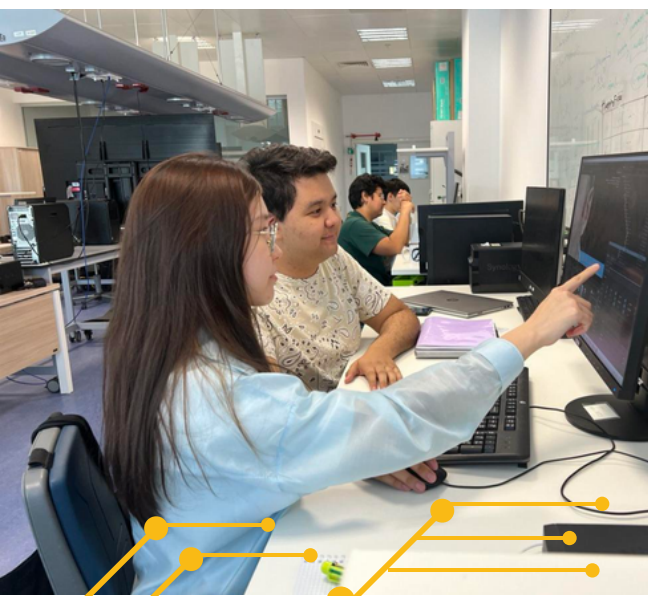
SUMMER RESEARCH PROGRAM 2023

Summer Research Program 2023 opened its doors to 39 students from different academic institutions, including universities and high schools. To note, in 2023 for the first time the program opened its doors to high school students, allowing for an opportunity for young researchers to explore new knowledge and practical experience in their fields of interest. Breaking new ground, the program hosted 18 high school students for the first time, alongside 21 college students. This blend of young scholars and seasoned learners fueled a lively and inventive atmosphere.

Participants came from all corners of Kazakhstan's high schools and a range of respected universities including Astana IT University, Kazakh British Technical University, Al-Farabi Kazakh National University, as well as internationally recognized institutions like Princeton University, University of Paris-Saclay and Sharif University of Technology. This mix of different backgrounds has made the program a rich and globally-minded experience.

During the program, students had the opportunity to work alongside seasoned mentors from the ISSAI data science team on challenging projects to apply the theoretical knowledge they had gained in their studies to practice. Engaging with experts in the field of AI, students were able to experience actual AI applications and learn about the most current industry developments.

We encourage students to participate in our upcoming Summer Research Program 2024. Registration will open in March-April. Stay updated by following our website and social media channels.





NEWS HIGHLIGHTS

NEWS HIGHLIGHTS

PRESIDENT KASSYM-JOMART TOKAYEV ANNOUNCED THE TRANSFORMATION OF THE ISSAI INTO A MAJOR RESEARCH INSTITUTE AT THE DIGITAL BRIDGE 2023

The Institute of Smart Systems and Artificial Intelligence participated in two biggest digital forums in Kazakhstan: the Digital Bridge 2023, and the 5th International Digital Almaty forum.

ISSAI presented key projects at the Digital Bridge 2023 forum on 12-13 October 2023, which was dedicated to the “Artificial and Human Intelligence: The Right Balance” topic. Main focus of the event was on the President of the Republic of Kazakhstan Kassym-Jomart Tokayev’s significant speech. He advocated for the transformation of ISSAI into a major research institute for talents and experts by forming a robust ecosystem for industry collaboration. According to the President’s vision ISSAI will become a leading research center closely collaborating with top IT companies globally and locally, with a strong focus on commercializing its innovative research for future growth and innovation.

On 2-3 February at the Digital Almaty forum ISSAI represented Nazarbayev University with the School of Engineering and Digital Sciences (SEDS) at the exhibition zone for universities. Specifically, research assistant Tolegen Akhmetov, who works on ISSAI projects, introduced his “Industrial safety using AR” project in the Innovation zone, emphasizing digital technology’s role in manufacturing safety. ISSAI highlighted its scientific developments, including AI projects for Kazakh and Turkic languages, which attracted interest from guests like the Minister of Science and Higher Education of the Republic of Kazakhstan, Sayasat Nurbek.

In 2024 The Institute of Smart Systems and Artificial Intelligence will continue to share open-source access to the datasets and models, creating projects of national significance, and support the technological growth and development of Kazakhstan.



NEWS HIGHLIGHTS

ISSAI HOSTED A VISIT FROM REPRESENTATIVES OF THE PRESIDENTIAL ADMINISTRATION OF THE REPUBLIC OF KAZAKHSTAN

ISSAI hosted a visit from representatives of the Presidential Administration of the Republic of Kazakhstan headed by Mr Altair Akhmetov, Head of the Department of Public Administration of the Presidential Administration in April 2023.

During the visit, founding director of ISSAI, Professor Atakan Varol, demonstrated various ISSAI projects including AI-based voice technologies for Kazakh language, smart systems for people with special needs, and face detection and computer vision technologies.

Mr. Altair Akhmetov praised the researchers for their dedication and hard work, noting that their work was critical to the development of smart systems and AI in the country. He noted that the work being done by the researchers at the Institute was in line with the government's agenda of promoting innovation and technological advancement.

The guests were informed that the Institute's datasets are open-source and freely available to the public.

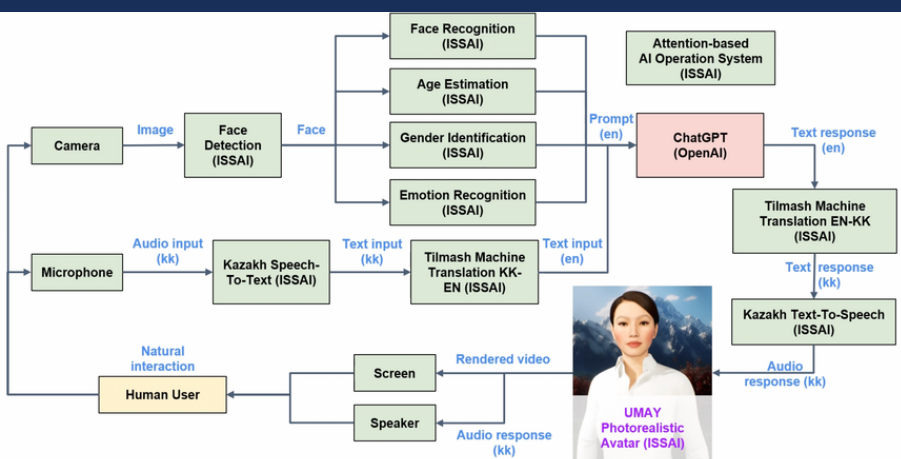


NEWS HIGHLIGHTS

ISSAI LAUNCHED A VIRTUAL ASSISTANT, WHO SPEAKS IN THE KAZAKH LANGUAGE

Umay is a virtual assistant proficient in the Kazakh language, embodied in a digitally crafted, lifelike human avatar, was launched by the ISSAI team on 23 October 2023.

Powered by Unreal Engine 5, Umay excels in delivering high-standard, real-time facial animations. This human prototype integrates cutting-edge speech technologies developed by ISSAI, including automatic speech recognition (ASR) and text-to-speech (TTS), to facilitate natural and fluent communication in the Kazakh language.

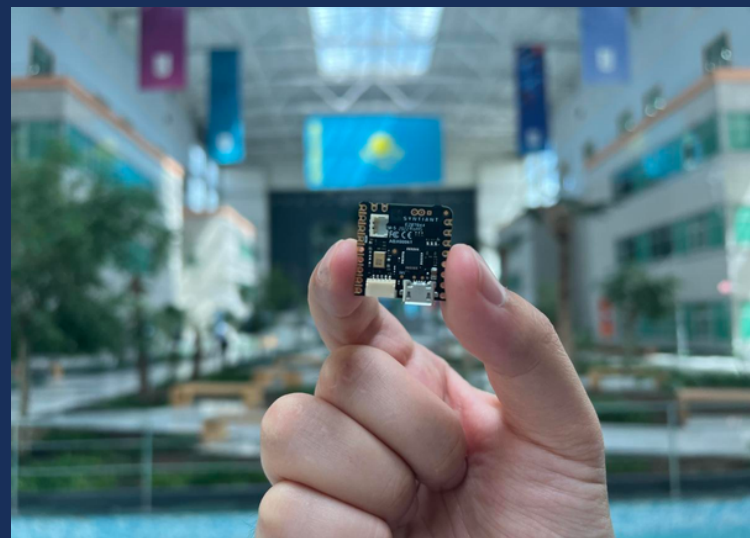


NEWS HIGHLIGHTS

ISSAI PRESENTED KAZAKH SPEECH COMMANDS RECOGNITION PROJECT

ISSAI team members launched a new Kazakh Speech Commands Recognition project in June 2023. The goal of Speech Command Recognition (SCR) is to detect a particular set of predefined words or phrases from a speech signal and to trigger a specific response or action based on the identified keyword.

SCR is widely used in applications such as voice-controlled smart home devices, personal digital assistants, robotics, IoT, and industrial automation. Additionally, it can be used in security and surveillance systems to detect specific trigger words that alert law enforcement or security personnel of potential threats.

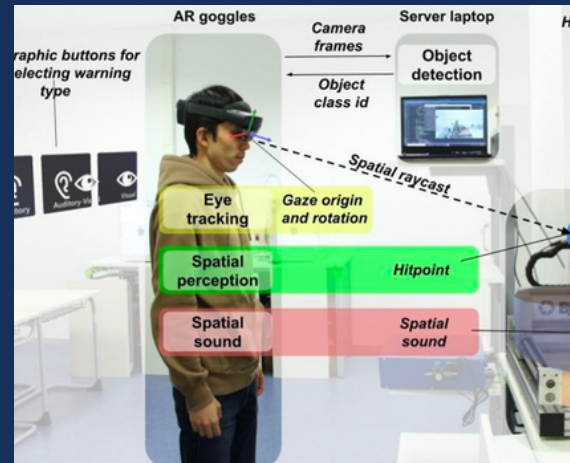


NEWS HIGHLIGHTS

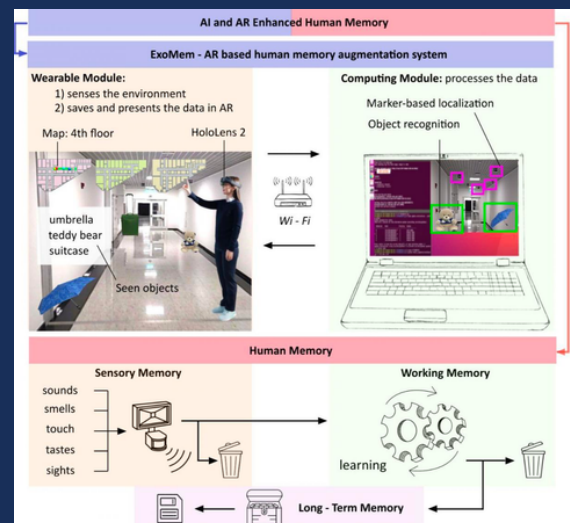
TWO ISSAI RESEARCH ASSISTANTS DEFENDED THEIR PHD THESES

PhD student Zhanat Makhataeva and doctoral student Tolegen Akhmetov, who both study Robotics Engineering at the School of Engineering and Digital Sciences at Nazarbayev University and work on ISSAI projects successfully defended their PhD theses.

Tolegen Akhmetov defended his PhD thesis on “Industrial Safety Using Augmented Reality and Artificial Intelligence” on 10 November 2023. His work showcased innovative approaches to enhancing workplace safety, highlighting the potential of AR and AI in preventing accidents in industrial settings. Tolegen Akhmetov’s contributions include the development of an AR-based warning system, utilizing eye-tracking technology, and an AR-based safety assistant to address burn injury risks in the industrial workplace.



Zhanat Makhataeva defended her PhD Thesis on “Augmented Reality-Based Human Memory Enhancement Using Artificial Intelligence” on 23 November 2023. She presented a human memory augmentation system (ExoMem) that combines advances in AR and AI. Her research work represents AR-assisted technology to aid people with memory impairments, such as Alzheimer’s disease.



Zhanat’s doctoral studies were also supported by the tech giant Microsoft through the Microsoft Research Fellowship.

NEWS HIGHLIGHTS

ISSAI REGIONAL OUTREACH: SEMINARS AND LECTURES FOR THE UNIVERSITIES

In 2023, ISSAI has conducted more than 10 on-site seminars (Outreach) for regional universities and scientific organizations with the aim of collaboration, providing consultation and, most importantly, providing access to NVIDIA DGX-1 supercomputers for AI free of charge (KazNU al-Farabi, SDU Almaty, Institute of Linguistics named after A. Baitursynov, KBTU, KarU named after E. Buketov, KarTU named after A. Saginov, Toraigyrov University Pavlodar, ARU named after K. Zhubanov Aqtobe, Qorkyt Ata University Qyzylorda, EKTU Oskemen, Amanzholov University Oskemen).

Based on the results of on-site seminars, researchers and students from 6 universities participated in various ISSAI research projects (Al-Farabi KazNU, SDU Almaty, MKTU named after Kh.A. Yassawi Turkestan, KRU named after A. Baitursynov Kostanay, Institute of Linguistics named after A. Baitursynov and ARU named after K. Zhubanov Aqtobe).

Additionally, ISSAI provides consultations to senior researchers and doctoral students at regional universities on AI-related projects and research and provided one guest lecture for KazNU named after al-Farabi on Machine learning.

ISSAI's initiative sparked keen interest during these visits, with discussions exploring AI's application in diverse sectors, notably the decision-making processes in the gas and oil industry. The hands-on demonstrations of how AI tools like NVIDIA DGX-1 and DGX-2 are applied to projects in natural language processing (NLP) and computer vision have been particularly illustrative, showcasing the practical benefits and efficiency improvements.

In 2024, ISSAI will continue to support partner universities in enhancing their AI capabilities, provide guest lectures, facilitate remote supercomputer access, and offer guidance on setting up AI labs. Through these initiatives, ISSAI envisions fostering a strong inter-university AI research network that will substantially contribute to the nation's expertise and capacity in the burgeoning field of AI.

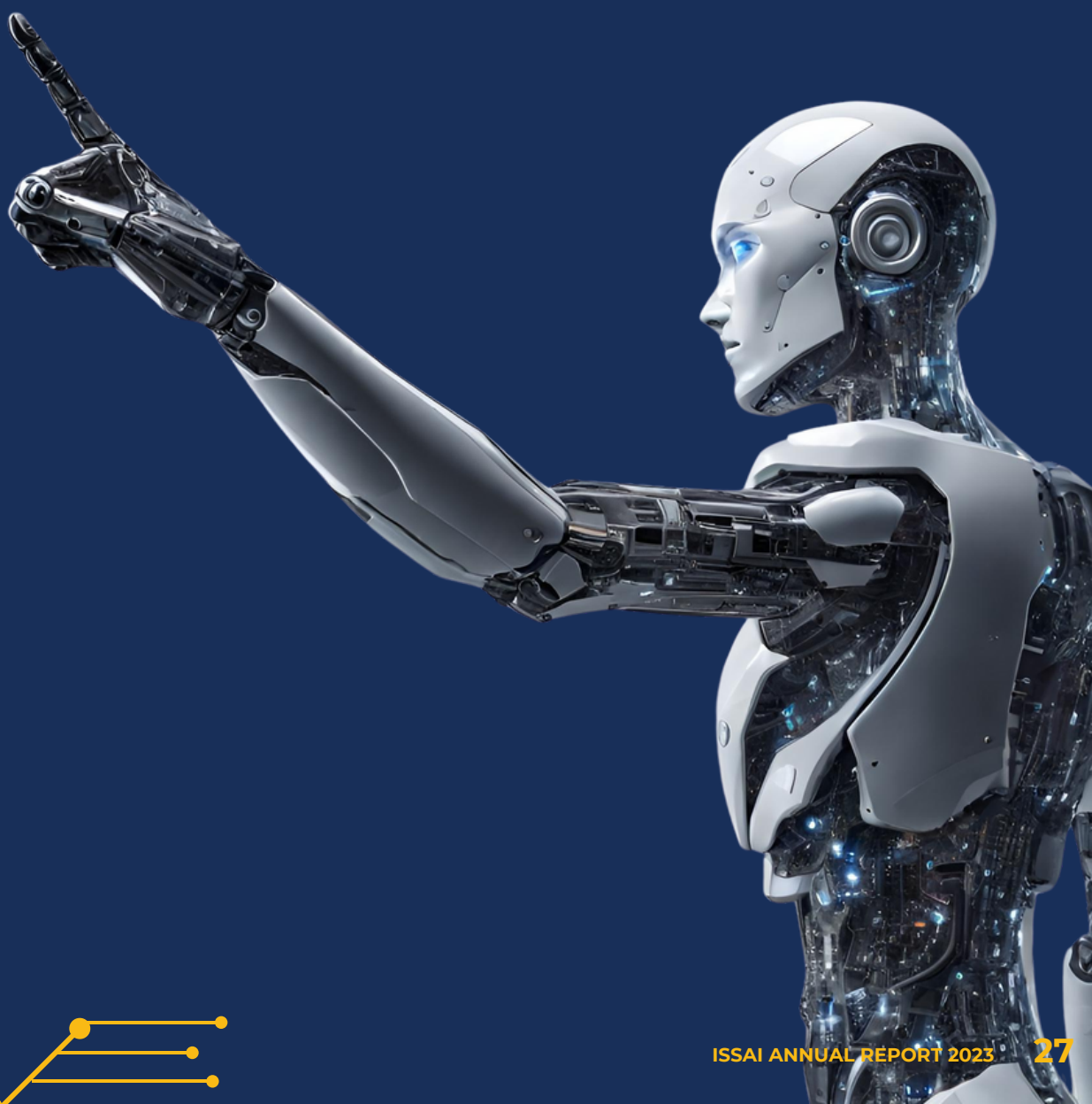


NEWS HIGHLIGHTS



**FIND MORE INFORMATION AND NEWS
ABOUT ISSAI ON THE OFFICIAL
WEBSITE:**

<https://issai.nu.edu.kz/>





NEW PROJECTS



- * Tilmash is a two-way machine translation model for Kazakh, Russian, English, and Turkish languages. Model was fine-tuned using Facebook's NLLB model, designed to handle translation challenges across 202 languages.

The link to projects description and a demo is here:

<https://issai.nu.edu.kz/tilmash/>



- * Umay is a virtual assistant embodied in a digitally created photo-realistic human avatar. Prototype Umay can assist in various fields, including science, history, technology, and medicine. Using Unreal Engine 5, Umay expresses herself with real-time facial animations. It incorporates state-of-the-art speech technologies developed by ISSAI like automatic speech recognition (ASR) and text-to-speech (TTS) to facilitate natural communication in the Kazakh language.

- * Additionally, with the aid of advanced facial AI technologies, Umay has the ability to recognize users and predict their age, gender, and even feelings. The core of this system is ChatGPT by OpenAI despite its known inefficiency with Kazakh. To address this, Umay utilizes ISSAI's machine translation model, Tilmash, to convert user prompts into English and responses from ChatGPT back into Kazakh.



Demonstration of Umay

https://www.youtube.com/watch?v=qpcKn_VShHs



* Nazarbayev University students who participated in the 2023 Summer Research Program of ISSAI have developed a smartphone app called Dauys, which is based on the large-scale dataset KazakhTTS2, created by ISSAI. The dataset features 271 hours of high-quality transcribed audio from five professional speakers.

* This app allows users to instantly convert any text into Kazakh speech with just one click.

Download Dauys app on Google Play:

<https://play.google.com/store/apps/details?id=com.anonymous.dauys>

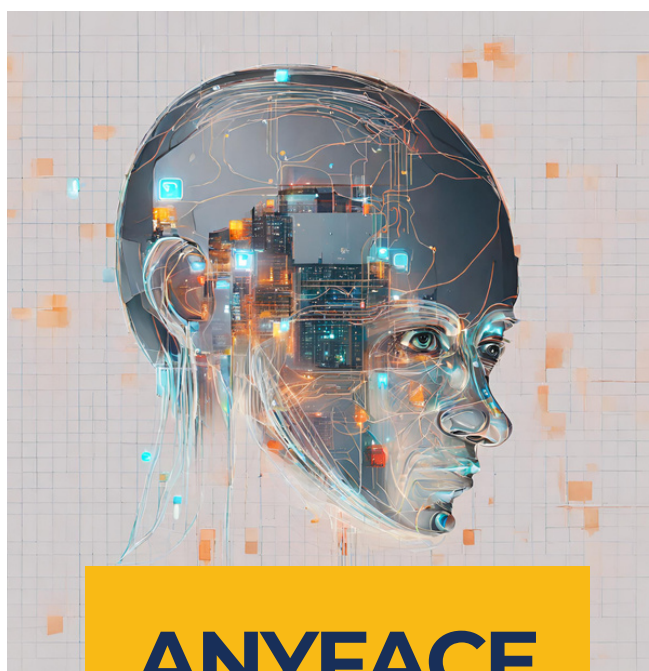


* Söyle model exhibited high performance for multilingual automatic speech recognition (17 languages). Model is also trained to be noise-robust and to perform long-form transcription.

The link to projects description and a demo is here:

<https://issai.nu.edu.kz/soyle-project/ore/apps/details?id=com.anonymous.dauys>





ANYFACE

A Data-Centric Approach For
Input-Agnostic Face Detection

- * AnyFace is a data-centric approach to input-agnostic face detection. It is a simple but effective method to facilitate the labeling of different face datasets.
- * This model facilitates the annotation of face datasets in various domains.
- * The model achieves accurate results in all domains-humans, animals and cartoon characters. It can be used to quickly and easily annotate face datasets in different domains, which will further facilitate the development of face applications.

The link to projects
description and a demo
is here:

<https://issai.nu.edu.kz/soyle-project/ore/apps/details?id=com.anonymous.dauys>





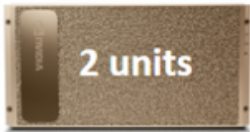
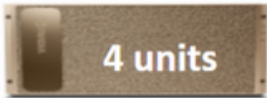
TATAR SPEECH CORPUS

- * Tatar speech corpus presents the first large open-source speech corpus for the Tatar language which was created together with the Institute of Applied Semiotics of Tatarstan Academy of Sciences. We demonstrate that speech recognition performance for Tatar improves with the model trained using the new Tatar Speech Corpus (TatSC). Our model is also trained to be noise-robust and to perform long-form transcription.
- * In 2024 with the Tatarstan Academy of Sciences Institute of Applied Semiotics we plan to create a Tatar text-to-speech and parallel corpuses.
- * We open-source our model and TatSC to encourage further research.

AI COMPUTATIONAL RESOURCES

ISSAI AI Computing cluster consists of many interconnected computing elements (nodes). The nodes in each cluster operate in parallel with each other, reaching higher processing power to train deep learning models.

The current AI computing resources at ISSAI consist of 7 computing nodes:

<p>Training (new staff, students, and other inexperienced users)</p>  <p>7 units</p> <p>HPC_AMD (01.02.03) GPUs 1 x NVIDIA® RTX 2080Ti GPU Memory 8 GB CPU AMD 32 core System Memory 128 GB, 3,333 MHz DDR4 RDIMM Storage 1X 1.92 TB NVMe SSD</p>	<p>Experimentation (resource man., docker, and other tools)</p>  <p>1 unit</p> <p>DGX 1 GPUs: 8 x NVIDIA® Tesla® V100 GPU Memory 256 GB CPU Dual 20-Core Intel Xeon ES-2698 v4 2.2 GHz System Memory 512 GB, 2,133 MHz DDR4 RDIMM Storage 4X 1.92 TB SSD RAID 0 Power Requirements: 3,500 W</p> <p>Delivered March 2018 1x1PF = 1 PF</p>	<p>E.g.: NU employees, students, ISSAI RAs, and interns</p>  <p>2 units</p> <p>DGX 2 (01. 02) GPUs: 16 x NVIDIA® Tesla® V100 GPU: Memory 512 GB total CPU: Dual Intel Xeon Platinum 8168, 2.7 GHz, 24-cores System Memory: 1.5TB DDR4 RDIMM Storage: 2 x 960GB NVMe SSDs Internal Storage: 30TB (8X 3.84TB) NVMe SSDs Maximum Power Usage: 10kW</p> <p>Delivered February 2020 2x2PF = 4 PF</p>	<p>E.g.: ISSAI team (collaborating faculty, data scientists, postdocs, RA, computer engineer, etc.)</p>  <p>4 units</p> <p>DGX A100 (01.02.03.04) GPUs: 8 x NVIDIA A100 40 GB GPUs GPU: Memory 320 GB total CPU: Dual AMD Rome 7742, 128 cores total, 2.25 GHz (base), 3.4 GHz (max boost) System Memory: 1TB DDR4 RDIMM Storage: 2 x 1.92TB M.2 NVMe drives Internal Storage: 15 TB (4x 3.84 TB) U.2 NVMe drives Maximum Power Usage: 6.5 kW</p> <p>Delivered December 2021 4x5PF = 20 PF AI</p>
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We are committed to share our know-how and resources with the Kazakhstani research community.

PROJECT REPOSITORY

IN 2023 WE CREATED OVER 14 DATASETS

The ISSAI provides open access to all its research datasets and models, which can be freely downloaded from the official website:

<https://issai.nu.edu.kz/issai-datasets/>



KAZNERD

The largest publicly available dataset for Kazakh named entity recognition. Dataset contains 112,702 sentences and 136,333 annotations for 25 entity classes.



ANYFACE: A DATA-CENTRIC APPROACH FOR INPUT-AGNOSTIC FACE DETECTION

A model focused on data-driven input-independent facial recognition. This flexible model excels across various domains, consistently delivering precise detection of faces not only in humans but also in animals and animated figures. Its implementation streamlines the process of labeling facial datasets across these diverse areas, thereby accelerating the progress in facial recognition technology applications.



KAZAKH SPEECH CORPUS 2

The KSC2 is the first industrial-scale open-source Kazakh speech corpus, which subsumes the previously introduced two corpora: Kazakh speech corpus and Kazakh Text-To-Speech 2, and supplements additional data from other sources like tv programs, radio, senate, and podcasts. In total, KSC2 contains around 1.2k hours of high-quality transcribed data comprising over 600k utterances.

PROJECT REPOSITORY



KAZAKH TEXT-TO-SPEECH 2

Expanded version of the previously released Kazakh text-to-speech (KazakhTTS) synthesis corpus. In the new KazakhTTS2 corpus, the overall size has increased from 93 hours to 271 hours, the number of speakers has increased from two to five (three females and two males), and the topic coverage has been diversified with the help of new sources, including a book and Wikipedia articles.



A CENTRAL ASIAN FOOD DATASET FOR PERSONALIZED DIETARY INTERVENTIONS

First Central Asian Food Dataset, containing 16,499 images across 42 food items. The dataset is unbalanced, the number of images per class varies from 99 to 922. The dataset is websrated and contains extracted frames from the videos.



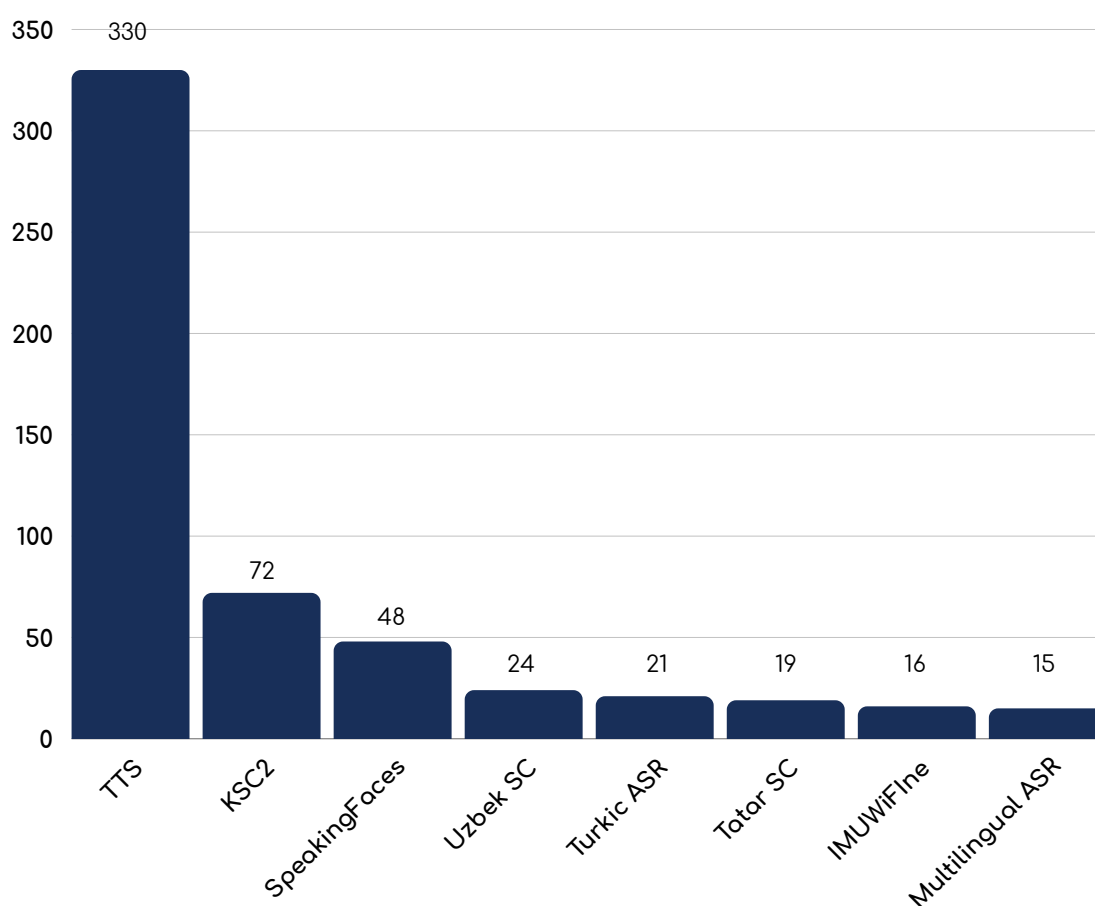
EXOMEM-AR-MEMORY

ExoMem represents the pioneering integration of Augmented Reality (AR) and Artificial Intelligence (AI) head-worn system that constructs a holographic visuospatial memory in an indoor environment. Microsoft HoloLens AR Goggles sense the environment, exchange data over a wireless network with a computing module (PC with Ubuntu 16.04), and construct a holographic visuospatial memory. The external computer processes the first-person visual data from the HoloLens, undertaking tasks such as localization and object recognition within the wearer's environment.

PROJECT REPOSITORY

More than 100 local and international companies and educational organizations have downloaded ISSAI datasets. The list includes affiliations like Google, Amazon, Logitech, Halyk Bank, China Telecom Corporation Limited Beijing Research, Centro Tecnológico de Automoción de Galicia (CTAG), Korea Electronics Technology Institute, University of Michigan, Boston University, Birmingham City University, Carnegie Mellon University, Massachusetts Institute of Technology, National Tsing Hua University, Moscow Institute of Physics and Technology, Kazakh British Technical University, SDU, nFactorial Incubator etc.

The number of downloads for each dataset
January-December 2023



PROJECT REPOSITORY

ISSAI shares the pre-trained AI models of its projects on the ISSAI GitHub page.

The models are available for free download to anyone:

<https://github.com/IS2AI>

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Repositories



* TOP REPOSITORIES:

- Kazakh_TTS
- SpeakingFaces
- Kazakh_ASR
- TurkicASR
- TurkicTTS
- Thermal-facial-landmarks-detection

* TOP LANGUAGES:

- Python
- Jupyter Notebook
- Shell,
- JavaScript
- C#



YOUTUBE ANALYTICS

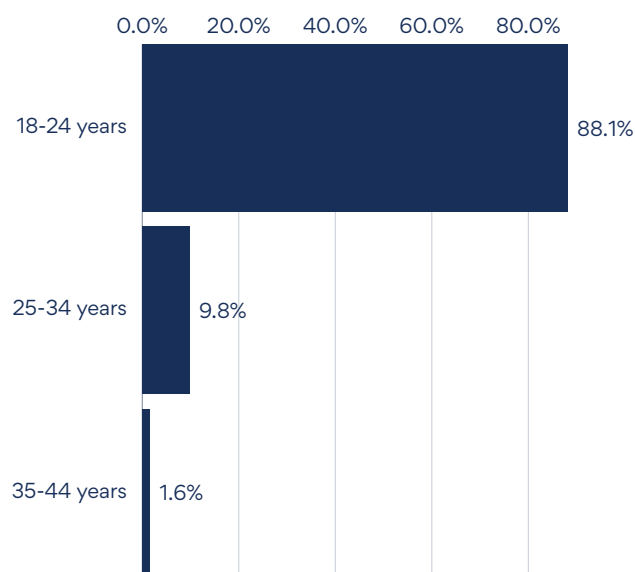
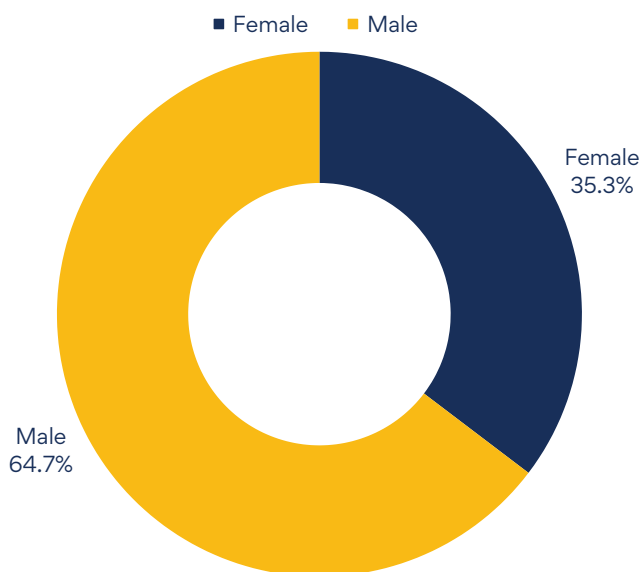
36 037

Views



1.2K hrs


Watch time





TOP-5 YOUTUBE VIDEOS


1



MACHINE LEARNING BASICS
Gaussian Mixture Models (GMMs) and the Expectation Maximization (EM) Algorithm

Machine Learning Basics: Gaussian Mixture Models and the Expectation Maximization Algorithm


2



MACHINE LEARNING BASICS
Ensemble Learning: Bagging, Boosting, Stacking

Machine Learning Basics: Ensemble Learning: Bagging, Boosting, Stacking

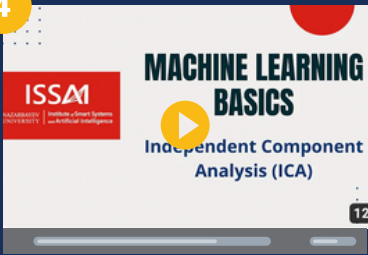
3



ISSAI
A Tutorial on WiFi-based Indoor Localization: Overview

A tutorial on WiFi-based Indoor Localization: Overview


4



MACHINE LEARNING BASICS
Independent Component Analysis (ICA)

Machine Learning Basics Independent Component Analysis

5



MACHINE LEARNING BASICS
Hidden Markov Model (HMM)

Machine Learning Basics: Hidden Markov Model (HMM)



ISSAI ETHICAL PRINCIPLES

ISSAI operates in accordance with the following ethical principles:



Societal Well-Being

AI systems should prioritize the benefits for humanity and the stewardship of the environment, emphasizing sustainability, and observing the Hippocratic credo of “first, do no harm”.



Human-Centered Values

AI systems should respect human rights, the rule of law, and democratic values of freedom and dignity. AI systems should respect the privacy and anonymity of people, incorporating data protection, and observing values of equality, non-discrimination, diversity, social justice, and internationally recognized labor rights.



Transparency

AI systems utilize algorithms and learning methodologies that can be inscrutable, thus it is imperative to ensure responsible disclosure of a system’s design, methodologies, capabilities, limitations, and risks such that humans can understand and challenge the outcomes.



Technical Resilience and Robustness

AI systems must operate in a safe and secure manner, with engineered fault-tolerance and the capacity to detect risks and avoid harm in the event of an error or system failure.



Accountability

Organizations and humans developing, using and/or operating AI systems should be accountable for their proper functioning in line with the above principles.

MEMBERSHIPS

ISSAI is a member of international organizations listed below :



The International Telecommunication Union (ITU) is the specialized United Nations Agency for ICT services and technologies promotion, collaboration, and standardization.



DataCite is a leading global non-profit organization that provides persistent identifiers (DOIs) for research outputs. With the help of DataCite, organizations assign DOIs to their research works. Since August 2020, ISSAI has been a certified repository with the right to assign up to 100 DOIs.



ISSAI researchers are members of the Institute of Electrical and Electronics Engineers (IEEE), the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity.

SUBSCRIPTIONS

ISSAI has subscriptions to services listed below :



NVIDIA invents the Graphic Processing Units and drives advances in AI, HPC, gaming, creative design, autonomous vehicles, and robotics. ISSAI holds 6 Nvidia DGX servers.



Overleaf is a collaborative cloud-based LaTeX editor used for writing, editing and publishing scientific documents. It partners with a wide range of scientific publishers to provide official journal LaTeX templates, and direct submission links.



ISSAI researchers are members of the Midjourney - an independent research lab, which explores new mediums of thought and expanding the imaginative powers of the human species.



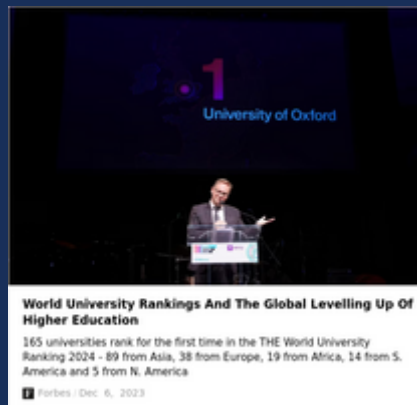
ISSAI researchers are members of OpenAI's GPT-4 - the most advanced system, producing safer and more useful responses for users.



MEDIA ABOUT ISSAI

MEDIA ABOUT ISSAI

ISSAI mentioned in a Forbes Magazine article

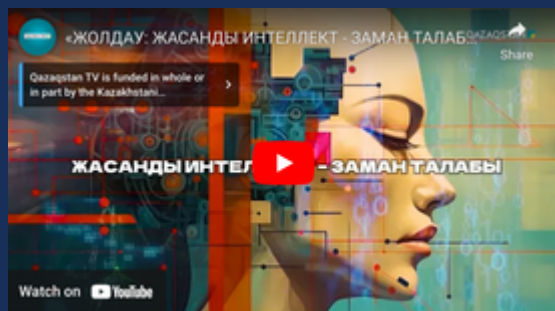


Tengrinews.kz

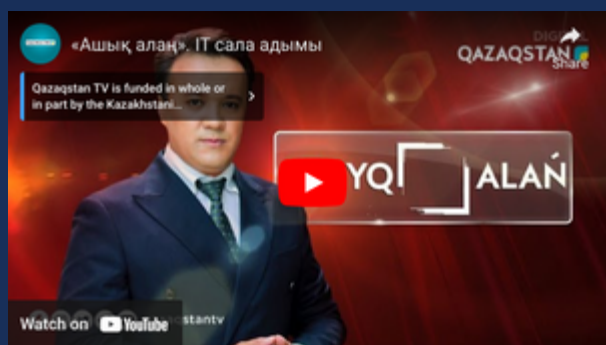
Abai TV



Qazaqstan TV



Qazaqstan TV



MEDIA ABOUT ISSAI

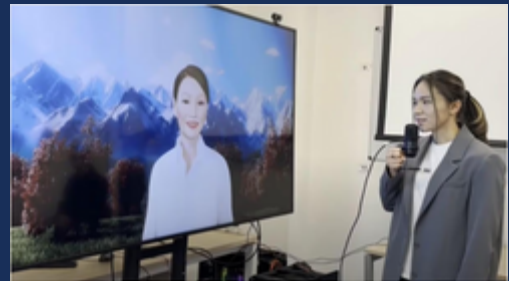


WE Project

ИИ, говорящий по-казахски: в NU создали виртуальный прототип человека

Команда Института умных систем и искусственного интеллекта при Назарбаев Университете, известная казахстанцам по аббревиатуре ISSAI, удивила очередную разработкой. Недавно институт презентовал цифровой прототип...

weproject.media



Nur.kz

ИИ, говорящий на казахском языке: в Назарбаев Университете создали цифровой прототип человека

В Институте умных систем и искусственного интеллекта (ISSAI) при Назарбаев Университете создали цифровой прототип человека – помощницу Umay, сообщили в университете.

PortalNUR.KZ / Dec 15, 2023



Atameken Business News

24.kz

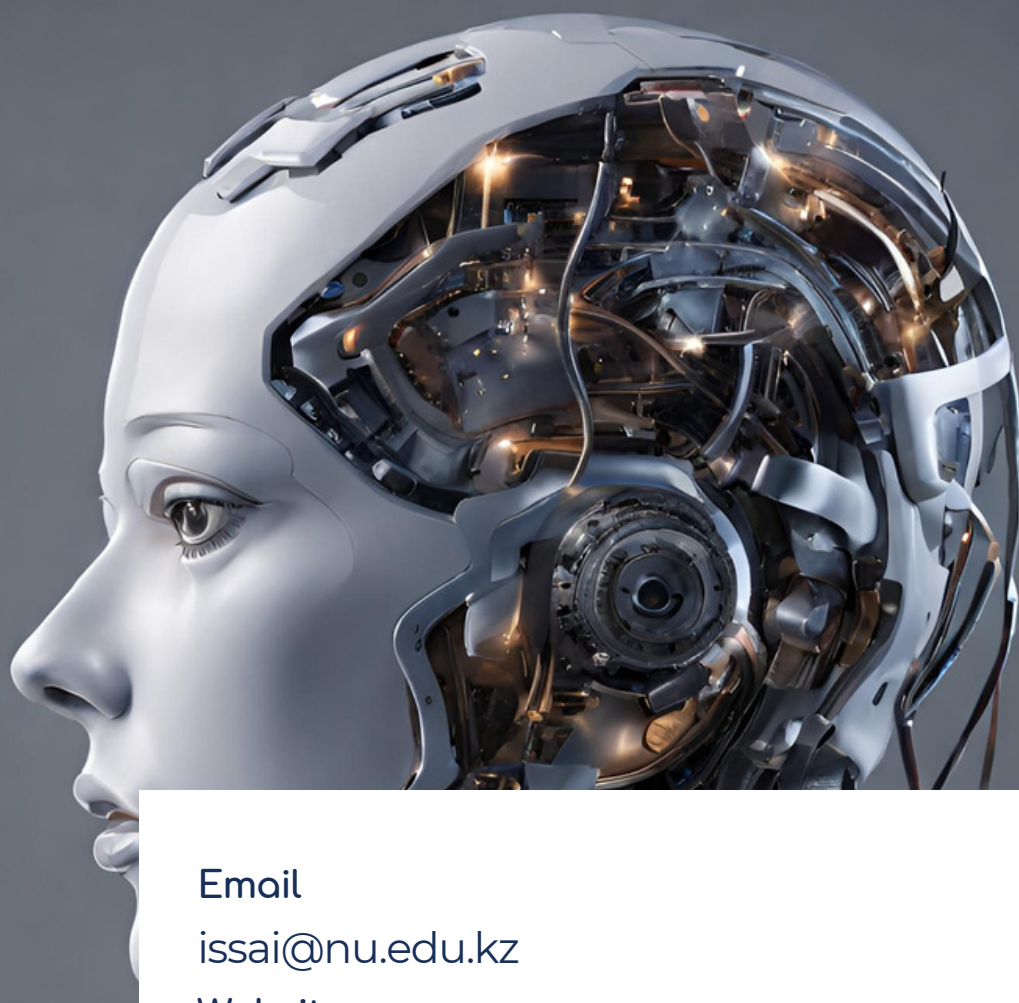


Доктор наук Хусейн Атакан Вароп: «Человечество на пороге величайшего преобразования» | Диалог

Доктор наук Хусейн Атакан Вароп: «Человечество на пороге величайшего преобразования» | Диалог

Новости Казахстана и мира на сегодня / Apr 20, 2023

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