

## Brief information about the project

Name of the project	AR19678998 “Neural computer vision of smart traffic lights in megacities of the country” (0123PK00729)
Relevance	The project is aimed at developing scientific approaches to the use of artificial intelligence (AI) and methods for designing specialized neural networks with computer vision, aimed at solving problems of recognizing the characteristics of vehicle traffic and the collective operation modes of traffic light objects in our country. The main idea: the use of AI to recognize the traffic situation at the intersections of Almaty and Astana and manage traffic taking into account traffic intensity
Purpose	The goal of the project is to create a semi-industrial prototype of a smart traffic light with neural computer vision, which allows you to automatically analyze, optimize and manage vehicle traffic during congestion at adjacent traffic light intersections in large cities of the country
Objectives	<p>Scientific and technical research solves the following problems:</p> <ol style="list-style-type: none"> <li>1. the most appropriate neural network models adapted for solving traffic flow management problems.</li> <li>2. Analysis of the prospects for using already trained neural systems for their adaptation for adaptive traffic lights, taking into account the conditions and standards of the road network of Kazakhstan</li> <li>3. Justification of the parameters of the technical modernization of the traffic light controller DK 2 with a separate block of neurophysical computer vision from the standpoint of compliance with the ST RK and the current regulatory documents of the traffic police.</li> <li>4. Creation of a prototype of a traffic light controller with computer vision for its training, testing and trial operation on a mock-up of adjacent intersections in the laboratory of the Department of AI and Big Data of Al-Farabi Kazakh National University</li> <li>5. Conducting experimental and semi-industrial modernization work to create a semi-industrial model of a smart traffic light with neuro-computer vision and conducting a series of pre-certification tests in the conditions of a test site and lightly loaded city intersections</li> <li>6. Development of technical specifications for typing a semi-industrial prototype and correcting comments on the operation of smart devices, upgrade the traffic light prototype to the level of a pre-production model</li> <li>7. Protection of intellectual property, writing reports and instructions, training staff. Development and publication of workshops and articles in rating publications</li> </ol>
Expected and achieved results	Experimental and semi-industrial modernization work will be carried out to create a semi-industrial model of a smart traffic light with neuro-computer vision and conduct a series of pre-certification tests in the conditions of a test site and lightly loaded intersections of the city

	<p>Pilot tests of smart traffic lights and smart software will be carried out.</p> <p>Work will be carried out to typify and unify sets of IoT devices for smart traffic lights in different sizes and with different software compositions.</p> <p>A technical specification will be developed to typify the semi-industrial prototype and correct comments on the operation of smart devices, to upgrade the traffic light prototype to the level of a pre-production model.</p> <p>Certificates for automated systems will be obtained and the project will be protected by guest supervision authorities.</p> <p>Agreements will be concluded for the supply of sets of smart traffic lights with IoT traffic police devices.</p> <p>Intellectual property protection, writing reports and instructions, and personnel training will be carried out. Workshops and articles will be developed and published in rating publications.</p> <p>Work will be carried out to distribute technical literature on the automation of traffic lights to the traffic police system and seminars and summer schools will be held.</p> <p>The training manual of the RUMS MES RK “Micro Automation” will be published and a chapter will be written on “traffic lights as smart IoT devices with neuro-computer vision.”</p> <p>A patent from the Republic of Kazakhstan and articles in collections of international Scopus conferences will be obtained.</p> <p>Technical literature on the automation of traffic lights will be distributed to the traffic police system. Seminars and summer schools will be held.</p> <p>Police officers and students will be trained in smart technologies in vehicle traffic.</p> <p>Marketing research will be conducted to further expand the sales of smart traffic lights to cities across the country.</p>
<p>Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles</p>	<p>1. Project supervisor: Baurzhan Belgibaev, Doctor of Technical Sciences, h-index = 1 Scopus Author ID: 57223978289  <a href="https://www.scopus.com/authid/detail.uri?authorId=57223978289">https://www.scopus.com/authid/detail.uri?authorId=57223978289</a></p> <p>2. Madina Mansurova, h-index = 5 Researcher ID: O-4501-2014. ORCID: 0000-0001-6284-8283. Scopus Author ID: 56617164900  <a href="https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0002-9680-2758&amp;AUTHORID=56617164900&amp;RIRIGIN=AARIGINE=AARIRIGINEM ID = 0000-0002-9680-2758 &amp; Category = Orcidlink">https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0002-9680-2758&amp;AUTHORID=56617164900&amp;RIRIGIN=AARIGINE=AARIRIGINEM ID = 0000-0002-9680-2758 &amp; Category = Orcidlink</a></p>

	<p>2. Dusmat Zhamangarin, h-index = 2 Scopus Author ID: 57215321713 <a href="https://www.scopus.com/authid/detail.uri?authorId=57215321713">https://www.scopus.com/authid/detail.uri?authorId=57215321713</a></p> <p>3. Sarsembayeva Talshyn, h-index = 2  ORCID: 0000-0001-7668-2640  Scopus Author ID: 57224454827  <a href="https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0001-7668-2640&amp;authorId=57224454827&amp;origin=AuthorProfile&amp;orcid=0000-0001-7668-2640&amp;category=orcidLink">https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0001-7668-2640&amp;authorId=57224454827&amp;origin=AuthorProfile&amp;orcid=0000-0001-7668-2640&amp;category=orcidLink</a></p>
List of publications with links to them	<p>1. Baurzhan Belgibaev, Madina Mansurova, Sanzhar Abdrakhim and Ainur Ormanbekova. Smart traffic lights with video vision based on a control minicomputer in Kazakhstani megacities. - Семинар «Мягкие вычисления и интеллектуальные системы: теория и приложения» Казахстане 7-9 ноября 2023 года одновременно с 14-м Международной конференция по новым повсеместным системам и распространяющимся сетям (EUSPN). SCISTA2023 submission 20 update .- Алматы, 2023.</p> <p>2. Baurzhan Belgibaev, Madina Mansurova, Rahatay Rysbayva, Nurassyl Zholdas. Robotization Of Transport Logistics Of The Surgical Department Of The Hospital.- 17-ая международная конференция IEEE по применению информационных и коммуникационных технологий, IEEE АІСТ2023, 18-20 октября 2023 г.- город Баку, Азербайджан, pp.338-344</p> <p>3. Дуйсембаева Лаура Сериковна, Бельгибаев Бауржан Абдрахимович, Мансурова Мадина Есимхановна, Эбдрэхім Санжар. Елдің мегаполистерінің смарт бағдаршамдарының нейрондық компьютерлік көрінісі.- Авторское свидетельство РК № 39772 от «19» октября 2023 года</p> <p>4. Жамангарин Д.С.Қалалық көлікті басқарудың ІоТ технологиялар негізіндегі интеграцияланған интеллектуалды жүйелері.-ADAL КІТАП, 2023.-242 б.</p>
Patents	-