Natural Gas Price Prediction System Using IBM Watson Machine Learning Service

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1)**Introduction**

a)**Overview**: Forecasting natural gas prices is a powerful and essential tool which has become more important for different stakeholders in the natural gas market, allowing them to make better decisions for managing the potential risk, reducing the gap between the demand and supply, and optimizing the usage of resources based on accurate predictions.

Accurate natural gas price forecasting not only provides an important guide for effective implementation of energy policy and planning, but also is extremely significant in economic planning, energy investment, and environmental conservation.

b)**Purpose**:The aim of this project is to build data-driven machine learning for natural gas price forecasting.

- Able to understand the problem to classify if it is a regression or a classification kind of problem.
- Will be able to know how to pre-process/clean the data using different data preprocessing techniques.
- Will able to analyze or get insights into data through visualization.
- Will be able to know how to build a web application using the Flask framework.

2)***Literature survey***:

Natural gas has been proposed as a solution to increase the security of energy supply and reduce environmental pollution around the world. Being able to forecast natural gas price benefits various stakeholders and has become a very valuable tool for all market participants in competitive natural gas markets. Machine learning algorithms have gradually become popular tools for natural gas price forecasting. In this paper, we investigate data-driven predictive models for natural gas price forecasting based on common machine learning tools, i.e., artificial neural networks (ANN), support vector machines (SVM), gradient boosting machines (GBM), and Gaussian process regression (GPR).

a)Proposed System:

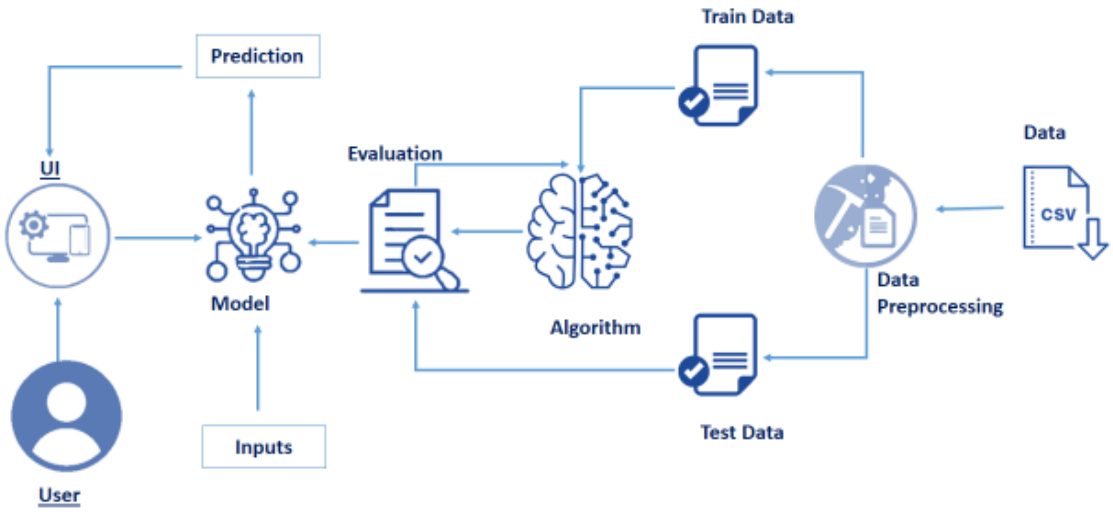
- The proposed solution for the problem is first we need to collect the data related to the natural gas price of certain months.

- According to the collected data we perform different actions for getting the gas price at particular month from the given data.
- The use of this model is to Accurate natural gas price forecasting not only provides an important guide for effective implementation of energy policy and planning, but also is extremely significant in

economic planning, energy investment, and environmental conservation.

3)**Theoritical Analysis**:

a)Block diagram:



b)Hardware-Software designing:

Software Requirements:

- OS – Windows XP,7,8,10
- Jupyter Software
- Spyder Software
- Anaconda Command Prompt

Hardware Components:

- Processor – i3
- Hard Disk Storage – 10 GB
- RAM – 1GB

4)**Experimental Investigation** :

Forecasting natural gas prices is a powerful and essential tool which has become more important for different stakeholders in the natural gas market, allowing them to make better decisions for managing the potential risk, reducing the gap between the demand and supply, and optimizing the usage of resources based on accurate predictions.

Accurate natural gas price forecasting not only provides an important guide for effective implementation of energy policy and planning, but also is extremely significant in economic planning, energy investment, and environmental conservation.

5)**Results**:

This natural gas price process constitutes of three steps. These steps are mentioned below:

·There is input to be considered they are Theoretical gas price

* Theoretical Price is taken from the user.

· In the next step we use the prediction by train and testing the data which is analyzed during the process of accuracy calculation.

· The output is generated related to the analysis based on the data collected related to the prediction of natural gas price.

6)Advantages and Disadvantages :

a)Advantages:

It will be more significant in

- ☐ Energy investment
- ☐ Economic planning.
- ☐ environmental conservation

b)Disadvantages :

- **Gas** is highly flammable, which means leaks can result in explosions.
- **Natural gas** is toxic and emits more carbon dioxide.
- **Gas** infrastructure is expensive, pipelines cost a significant amount of money to construct.

7)**Applications** :

- We can easily predict the natural gas price based on the given theoretical data
- Consumers in the commercial sector also **use natural gas** as a fuel in combined heat and power systems.
- Home heating through **natural gas** furnaces.
- Warming water in hot water heaters.

8)**conclusion** :

By doing this project which is natural gas price prediction using machine learning we have gained the knowledge upon the natural gas algorithms related to machine learning and the flask deployment of the python code.

9)Future Scope:

By doing the project on natural gas we can predict the gas price on every month and the people can get aware of the using the natural gas so that the environment can be conserved even the economic can be well planned.

10)Biblography:

AICPA. 2012. *Entities With Oil and Gas Producing Activities - AICPA Audit and Accounting Guide*. AICPA.

Alciatore, M. L. and C. C. Dee. 2006. Environmental disclosures in the oil and gas industry. Environmental Accounting: Commitment or Propaganda. *Advances in Environmental Accounting & Management* (3): 49-75.

Allee, K. D., D. P. Lynch, K. R. Petroni and J. H. Schroeder. 2015. Do property taxes affect real operating decisions and market prices for crude oil? *Contemporary Accounting Research* 32(2): 736-762.

Andrew, J. and M. Baker. 2020. The radical potential of leaks in the shadow accounting project: The case of US oil interests in Nigeria. *Accounting, Organizations and Society* (82): 101101.

Archerd, W. R. 1955. Accounting in a petroleum equipment company. *N.A.C.A. Bulletin* (July): 1501-1507.

11)source code(model building):

```
import numpy as np

import pandas as pd

import pickle


dataset=pd.read_csv(r'C:\Users\yeshwanth\Desktop\natural gas ibm project\daily_csv.csv')


dataset['year']=pd.DatetimeIndex(dataset['Date']).year

dataset['month']=pd.DatetimeIndex(dataset['Date']).month

dataset['day']=pd.DatetimeIndex(dataset['Date']).day

dataset.drop('Date',axis=1,inplace=True)

dataset.isnull().any()

dataset['Price'].fillna(dataset['Price'].mean(),inplace=True)
```

```
x=dataset.iloc[:,1:4].values

y=dataset.iloc[:,0:1].values


from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=0)


from sklearn.tree import DecisionTreeRegressor

dtr=DecisionTreeRegressor()

dtr.fit(x_train,y_train)

y_pred=dtr.predict(x_test)

y_pred

from sklearn.metrics import r2_score

dtr_accuracy=r2_score(y_test,y_pred)

dtr_accuracy


pickle.dump(dtr,open('gas.pkl','wb'))
```

Source code(Application building):

```
import numpy as np

from flask import Flask,request,jsonify,render_template

import pickle
```

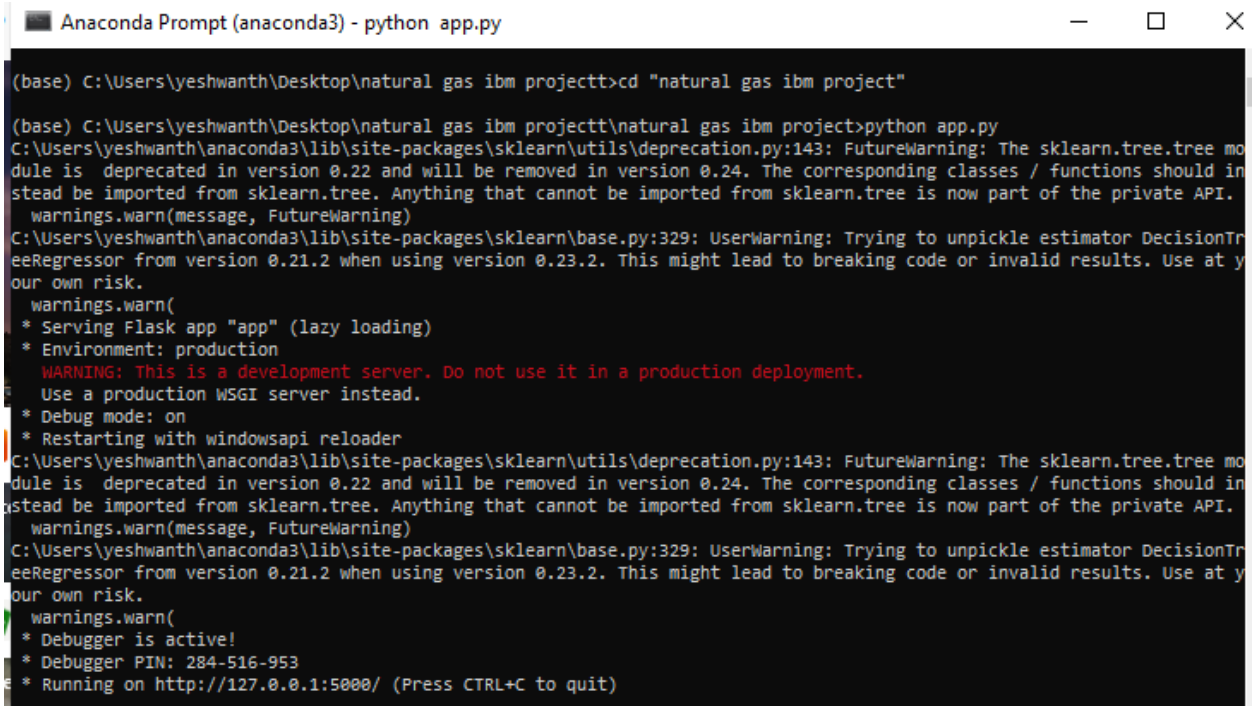
```
app=Flask(__name__)


model=pickle.load(open('gas.pkl','rb'))


@app.route('/')
def home():
    return render_template('index.html')


@app.route('/y_predict',methods=['POST'])
def y_predict():
    x_test=[int(x) for x in request.form.values()]
    x_test = [np.array(x_test)]
    prediction=model.predict(x_test)
    print(prediction)
    pred=prediction[[0]]
    return render_template('index.html',prediction_text='Gas Price is {} dollors'.format(pred))
if __name__=="__main__":
    app.run(debug=True)
```

Output:


Anaconda Prompt (anaconda3) - python app.py
(base) C:\Users\yeshwanth\Desktop\natural gas ibm projectt>cd "natural gas ibm project"
(base) C:\Users\yeshwanth\Desktop\natural gas ibm projectt\natural gas ibm project>python app.py
C:\Users\yeshwanth\anaconda3\lib\site-packages\sklearn\utils\deprecation.py:143: FutureWarning: The sklearn.tree.tree module is deprecated in version 0.22 and will be removed in version 0.24. The corresponding classes / functions should instead be imported from sklearn.tree. Anything that cannot be imported from sklearn.tree is now part of the private API.
warnings.warn(message, FutureWarning)
C:\Users\yeshwanth\anaconda3\lib\site-packages\sklearn\base.py:329: UserWarning: Trying to unpickle estimator DecisionTreeRegressor from version 0.21.2 when using version 0.23.2. This might lead to breaking code or invalid results. Use at your own risk.
warnings.warn(
* Serving Flask app "app" (lazy loading)
* Environment: production
WARNING: This is a development server. Do not use it in a production deployment.
Use a production WSGI server instead.
* Debug mode: on
* Restarting with windowsapi reloader
C:\Users\yeshwanth\anaconda3\lib\site-packages\sklearn\utils\deprecation.py:143: FutureWarning: The sklearn.tree.tree module is deprecated in version 0.22 and will be removed in version 0.24. The corresponding classes / functions should instead be imported from sklearn.tree. Anything that cannot be imported from sklearn.tree is now part of the private API.
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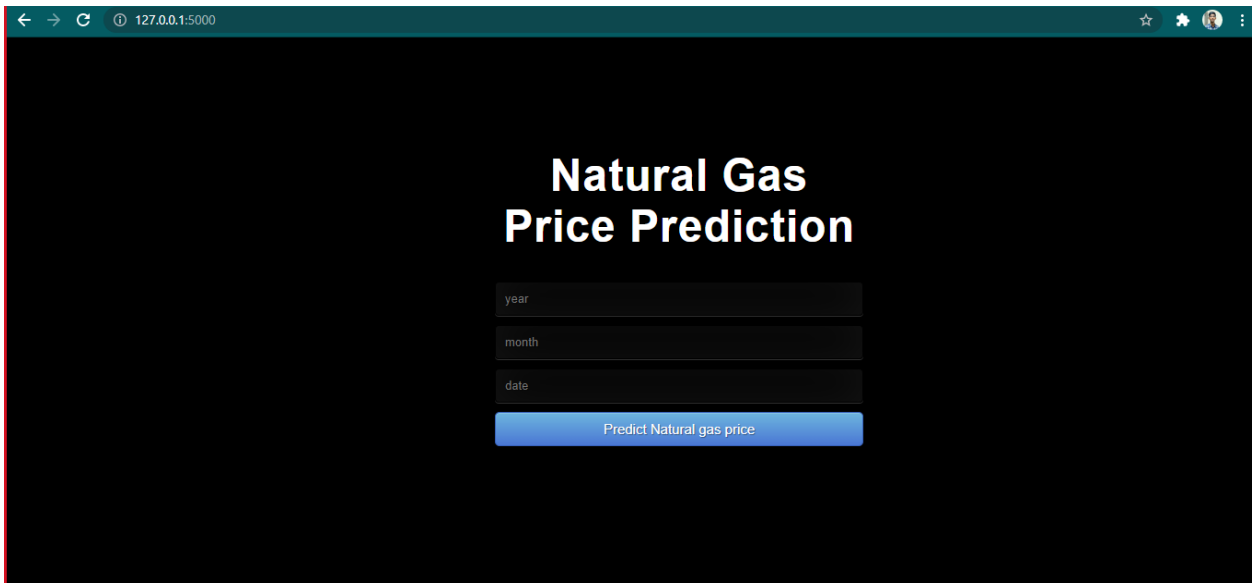
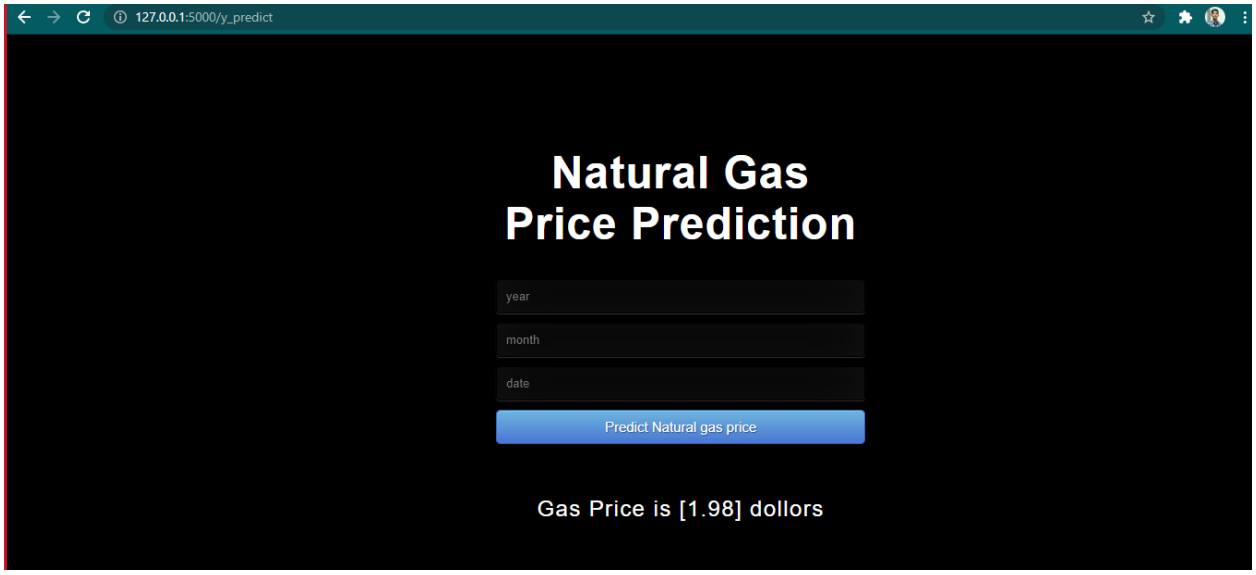
warnings.warn(
* Debugger is active!
* Debugger PIN: 284-516-953
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)


127.0.0.1:5000
Natural Gas
Price Prediction
year
month
date
Predict Natural gas price


127.0.0.1:5000/y_predict
Natural Gas
Price Prediction
year
month
date
Predict Natural gas price
Gas Price is [1.98] dollors