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USING ARTIFICIAL INTELLIGENCE FOR MONITORING UNAUTHORIZED CONNECTIONS TO CONSUMER POWER NETWORKS

In 2024, the issue of “Electricity theft” remains relevant in Kazakhstan, especially amid the projected electricity shortage, which, according to JSC “KEGOC”, may exceed 1.025 GW. This situation forces the government of the Republic of Kazakhstan to consider measures such as importing electricity from the Russian Federation or introducing consumption restrictions for domestic users. With increasing tariffs and resource shortages, illegal connections place an additional burden on the energy system, leading to financial losses for energy companies and reducing the reliability of power supply.

This article examines a monitoring system for electricity consumption aimed at detecting “Unauthorized connections” and excessive power usage. An AI-based automated management system analyzes electricity consumption in real-time, comparing it with the nominal average value stored in a database. If the consumption exceeds the set limit by 10 %, the program triggers an alarm by sending notifications via SMS to the subscriber’s phone, the Telegram messenger, and activating an alarm signal on the control panel or management system.

If the consumer fails to respond within 10 minutes, the system automatically disconnects power on all phases, preventing possible overloads and unauthorized consumption.

AI-based automated monitoring systems can track electricity consumption in real-time, detect anomalies, and quickly respond to unauthorized connections. This capability helps minimize financial losses, enhance control over power grids, and improve power supply reliability.

AI-driven information technologies are becoming key tools in preventing electricity theft and unauthorized electricity usage, including in the Republic of Kazakhstan.

Keywords: artificial intelligence, unauthorized access, energy consumption, automation of management, monitoring.

Introduction

An unauthorized connection to electrical networks refers to the illegal consumption of electricity without a contract with the supplier or with the intent to reduce the recorded electricity usage. There are several main methods of such connections:

1 Unauthorized Connection to Overhead Power Lines:

- Connecting to a power transmission line (PTL) without permission;
- Using wires for direct connection to high-voltage lines;
- Concealing the connection to resemble an existing legal line.

2 Illegal Connection to Distribution Panels:

- Unauthorized access to a building's electrical panel;
- Connecting to common electrical networks without a meter;
- Using hidden wiring to bypass metering devices.

3 Tampering with the Electricity Meter:

- Placing magnets on the meter to slow down its operation;
- Reprogramming or replacing the meter with a modified version that underreports consumption;
- Installing bypass circuits (jumpers) to use electricity without passing through the meter.

4 Connection to Underground Cable Lines:

- Unauthorized excavation and connection to underground power grids;
- Using hidden cables to supply electricity while bypassing metering;
- Masking illegal connections as part of a legitimate electrical network.

5 Use of Illegal “Dual” Power Supply Schemes:

- Connecting to an alternative unregistered power source;
- Switching between legal and illegal connections to avoid detection;
- Connecting to someone else's electrical line to reduce personal energy costs.

6. Unauthorized Electricity Consumption at Construction Sites:

- Using electricity without a temporary connection contract;
- Directly connecting to a transformer substation;
- Illegally utilizing power grids on private and industrial sites.

7. Large-Scale Unauthorized Connections in Residential Areas:

- Group connections to power grids without proper consumption accounting;
- Use of homemade distribution nodes in garage cooperatives and suburban areas:

- Multiple unregistered consumers drawing power from a single line.

The Code of the Republic of Kazakhstan on Administrative Offenses [1], the document [2]; [3]; [4] strictly regulates illegal connections to electric networks. Currently, fines and liability for unauthorized connection to the electric grid have been tightened in the Republic of Kazakhstan [5]; [6]; [7]; [8]; [9]. In particular, in America, criminal liability is provided for such acts [10].

Research Objective: Utilizing the capabilities of artificial intelligence to monitor unauthorized consumer connections to the power supply.

Materials and methods

The study utilizes machine learning methods, the object-oriented programming language Python, and the following libraries:

- sqlite3 – interaction with the database storing historical data on average electricity consumption;
- smtplib – sending SMS via an SMTP server;
- telepot – working with the Telegram API for automated notifications;
- gpiozero – controlling relay circuit breakers for power disconnection (suitable for use with Raspberry Pi);
- time – implementing delays in the algorithm's execution.

Results and discussion

Let's consider the algorithm of the program code for the **automated management system for monitoring unauthorized consumer connections to the power supply (Fig. 1).

Let's describe the operation of the algorithm.

Algorithm Description:

1 Retrieving Reference Data from SQLite Database:

- The 'sqlite3' library is used to extract the average electricity consumption data for a specific consumer.

2 Monitoring Current Electricity Consumption:

- The program receives input data on the current electricity consumption (in kWh) and compares it with the average values.

3 Detecting Exceedance of the Allowable Threshold:

– If the current consumption exceeds the average level by ****10 %****, the system classifies the situation as a ****potential unauthorized connection**.

4 Alert Mechanisms:

– In the event of anomalous consumption, the system implements three notification methods:

- Sending an SMS warning message (using the 'smtplib' module);
- Sending a notification to Telegram messenger (using the 'telepot' API);

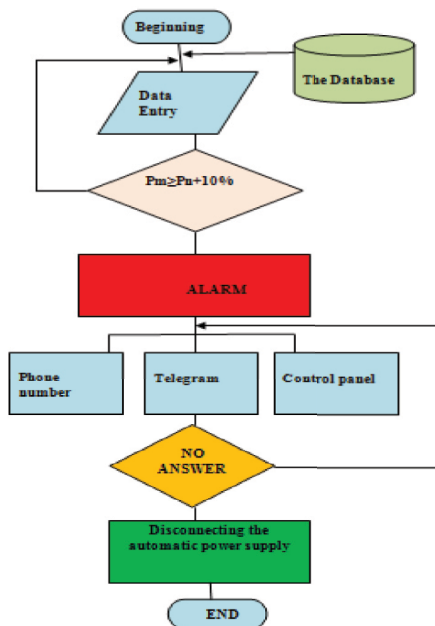


Figure 1–Algorithm of the program code for the automated management system for monitoring unauthorized consumer connections to the power supply

- Activating an alarm signal on the security control panel.

5. Decision to Disconnect the Power Supply:

– If the user does not respond to warning signals within 600 seconds, the system automatically disconnects the power supply by controlling phase relays using the 'gpiozero' module.

The program code “Automated Management System for Monitoring Unauthorized Consumer Connections to the Power Supply”, presented in (Fig. 2–5), is implemented using the Python programming language and is based on the algorithm described above.

Program Description

This Python program monitors electricity consumption to detect unauthorized connections and excessive power usage. It retrieves average power consumption data from a database and compares it with real-time consumption.

```

1  import sqlite3
2  Import time
3  Import smtplib
4  Import telepot
5  From gpiozero import LED #For controlling relay circuit breakers
6
7  def get average power (consumer id):
8      """Retrieve average power consumption from the database."""
9      try:
10         Conn=sqlite3.connect(power_data.db')
11         cursor = conn.cursor()
12         cursor.execute("SELECT avg_power FROM consumers WHERE id=?", (consumer_id,))
13         result = cursor.fetchone()
14         conn.close()
15         return result[0] if result else None
16     except Exception as e:
17         print(f'Error retrieving data from database: {e}')
18         return None
19
20     def send_sms(phone_number, message):
21         """Function to send SMS (uses SMTP, but should be replaced with an API
22         provider)"""
23         try:
24             sender_email = "your_email@example.com"
25             sender_password = "your_password"
26             smtp_server = "smtp.example.com"
27             port = 587

```

Figure 2– The program code “Automated Management System for Monitoring Unauthorized Consumer Connections to the Power Supply”

```

28     server = smtplib.SMTP(smtp_server, port)
29     server.starttls()
30     server.login(sender_email, sender_password)
31     server.sendmail(sender_email, phone_number + "@sms.gateway.com", message)
32     server.quit()
33     print("SMS sent.")
34     except Exception as e:
35         print(f'Error sending SMS: {e}')
36
37     def send_telegram_message(bot_token, chat_id, message):
38         """Function to send messages via Telegram."""
39         try:
40             bot = telepot.Bot(bot_token)
41             bot.sendMessage(chat_id, message)
42             print("Message sent to Telegram.")
43         except Exception as e:
44             print(f'Error sending message to Telegram: {e}')
45
46     def alert_security_panel():
47         """Trigger security panel alarm."""
48         print("SECURITY: ALERT! Unauthorized connection detected.")
49
50     def shutdown_power():
51         """Shutdown power supply on all phases."""
52         try:
53             phase1 = LED(17) # Connect to GPIO
54             phase2 = LED(27)
55             phase3 = LED(22)

```

Figure 3 – The program code “Automated Management System for Monitoring Unauthorized Consumer Connections to the Power Supply”

```

57 phase1.off()
58 phase2.off()
59 phase3.off()
60 print("Power circuits shut down.")
61 except Exception as e:
62     print(f"Error shutting down power: {e}")
63
64 def monitor_power(consumer_id, phone_number, bot_token, chat_id):
65     """Monitor electricity consumption"""
66     average_power = get_average_power(consumer_id)
67     if average_power is None:
68         print("Error: Unable to retrieve average consumption data.")
69     return
70
71     while True:
72         try:
73             current_power = float(input("Enter current electricity consumption (kW/h): "))
74             if current_power > average_power * 1.1:
75                 message = "ALERT! Unauthorized connection detected. Consumption exceeded by
76                 10%."
77                 send_sms(phone_number, message)
78                 send_telegram_message(bot_token, chat_id, message)
79                 alert_security_panel()
80                 time.sleep(60) # Wait for 1 minute response
81                 response = input("Did the consumer respond? (yes/no: ")
82                 if response.lower() != "yes":
83                     shutdown_power()
84                     break

```

Figure 4 – The program code “Automated Management System for Monitoring Unauthorized Consumer Connections to the Power Supply”

```

86 time.sleep(10) # Monitor every 10 seconds
87 except Exception as e:
88     print(f"Error during monitoring: {e}")
89     # Parameters
90     consumer_id = 1
91     phone_number = "1234567890"
92     bot_token = "YOUR_TELEGRAM_BOT_TOKEN"
93     chat_id = "YOUR_TELEGRAM_CHAT_ID"
94     monitor_power(consumer_id, phone_number, bot_token, chat_id)

```

Figure 5– The program code “Automated Management System for Monitoring Unauthorized Consumer Connections to the Power Supply”

If the power usage exceeds 10 % above the nominal value, it triggers a series of alerts and takes corrective actions.

Key Features:

1 Database Integration (`sqlite3`):

- The program retrieves historical power consumption data from an SQLite database;

- Function: `get\_average\_power(consumer\_id)`

2 Real-Time Power Monitoring

- The program continuously checks the electricity consumption provided by the user;

- If consumption surpasses the threshold, it initiates alerts;

- Function: `monitor\_power(consumer\_id, phone\_number, bot\_token, chat\_id)`

3 Alert Mechanisms:

- SMS Notification (`smtplib`): Sends an alert to the user’s phone via email-to-SMS gateway;

- Telegram Alert (`telepot`): Notifies the consumer through Telegram messaging;

- Security Alarm (`alert\_security\_panel()`): Triggers an alert at the security control panel.

- 4 Power Shutdown System (`gpiozero`):

- If the consumer does not respond within 600 seconds, the system automatically cuts off power on all phases.

- Function: `shutdown\_power()`, which controls GPIO-connected relays to turn off power circuits.

- 5 Error Handling

- The program includes `try-except` blocks to catch errors related to database queries, message sending, and power shutdown.

- Execution Process:

- 1 The program retrieves average monthly consumption from the database.

- 2 It continuously monitors the real-time power usage.

- 3 If consumption exceeds 10% above the nominal value, the system:

- Sends an SMS alert.

- Sends a Telegram notification.

- Triggers a security panel alarm.

- 4 If no response is received within 600 seconds, it automatically disconnects power.

- Technologies Used:

- SQLite3: Stores historical power consumption data;

- SMTP (`smtplib`): Sends SMS notifications;

- Telegram API (`telepot`): Sends instant messages to the consumer;

- GPIO (`gpiozero`): Controls power relays for automatic shutdown.

This program is useful for electricity providers and industrial facilities to detect and prevent unauthorized electricity connections, reducing energy losses and ensuring safety. The developed program code was uploaded to the Arduino microcontroller (Fig. 6) presents the functional diagram of the implementation of the automated management system for monitoring unauthorized consumer connections to the power supply.

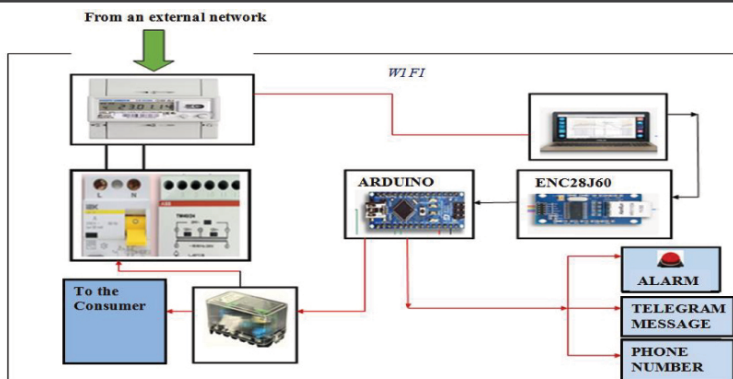


Figure 6 – Functional diagram of the automated management system for monitoring unauthorized consumer connections to the power supply

In the functional diagram: the power supply from the external network is delivered to the metering device, and then to the circuit breakers. The meter readings are accumulated in a database via a Wi-Fi network. The database is connected via mobile access to the ENC28J60 internet module, which transmits data to the Arduino microcontroller, where the program code is uploaded.

Based on the input data, the monitoring process runs continuously. In case of unauthorized connection to the power supply, the system executes the scenario described in the algorithm above.

Conclusions

The proposed automated monitoring system enables the rapid detection of unauthorized electricity consumption. The integration of artificial intelligence with machine learning technology for accurate forecasting, along with SQLite database integration and feedback communication with various devices, ensures the convenience and flexibility of the system.

Currently, a prototype is undergoing testing to improve performance parameters, interfacing devices, and node configurations for the subsequent patent application for a utility model and the possibility of mass production implementation.

Thus, the presented program code is a reliable solution for monitoring electricity consumption and protecting power systems from unauthorized connections.

REFERENCES

1 Кодекс Республики Казахстан об административных правонарушениях. Статья 309-1: Самовольное подключение к электрическим сетям [Электронный ресурс]. – https://kodeksy-kz.com/ka/ob_administrativnyh_pravonarusheniyah/309-1.htm.

2 АО «Астана – Региональная Электросетевая Компания». Уведомление о введении ответственности за самовольное подключение к электрическим сетям [Электронный ресурс] – <https://astrec.kz/ru/news/21265>](<https://astrec.kz/ru/news/21265>).

3 АО «АРЭК». Об ответственности за самовольное подключение к электросети [Электронный ресурс]. – <https://www.arek.kz/ru/press-czentr/company-news/ob-otvetstvennosti-za-samovolnoe-podklyuchenie-k-elektroseti.html>.

4 FlashPress.kz. Административная ответственность за незаконное подключение и использование электроэнергии [Электронный ресурс]. – <https://flashpress.kz/blog/Flash-news/175636.html>.

5 Министерство энергетики Республики Казахстан. Об утверждении Правил пользования электрической энергией [Электронный ресурс]. – <https://adilet.zan.kz/rus/docs/V1500010403>.

6 Inatyr.kz. Новые штрафы ввели в Казахстане за несанкционированное подключение к электросетям [Электронный ресурс]. – <https://www.inatyr.kz/news/3807645/novye-strafy-vveli-v-kazahstane>.

7 Информационно-правовая система «Әділет». О внесении изменений и дополнений в некоторые законодательные акты Республики Казахстан по вопросам электроэнергетики [Электронный ресурс]. – <https://www.adilet.zan.kz/rus/docs/Z1200000025>.

8 Газета «Спектр». Определена ответственность за самовольное подключение к электрическим сетям [Электронный ресурс]. – <https://spectr.com.kz/novosti/kazakhstan/5131-opredelena-otvetstvennost-za-samovolnoe-podklyuchenie-k-elektricheskim-setyam.html>.

9 Zakon.kz. Какой штраф грозит предпринимателям за самовольное подключение к электросетям [Электронный ресурс]. – https://online.zakon.kz/Document/?doc_id=38017070.

10 One to five years in prison for stealing electricity [Электронный ресурс]. – <https://gestoenergy.com/one-to-five-years-in-prison-for-stealing-electricity/>.

REFERENCES

1 Kodeks Respubliki Kazakhstan ob administrativnykh pravonarusheniyakh. Stat'ya 309-1 : Samovol'noe podklyuchenie k elektricheskim setyam. Code

of Administrative Offenses of the Republic of Kazakhstan. Article 309-1 : Unauthorized connection to electrical networks] : [Electronic resource]. – https://kodeksy-kz.com/ka/ob_administrativnyh_pravonarusheniyah/309-1.html.

2 AO «Astana – Regional’naya Elektrosетevaya Kompaniya». Uvedomlenie o vvedenii otvetstvennosti za samovol’noe podklyuchenie k elektricheskim setyam. [JSC «Astana – Regional Electric Grid Company». Notification on the introduction of responsibility for unauthorized connection to electrical networks] [Electronic resource]. – <https://astrec.kz/ru/news/21265>

3 AO «AREK». Ob otvetstvennosti za samovol’noe podklyuchenie k elektroseti [JSC “AREK”. On liability for unauthorized connection to the electrical network] [Electronic resource]. – <https://www.arek.kz/ru/press-czentr/company-news/ob-otvetstvennosti-za-samovolnoe-podklyuchenie-k-elektroseti.html>

4 FlashPress.kz. Administrativnaya otvetstvennost’ za nezakonnoe podklyuchenie i ispol’zovanie elektroenergii [Administrative liability for illegal connection and use of electricity] [Electronic resource]. – <https://flashpress.kz/blog/Flash-news/175636.html>

5 Ministerstvo energetiki Respubliki Kazakhstan. Ob utverzhdenii Pravil pol’zovaniya elektricheskoy energiyey. Ministry of Energy of the Republic of Kazakhstan [Approval of the Rules for the Use of Electric Energy] [Electronic resource]. – <https://adilet.zan.kz/rus/docs/V1500010403>

6 Inatyr.kz. Novye shtrafy vveli v Kazakhstane za nesanktsionirovannoe podklyuchenie k elektrosetyam [New fines introduced in Kazakhstan for unauthorized connection to power grids] [Electronic resource]. – <https://www.inatyr.kz/news/3807645/novye-strafy-vveli-v-kazahstane>

7 Informatsionno-pravovaya sistema «Adilet». O vnesenii izmeneniy i dopolneniy v nekotorye zakonodatel’nye akty Respubliki Kazakhstan po voprosam elektroenergetiki. Information and Legal System «Әділет» [Amendments and additions to certain legislative acts of the Republic of Kazakhstan on electricity issues] [Electronic resource]. – <https://www.adilet.zan.kz/rus/docs/Z1200000025>

8 «Spektr» Newspaper. Opredelena otvetstvennost’ za samovol’noe podklyuchenie k elektricheskim setyam [Responsibility for unauthorized connection to electrical networks has been defined] [Electronic resource]. – <https://spectr.com.kz/novosti/kazakhstan/5131-opredelena-otvetstvennost-za-samovolnoe-podklyuchenie-k-eletricheskim-setyam.html>

9 Zakon.kz. Kakoï shtraf grozit predprinimatelyam za samovol’noe podklyuchenie k elektrosetyam [What fines do entrepreneurs face for unauthorized connection to power grids] [Electronic resource]. – https://online.zakon.kz/Document/?doc_id=38017070

10 One to five years in prison for stealing electricity [Электронный ресурс]. – <https://gestoenergy.com/one-to-five-years-in-prison-for-stealing-electricity/>

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ЖАСАНДЫ ИНТЕЛЛЕКТТІ ЭЛЕКТР ЖҮЙЕЛЕРІНЕ ТҰТЫНУШЫЛАРДЫҢ РҰҚСАТСЫЗ ҚОСЫЛУЫН МОНИТОРИНГТЕУ ҮШІН ПАЙДАЛАНУ

2024 жылы Қазақстанда «Электр энергиясын ұрлау» мәселесі өзекті болып қала береді, әсіресе «KEGOC» АҚ деректеріне сәйкес 1,025 ГВт-тан кем емес электр энергиясының тапшылығы күтілуде. Бұл жағдай Қазақстан Республикасының билігін Ресей Федерациясынан электр энергиясын импорттау немесе ішкі тұтынушыларға шектеулер енгізу сияқты шараларды қарастыруға мәжбүрлейді. Тарифтердің өсуі және ресурстардың жетіспеушілігі жағдайында заңсыз қосылымдар энергия жүйесіне қосымша жүктеме салып, энергетикалық компаниялардың қаржылық шығындарын арттырып, электрмен жабдықтаудың сенімділігін төмендетеді.

Бұл мақала «Рұқсатсыз қосылымдарды» және «шамадан тыс қуат тұтынуды» анықтауға арналған электр энергиясын тұтынуды бақылау жүйесін қарастырады. Жасанды интеллект негізіндегі автоматтандырылған басқару жүйесі электр энергиясын нақты уақыт режимінде талдайды, оны дерекқорда сақталған орташа номиналды мәнмен салыстырады. Егер тұтыну белгіленген шекті 10 %-ға асып кетсе, бағдарлама абоненттің телефонына SMS арқылы, Telegram мессенджері арқылы хабарлама жіберіп, басқару панелінде немесе басқару жүйесінде дабыл сигналын іске қосып ескертулер жасайды.

Егер тұтынушы 10 минут ішінде жауап бермесе, жүйе барлық фазалардағы электрмен жабдықтауды автоматты түрде өшіреді, бұл мүмкін болатын шамадан тыс жүктемелер мен заңсыз тұтынудың алдын алады.

Жасанды интеллект негізіндегі автоматтандырылған мониторинг жүйелері электр энергиясын нақты уақыт режимінде қадағалап, аномалияларды анықтап, рұқсатсыз қосылымдарға жедел әрекет ете алады. Бұл қаржылық шығындарды азайтуға, электр желілерін бақылауды жақсартуға және электрмен жабдықтаудың сенімділігін арттыруға көмектеседі.

Жасанды интеллектке негізделген ақпараттық технологиялар электр энергиясын ұрлау мен рұқсатсыз электр энергиясын пайдаланудың алдын алуда маңызды құралға айналууда, оның ішінде Қазақстан Республикасында да.

Кілтті сөздер: жасанды интеллект, рұқсатсыз қолжетімділік, энергия тұтыну, автоматтандырылған басқару, мониторинг.

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ИСПОЛЬЗОВАНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА ДЛЯ МОНИТОРИНГА НЕСАНКЦИОНИРОВАННОГО ПОДКЛЮЧЕНИЯ К ЭНЕРГОСЕТЯМ ПОТРЕБИТЕЛЕЙ

В 2024 году в Казахстане проблема «кражи электроэнергии» остается актуальной, особенно на фоне прогнозируемого дефицита электроэнергии, который, по данным АО «KEGOC», может составить не менее 1,025 ГВт.

Это вынуждает власти Республики Казахстан, рассматривать меры по импорту электроэнергии из Российской Федерации или введению ограничений для внутренних потребителей. В условиях роста тарифов и нехватки ресурсов «Нелегальные подключения создают дополнительную нагрузку на энергосистему», увеличивая финансовые потери энергокомпаний и снижая надёжность электроснабжения.

В данной статье рассматривается система мониторинга потребления электроэнергии с целью выявления «Несанкционированных подключений» и «Чрезмерного использования мощности». Автоматизированная система управления на основе искусственного

интеллекта, анализирует потребление электроэнергии в режиме реального времени, сравнивая его со средним номинальным значением, хранящимся в базе данных. В случае превышения установленного лимита на 10 %, программа инициирует тревожные оповещения, отправляя уведомления через «SMS» на телефон абонента, мессенджер Telegram, а также активируя «сигнал тревоги на панель управления или систему управления.

Если потребитель не реагирует на полученные сообщения в течение определенного времени 10 минут, система автоматически «отключает электроснабжение на всех фазах», предотвращая возможные перегрузки и незаконное потребление.

Автоматизированные системы мониторинга на основе искусственного интеллекта, способны в режиме реального времени отслеживать потребление электроэнергии, выявлять аномалии и оперативно реагировать на несанкционированные подключения, что позволяют минимизировать финансовые потери, улучшить контроль над электросетями и повысить надёжность энергоснабжения.

Информационные технологии на основе искусственного интеллекта становятся «ключевыми» в предотвращении краж и несанкционированного использования электрической энергии в том числе и в Республике Казахстан.

Ключевые слова: искусственный интеллект, не санкционированный доступ, энергопотребление, автоматизированное управление, мониторинг.

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