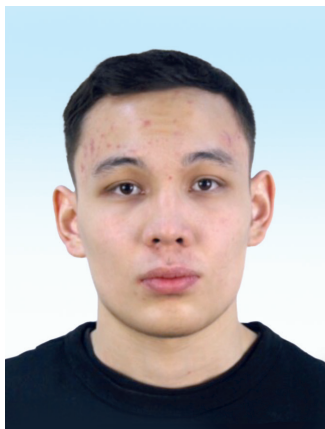


APPLICATION OF ARTIFICIAL INTELLIGENCE FOR CONSTRUCTION OF WELL IPR



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The development of artificial intelligence (AI) technologies opens up new opportunities for optimization and automation of processes in the oil and gas industry. The use of AI in this area is aimed at improving the procedures for searching, producing, processing and transporting hydrocarbons. The article contains practical examples of using AI to analyze geological data, predict well production, automate equipment control, and improve the safety of work processes. The potential benefits and challenges associated with the application of artificial intelligence in the industry are also highlighted. The study contains a comparative analysis of the effectiveness of traditional methods and AI-based methods, as well as recommendations for their implementation in enterprises.

The development and implementation of AI-based systems in the oil and gas industry provides additional benefits. Deep learning tools may have difficulty identifying complexities in data processed using traditional methods. This can significantly speed up decision-making processes, with the introduction of new fields or the optimization of existing laws.

However, the article also discusses the risks and limitations associated with the application of AI in the oil and gas sector. In particular, attention to quality and objective initial training, potential security threats, and issues of responsibility for decision making using automated systems.

To ensure the development of AI in the oil and gas industry, it is also necessary to take into account the specifics of this industry, the characteristics of corporate culture and the readiness of personnel to change. In conclusion, recommendations were formulated for training specialists and creating interdisciplinary teams for the successful development of artificial intelligence technologies in production processes.

KEYWORDS: artificial intelligence, oil and gas industries, optimization, automation, geological data, forecasting, safety, integration technologies.

ҰҢҒЫМАНЫҢ ИНДИКАТОРЛЫҚ ДИАГРАММАСЫН ҚҰРУ ҮШІН ЖАСАНДЫ ИНТЕЛЛЕКТТІ ҚОЛДАНУ

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Жасанды интеллект (ЖИ) технологияларының дамуы мұнай-газ саласындағы процестерді оңтайландыру мен автоматтандырудың жаңа мүмкіндіктерін ашады. Бұл салада ЖИ қолдану көмірсутектерді іздеу, өндіру, өңдеу және тасымалдау процедураларын жақсартуға бағытталған. Мақалада геологиялық деректерді талдауға, ұңғымаларды өндіруді болжауға, жабдықты басқаруды автоматтандыруға және жұмыс процестерінің қауіпсіздігін арттыруға арналған ЖИ практикалық мысалдары келтірілген. Өнеркәсіпте жасанды интеллектті қолданумен байланысты ықтимал артықшылықтар мен қиындықтар да атап өтілген. Зерттеуде дәстүрлі әдістер мен ЖИ негізіндегі әдістердің тиімділігінің салыстырмалы талдауы, сондай-ақ оларды кәсіпорындарда енгізу бойынша ұсыныстар бар.

Мұнай-газ саласында ЖИ негізіндегі жүйелерді әзірлеу және енгізу қосымша артықшылықтар береді. Терең оқыту құралдары дәстүрлі әдістерді қолдана отырып өңделген деректердің күрделілігін анықтауда қиындықтарға тап болуы мүмкін. Бұл жаңа өрістерді енгізу немесе қолданыстағы заңдарды оңтайландыру арқылы шешім қабылдау процестерін айтарлықтай жылдамдатуы мүмкін.

Дегенмен, мақалада мұнай-газ секторында ЖИ қолданумен байланысты тәуекелдер мен шектеулер де қарастырылады. Атап айтқанда, сапалы және объективті бастапқы дайындыққа, қауіпсіздіктің ықтимал қатерлеріне және автоматтандырылған жүйелерді пайдалану арқылы шешім қабылдауға жауапкершілік мәселелеріне назар аудару.

Мұнай-газ саласында ЖИ дамуын қамтамасыз ету үшін сонымен қатар осы саланың ерекшеліктерін, корпоративтік мәдениеттің ерекшеліктерін және персоналдың өзгерістерге дайындығын ескеру қажет. Қорытындылай келе, өндірістік процестерде жасанды интеллект технологияларын табысты дамыту үшін мамандарды дайындау және пәнаралық командаларды құру бойынша ұсыныстар тұжырымдалды.

ТҮЙІН СӨЗДЕР: жасанды интеллект, мұнай және газ өнеркәсібі, оңтайландыру, автоматтандыру, геологиялық деректер, болжау, интеграциялық технологиялар.

ПРИМЕНЕНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА ДЛЯ ПОСТРОЕНИЯ ИНДИКАТОРНОЙ ДИАГРАММЫ СКВАЖИН

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Развитие технологий искусственного интеллекта открывает новые возможности для оптимизации и автоматизации процессов в нефтегазовой отрасли. Использование искусственного интеллекта в этой области направлено на совершенствование процедур поиска, добычи, обработки и транспортировки углеводородов. В статье практические примеры искусственного интеллекта для анализа геологических дан-

ных, прогнозирования дебита скважин, автоматизации управления оборудованием и повышения безопасности рабочих процессов. Освещаются также потенциальные преимущества и вызовы, связанные с применением искусственного интеллекта в отрасли. Исследование содержит сравнительный анализ эффективности традиционных методов и методов на основе искусственного интеллекта, а также рекомендации по их внедрению на предприятиях.

Разработка и внедрение систем на основе искусственного интеллекта в нефтегазовой отрасли обеспечивают дополнительные выгоды. Инструменты глубокого обучения могут с трудом выявить сложности в данных, которые обрабатываются с помощью традиционных методов. Это может значительно ускорить процессы принятия решений, с внедрением новых месторождений или оптимизацией действующих законов.

Тем не менее, в статье также обсуждаются риски и ограничения, связанные с применением искусственного интеллекта в нефтегазовой сфере. В частности, внимание к качественному и объективному начальному обучению, потенциальным угрозам безопасности, а также вопросам ответственности за принятие решений с использованием автоматизированных систем.

Для обеспечения развития искусственного интеллекта в нефтегазовой отрасли необходимо также учитывать специфику данной отрасли, особенности корпоративной культуры и готовность персонала к изменениям. В заключении были сформулированы рекомендации по обучению специалистов и созданию междисциплинарных команд для успешного развития технологий искусственного интеллекта на производственных процессах.

КЛЮЧЕВЫЕ СЛОВА: искусственный интеллект, нефтегазовые отрасли, оптимизация, автоматизация, геологические данные, прогнозирование, технологии интеграции.

Introduction. The application of artificial intelligence in the oil and gas industry represents a new era of technical progress focused on improving processes, increasing efficiency, and mitigating risks. The petroleum sector has several complex obstacles, including the interpretation of geological data, predicting well yields, and detecting leaks, among other issues. Given the escalating requirements for extraction operations and the growing emphasis on environmental regulations, the integration of artificial intelligence (AI) provides extraction firms with a framework to make well-informed judgements using extensive datasets [1]. When subjected to machine learning algorithms, this dataset provides organisations with valuable information pertaining to possible reservoirs, estimations of production rates, and projections for safety operations. Currently, there is a noticeable transition occurring in which several technical methods that formerly relied on human intuition and skill are being replaced by AI-based systems. This change is resulting in an increased degree of accuracy and efficiency. The importance of efficient data management and accurate analytical forecasting in the petroleum industry should not be underestimated. In the context of intensifying market rivalry and the process of globalisation, the capacity to forecast trends, identify possible risks, and promptly adjust to changing conditions may become a crucial factor in determining the success of businesses [2]. Artificial intelligence (AI) presents new opportunities for enhancing operational process optimisation, reducing data analysis time, and expediting decision-making [3]. By using state-of-the-art technology and techniques, such as deep learning and neural networks, it is possible to develop automated monitoring and diagnostic systems, as well as prediction models for reservoir behaviour and optimal extraction procedures.

As a result, the integration of artificial intelligence in the petroleum industry not only provides innovative analytical and managerial resources, but also enables a transition towards a new operational framework in which data, analytics, and automation are of utmost significance.

In recent years, there has been a notable increase in the development of artificial intelligence (AI) applications within the petroleum industry [4]. In their 2020 publication, Saghir et al. from Schneider Electric highlighted the incorporation of Augmented Intelligence into Edge Analytics. The authors emphasised that this integration enables oil and gas operators to train machine learning models without requiring prior knowledge in the field of Data Science. The utilisation of a no-code method streamlines the process of digital decision-making for end-users, hence reducing the level of complexity required for entrance into the system. Moreover, the notion of utilising Augmented Intelligence in the workflow of upstream operations is not limited just to rod pumps. It also encompasses other artificial lift systems such as Electric Submersible Pumps (ESP), Progressive Cavity Pumps (PCP), and Plunger Lift. Artificial intelligence (AI) is progressively becoming a crucial instrument for scholarly investigation and technological advancement [5]. In 2015, a study was conducted by Mohamed Nageh and Helmy Sayyounh from Cairo University. The researchers utilised fuzzy logic, an artificial intelligence methodology, to develop a model for the selection of criteria in Enhanced Oil Recovery (EOR) methodologies [6]. The researchers' technique was based on conducting a statistical analysis of a comprehensive database that included 347 successful enhanced oil recovery (EOR) operations from across the world [7]. The tool that has been created exhibits the capability to conduct screening for a total of fourteen various Enhanced Oil Recovery (EOR) methodologies [8]. Upon further examination, it becomes apparent that the integration of artificial intelligence with other technical methodologies and advancements presents an opportunity to develop powerful tools specifically designed to enhance the efficiency of oil and gas extraction and processing.

The use of artificial intelligence (AI) for data processing and analysis is gaining significant traction within the oil and gas sector. In 2016, a research was done by Korovin, Tkachenko, and Khisamutdinov from the Research Institute of MVS at Southern Federal University. The study aimed to investigate the processing of intelligent seismic survey data. It was inferred by the researchers that employing such a methodology has the potential to significantly alleviate the effects of subjectivity and errors in mathematical models [9]. There is a significant focus on customising processes to suit specific production circumstances, analysing past events in a systematic manner, and identifying hidden patterns within telemetric data archives. The researchers emphasised the need of gathering and analysing historical data in formats that can be easily read and processed by machines. This facilitates more in-depth analyses and predictions. The successful implementation of this strategy requires a comprehensive systematisation and automation of digital documentation, encompassing rock studies and operational operating criteria [10]. Significant emphasis is placed on the application of artificial neural networks as a fundamental tool for information processing, highlighting their effectiveness in efficiently categorising extensive collections of data. This holds particular relevance in the context of real-time management of oilfield activities [11]. Therefore, the incorporation

and advancement of artificial intelligence (AI) within the oil and gas industry not only enhances the efficiency of data processing and analytical methods, but also facilitates a more comprehensive understanding of various processes. Consequently, this leads to improved production optimisation and increased operational effectiveness.

In the year 2021, Armstrong Lee Agbadji, representing Armstrong & LightFoot, engaged in a discourse pertaining to the current state of affairs around the implementation and integration of digital transformation within the oil sector. The author highlights the potential of artificial intelligence, big data, and analytics to significantly transform the oil and gas industry. When integrated, these technologies have the potential to become of utmost importance, exerting a significant influence on the future of the sector [12]. These techniques will become highly effective instruments for predicting, offering an unprecedented level of precision that was previously unattainable. Artificial intelligence (AI) is a very promising field characterised by several potential and is now undergoing significant advancements. Agbadji asserts that while artificial intelligence may not be able to prevent major disasters such as the Exxon Valdez oil leak in 1989 or the BP Macondo incident in 2010, it possesses the capacity to aid in their anticipation [13].

Agbadji emphasises that despite the sector's nascent understanding of artificial intelligence (AI), a "arms race" has already been initiated. Firms and organisations are engaged in intense competition, and the ultimate result of this competition remains uncertain. Progressive oil and gas organisations are actively using artificial intelligence (AI) into their complete value generation process. The organisation is strategically positioning itself in order to surpass competition and succeed in an era where digital transformation will distinguish industry leaders from those who fall behind. According to Agbadji, it is postulated that data would emerge as the predominant "currency" in the energy industry, superseding oil, in the forthcoming era. Failure to increase investments in artificial intelligence (AI) and alternative energy sources within the oil and gas business may result in a potential decline in competitiveness [14].

Materials and methods of research. In contemporary society characterised by rapid technology advancements, the integration of advanced technical instruments across many industries has emerged as an essential component of inventive innovation. In recent years, the oil and gas sector, which has historically been characterised by a reluctance to adopt innovative practises, has demonstrated a proactive approach in exploring avenues to enhance operational efficiency and effectiveness by using sophisticated technology. One of the most auspicious domains in this particular context is to the use of artificial intelligence (AI) technologies, specifically focusing on models of the generative pre-trained transformer, such as ChatGPT. These models exhibit a significant level of versatility and may be applied in a wide range of activities, encompassing data analysis, forecasting, and the automation of communication operations. The objective of this research is to analyse the prospective uses and capacities of ChatGPT-based models within the oil and gas sector. The objective of this study is to assess the efficacy and practical implications of integrating real-life instances and experiments in addressing the present and future challenges faced by the sector. Acknowledging the significance of impartial study, our objective is to do the analysis in an unbiased manner, while considering all potential hazards and constraints linked to the utilisation of artificial intelligence (AI) in the very crucial and accountable domain of the oil and gas sector.

The Inflow Performance Relationship (IPR) has significant importance as a technique for evaluating well performance within the oil and gas sector. The IPR graph illustrates the relationship between the rate of liquid flow and the corresponding pressure decrease within the well. The construction of this graph enables engineers to make predictions regarding the performance of a well under different operational circumstances. Leveraging models such as ChatGPT in coding endeavours can provide notable improvements in both efficiency and ease of the development process [15]. Engineers have the option to express their duties in textual format instead of relying on manual code creation and testing. By doing so, ChatGPT can provide the suitable code solution for the given problem. This might be particularly advantageous for engineers who possess less expertise in programming.

Suppose we have the following data for the well:

- Maximum flow rate (Q_{max})
- Saturation pressure (P_{wf})

We need to construct an IPR graph that shows the liquid flow rate from the pressure drop. By making a request to ChatGPT based on our data, we get the following answer:

```
python Copy code

import numpy as np
import matplotlib.pyplot as plt

def ipr_curve(Qmax, Pwf, n_points=100):
    P = np.linspace(0, Pwf, n_points)
    Q = Qmax * (1 - np.sqrt(P/Pwf))
    return P, Q

# Example data
Qmax = 100 # m3/day
Pwf = 250 # atm

P, Q = ipr_curve(Qmax, Pwf)

plt.figure(figsize=(10, 6))
plt.plot(Q, P, '-o', label='IPR Curve')
plt.xlabel('Flow rate, m3/day')
plt.ylabel('Pressure drop, atm')
plt.title('IPR Graph')
plt.legend()
plt.grid(True)
plt.show()
```

Figure 1 – Code provided by ChatGPT

This code uses the numpy libraries for mathematical calculations and matplotlib for plotting graphs. The `ipr_curve` function returns two arrays: values of pressure and corresponding flow rates, which are then used to plot the graph. ChatGPT is capable of processing this request in a fraction of a second.

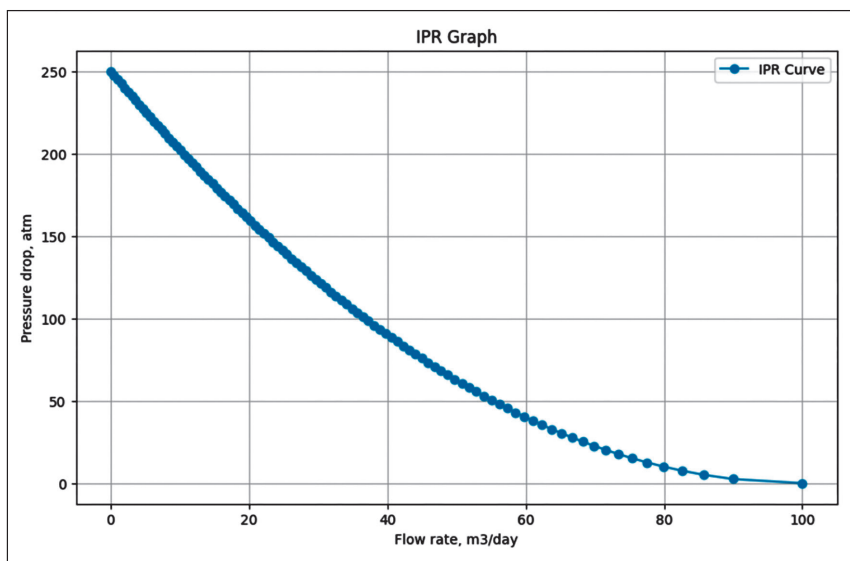


Figure 2 – IPR graph produced by ChatGPT

Within the oil and gas industry, the use of ChatGPT is possible not only for code generation but also for:

- Model selection: Based on available data, ChatGPT can suggest the most suitable mathematical model to describe the well's IPR.
- Optimization: Automatic parameter tuning to achieve the best fit to experimental data.
- Integration with other systems: Generating code for integration with data management systems, SCADA, and other tools used in the oil and gas industry.

```
python Copy code

from scipy.optimize import curve_fit

# Experimental data
P_exp = np.array([10, 50, 100, 150, 200])
Q_exp = np.array([90, 75, 50, 20, 5])

def model_func(P, Qmax, Pwf):
    return Qmax * (1 - np.sqrt(P/Pwf))

params, _ = curve_fit(model_func, P_exp, Q_exp)

Q_fit = model_func(P, *params)

plt.figure(figsize=(10, 6))
plt.plot(Q, P, 'o-', label='Initial IPR')
plt.plot(Q_fit, P, 's-', label='Optimized IPR')
plt.plot(Q_exp, P_exp, 'r.', label='Experimental data')
plt.xlabel('Flow rate, m3/day')
plt.ylabel('Pressure drop, atm')
plt.title('Comparison of Initial and Optimized IPR')
plt.legend()
plt.grid(True)
plt.show()
```

Figure 3 – Code provided by ChatGPT

Suppose we have experimental flow rate and pressure drop data, and we want to fit our IPR model to this data using optimization methods.

In this code, the `'curve_fit'` function from the `scipy` library is used to fit our IPR model to the experimental data.

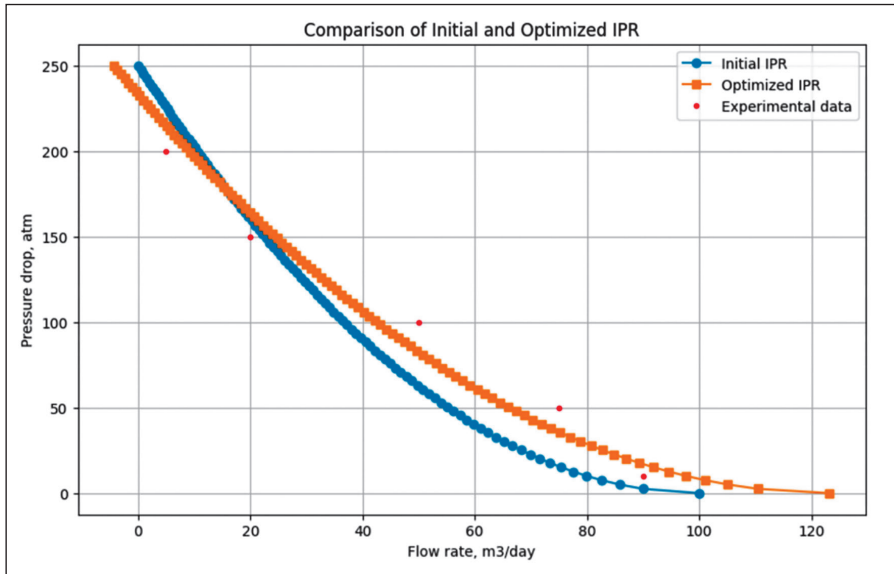


Figure 4 – IPR graph produced by ChatGPT

Given the increasing complexity of tasks facing engineers in the oil and gas industry, automated tools like ChatGPT can offer significant advantages. The code-writing process speeds up the development process, reduces the number of errors, and obtains more reliable results due to the ability to quickly conduct numerical experiments and optimization. For example, we have the following data from *Figure 5* for a well.

We make a request to ChatGPT to write a Python platform code for plotting and fully solving the problem:

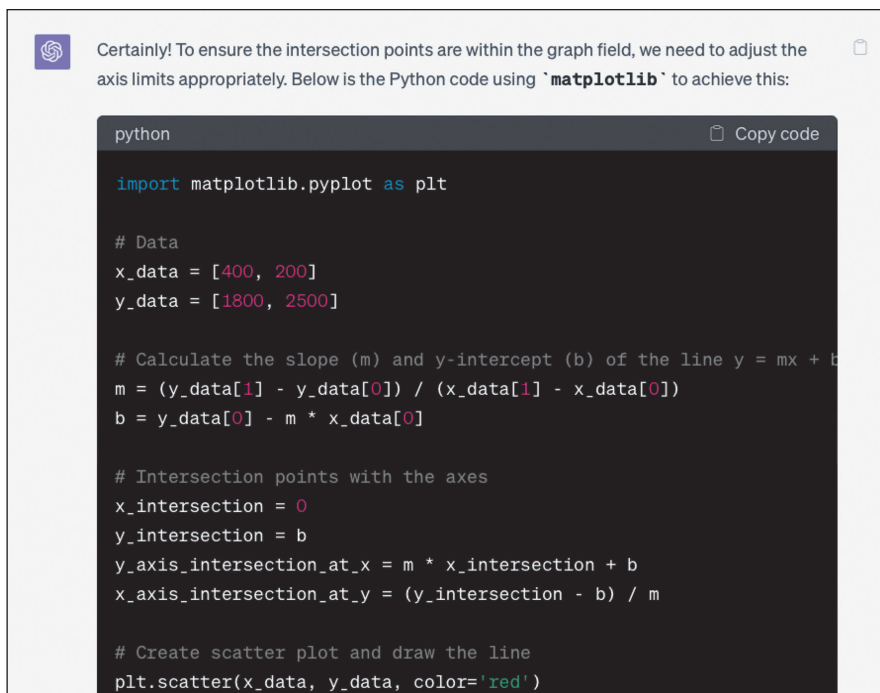
T

q	P
400	1800
200	2500

Generate python code to create a scatter plot. Write the code so that a line appears between two points. Write the code so that the line intersects the x and y axes. Write this code so that it shows the exact values at the points of intersection with the axes on the graph.

Figure 5 – Request to ChatGPT

We receive the following result:



```
python
import matplotlib.pyplot as plt

# Data
x_data = [400, 200]
y_data = [1800, 2500]

# Calculate the slope (m) and y-intercept (b) of the line y = mx + b
m = (y_data[1] - y_data[0]) / (x_data[1] - x_data[0])
b = y_data[0] - m * x_data[0]

# Intersection points with the axes
x_intersection = 0
y_intersection = b
y_axis_intersection_at_x = m * x_intersection + b
x_axis_intersection_at_y = (y_intersection - b) / m

# Create scatter plot and draw the line
plt.scatter(x_data, y_data, color='red')
```

Figure 6 – Response from ChatGPT

We input the ChatGPT response into the Python platform and obtain:

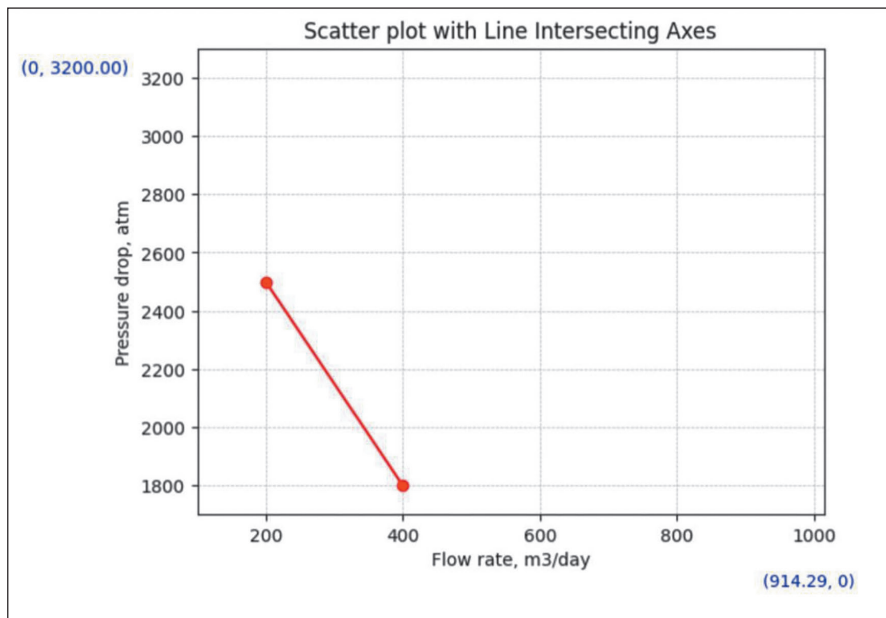


Figure 7 – IPR graph produced by ChatGPT

Thus, it can be noticed that ChatGPT has great potential on an industrial scale, as this platform requires only fractions of a second to process a request.

Apart from this example, the capabilities of ChatGPT in the oil and gas industry are limitless and have huge potential. For instance, generating code for well development, in the context of programming related to data analysis and processing, modeling, and forecasting.

Here are a few examples of where ChatGPT can help:

- Analysis and processing of well data.

Scenario: You need to process well flow rate data over a certain period of time to determine the average flow rate.

Request to ChatGPT: "I need Python code to analyze the time series of a well's flow rate and calculate the average value."

Response from ChatGPT:

```
python Copy code

import pandas as pd

data = pd.read_csv('debit_data.csv')
average_debit = data['debit'].mean()
print(f"Average flow rate: {average_debit} m3/day")
```

Figure 8 – Response provided by ChatGPT

- Reservoir pressure modeling:

Scenario: You want to use Darcy's law to calculate reservoir pressure based on known data.

Request to ChatGPT: "How to implement Darcy's law in Python for reservoir pressure calculation?"

Response from ChatGPT:

```
python Copy code

def darcy_equation(perm, visc, len, area, pres_diff):
    q = (perm * area * pres_diff) / (visc * len)
    return q
```

Figure 9 – Response provided by ChatGPT

- Well performance forecasting:

Scenario: Using the well performance data from the past year, you aim to predict the well's rate for the upcoming month using simple linear regression.

Request to ChatGPT: "Provide a code for forecasting the well rate for the next month using linear regression."

Response from ChatGPT:

```
python Copy code

import pandas as pd
from sklearn.linear_model import LinearRegression
import numpy as np

data = pd.read_csv('well_data.csv')
X = np.array(range(len(data))).reshape(-1, 1) # Transform days into
y = data['debit']

model = LinearRegression().fit(X, y)
next_month = len(data) + 30
prediction = model.predict([[next_month]])
print(f"Predicted flow rate on day {next_month}: {prediction[0]} m3
```

Figure 10 – Response provided by ChatGPT

These illustrations show how well-development professionals may benefit from ChatGPT's assistance with data analysis and coding. Nevertheless, in practical situations, particularly when dealing with complex models and extensive datasets, it is advisable to engage professionals and verify the offered solutions.

There are several instances in which the integration of ChatGPT with the Python programming language might prove to be a significant asset for the oil and gas sector. These instances encompass a wide range of applications, some of which are outlined below, although this list is not exhaustive:

1. The utilisation of GPT models enables the automated generation of reports or summaries following the analysis of well-related or extracted data.

2. Data Analysis: Employ the Python programming language to gather and manipulate data from diverse sources, subsequently utilising ChatGPT to analyse the findings or respond to inquiries pertaining to the analysis.

3. Process Optimisation: Utilising data pertaining to extraction, wells, and several other elements, ChatGPT has the capability to provide prospective enhancements or modifications to the existing processes.

4. Forecasting: By using past data and employing machine learning models, it becomes possible to anticipate prospective challenges or patterns in the extraction process. ChatGPT has the capability to analyse the outcomes and offer clear and concise elucidations.

These instances just represent a fraction of the overall phenomenon. The integration of Python and ChatGPT presents a multitude of potential applications within the oil and gas sector, hence expanding the range of options available. I propose inquiring directly with ChatGPT on its potential to provide assistance in the domain of oil field development.

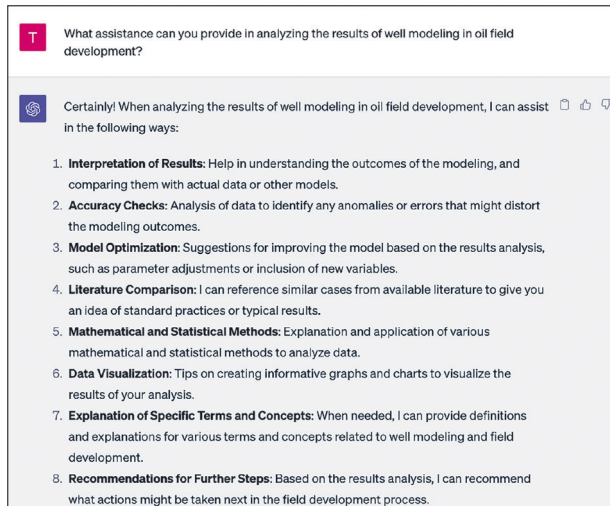


Figure 11 – Response issued by ChatGPT

Let's ask ChatGPT for a specific example of its services.

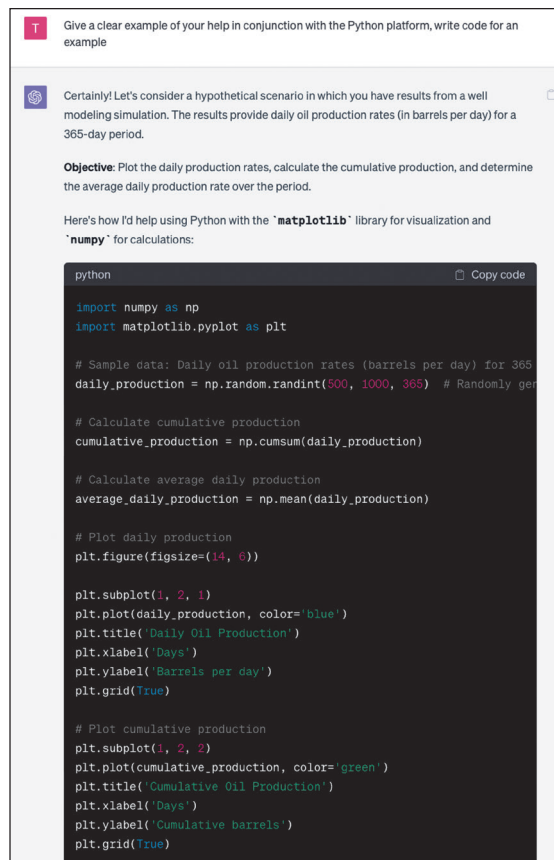



Figure 12 – Response issued by ChatGPT

Findings and conversation. This article presents the potential use of ChatGPT within the oil and gas business, highlighting its potential to bring about a substantial transformation in this particular industry. Moreover, a notable outcome will be the enhanced standard of data interpretation and analysis. When presented with relevant data, ChatGPT promptly provides information that often demands much time and exertion, perhaps spanning many days. An illustration of this may be seen in the notable decrease in the duration required for the interpretation of seismic data and the modelling of reservoirs, resulting in enhanced efficiency in predicting prospective reservoir zones.

Additionally, this increased efficiency resulted in decreased costs. The implementation of ChatGPT has obviated the necessity for extensive collectives dedicated to the interpretation and analysis of data. Consequently, organisations were able to attain substantial cost reductions, encompassing savings in terms of human capital and time allocation. In addition to its data analysis capabilities, ChatGPT has emerged as a powerful tool for supporting decision-making processes. The technology played a pivotal role in the prediction of maintenance schedules, evaluation of the viability of drilling plans, and execution of reservoir modelling, providing pragmatic and data-supported suggestions.

One notable benefit of incorporating ChatGPT into the system was its efficacy as an instructional component. Novice individuals entering the oil and gas business experienced enhanced ease in engaging with the model, hence facilitating comprehension of intricate ideas, exploration of patterns within historical data, and acquisition of familiarity with prevailing industry standards. This intervention has proven effective in reducing the learning duration for several individuals entering the sector. Nevertheless, while the numerous benefits associated with ChatGPT, it is not devoid of certain drawbacks. Despite its high level of knowledge, this tool occasionally exhibits inaccurate judgements, particularly when confronted with data that is confusing or incomplete. However, as compared to manual analysis, ChatGPT exhibited a much reduced error rate, hence emphasising its potential. Upon further examination, it becomes evident that there are various problematic aspects associated with this subject matter. The question of confidence in the outcomes derived by artificial intelligence (AI) is a significant concern among experts in several industries. Although ChatGPT functions as a very capable assistant, it is important to recognise that its optimal use lies in its role as a supplemental tool, operating in conjunction with human knowledge. Moreover, considering the ever-changing characteristics of the oil and gas sector, it is of utmost need for ChatGPT to undergo continuous updates. Ensuring the continuous relevance and correctness of the model is achieved by consistently providing it with up-to-date industry data and research. The efficacy of ChatGPT is intricately linked to the calibre and integrity of the data. Ensuring the comprehensiveness, accuracy, and absence of inherent biases in the input data is of utmost importance in order to mitigate the risk of generating erroneous projections. Looking ahead, the multifunctionality of ChatGPT implies a wider range of potential uses within the oil and gas industry. Through more refinement and focused training, this tool possesses the potential to expand its applicability to several domains such as drilling optimisation, logistics management optimisation, and even anticipating worldwide trends in the oil and gas industry.

Conclusion. In summary, our study findings suggest that the incorporation of ChatGPT within the oil and gas industry has resulted in a discernible enhancement in operational

effectiveness, namely in the realm of data analysis and interpretation. This is particularly relevant for those in professional settings who encounter challenges when programming with the Python language. The rapid acquisition of analytical insights not only facilitates expedited decision-making but also yields concrete economic advantages by mitigating the necessity for labor-intensive manual data processing. In addition to its impressive analytical capabilities, ChatGPT has emerged as a highly important platform for exchanging information, providing assistance to those new to the field as well as experienced professionals seeking a deeper grasp of complex industrial aspects. Nevertheless, it is imperative to emphasise the indispensable significance of human supervision. The precision and dependability of ChatGPT are contingent upon the calibre of the input data, underscoring the enduring need of human knowledge in guaranteeing precise results. In conclusion, as we enter the swiftly progressing era of integrating artificial intelligence, it is imperative for the industry to give due consideration to ethical dimensions, particularly with regards to the possible displacement of jobs, and to actively endorse initiatives aimed at enhancing the skills and retraining of the workforce. The integration of ChatGPT with diligent human interaction holds the potential for a forward-moving trajectory in the growth of the oil and gas industry. 

REFERENCES

- 1 Anifowose F. A. Creating Opportunities for Successful Artificial Intelligence Applications in the Upstream Petroleum Industry // SPE Middle East Intelligent Oil and Gas Symposium. – SPE, 2021. – C. D012S001R001.
- 2 Li H. et al. Applications of artificial intelligence in oil and gas development // Archives of Computational Methods in Engineering. – 2021. – T. 28. – C. 937-949.
- 3 Bello O. et al. Application of artificial intelligence techniques in drilling system design and operations: a state of the art review and future research pathways // SPE Nigeria Annual International Conference and Exhibition. – OnePetro, 2016.
- 4 Gupta S., Sharma A., Abubakar A. Artificial intelligence–driven asset optimizer // SPE Annual Technical Conference and Exhibition. – OnePetro, 2018.
- 5 Akanji L. T., Application of artificial intelligence in oilfield operation and intervention // SPE Intelligent Energy International Conference and Exhibition. – OnePetro, 2016.
- 6 Piovesan C., Kozman J. Cross-industry innovations in artificial intelligence // SPE digital energy conference and exhibition. – OnePetro, 2011.
- 7 Tariq Z. et al. A new technique to develop rock strength correlation using artificial intelligence tools // SPE Reservoir Characterisation and Simulation Conference and Exhibition. – OnePetro, 2017.
- 8 Kamal M. M. Petroleum: Role of SPE Members and the Industry in the Energy Transition // Journal of Petroleum Technology. – 2023. – T. 75. – №. 04. – C. 4-7.
- 9 Eckroth J. et al. Answering Natural Language Questions with OpenAI's GPT in the Petroleum Industry // SPE Annual Technical Conference and Exhibition. – SPE, 2023. – C. D031S032R005.
- 10 Abraham A. Technology Focus: Reservoir Simulation (July 2023) // Journal of Petroleum Technology. – 2023. – T. 75. – №. 07. – C. 61-62.
- 11 Ogundare O., Madasu S., Wiggins N. Industrial Engineering with Large Language Models: A case study of ChatGPT's performance on Oil & Gas problems // arXiv preprint arXiv:2304.14354. – 2023.

- 12 Paciello R., Alves M. A. Operational Applications and Legal Aspects of the Insertion of Artificial Intelligence and Machine Learning into the Brazilian Oil and Natural Gas Industry // Offshore Technology Conference Brasil. – OTC, 2023. – C. D022S054R004.
- 13 Weijermars R., bin Waheed U., Suleymanli K. Will ChatGPT and Related AI-tools Alter the Future of the Geosciences and Petroleum Engineering? // First Break. – 2023. – T. 41. – №. 6. – С. 53-61.
- 14 Eckroth J. et al. Answering Natural Language Questions with OpenAI's GPT in the Petroleum Industry // E Annual Technical Conference and Exhibition. – SPE, 2023. – C. D031S032R005.
- 15 Eltom H. Reproducing burrows in modelled sedimentary strata: A workflow using multipoint statistics modelling in Petrel™ // Available at SSRN 4563147.