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Roll No - 50

Experiment No.4
AI for disease Prognosis
Date of Performance: 16/10/2023
Date of Submission:28/10/2023

Aim: To perform AI for prognosis of a diseases
Objective: The objective of this experiment is to develop an AI-powered disease prognosis system that employs advanced machine learning algorithms, specifically convolutional neural networks (CNNs) for medical imaging and recurrent neural networks (RNNs) for time series data.
Theory:
The objective of using AI for the prognosis of diseases is to improve the accuracy and effectiveness of disease prediction, allowing for earlier and more precise diagnoses and treatment. AI can be a valuable tool in healthcare for a variety of purposes related to disease prognosis:

Early Detection: Detect diseases or medical conditions at an earlier stage when treatment is more effective, potentially saving lives and reducing the severity of the disease's impact.

Risk Assessment: Assess an individual's risk of developing a particular disease based on a range of factors, such as genetics, lifestyle, and medical history.

Personalized Medicine: Tailor treatment plans to individual patients based on their unique characteristics and needs, improving the effectiveness of treatments and reducing side effects.

Predictive Analytics: Use historical patient data to predict disease outcomes and recommend appropriate interventions or treatments.

Resource Allocation: Optimize healthcare resource allocation by identifying patients at higher risk and allocating resources accordingly. This can be especially important in resource-constrained healthcare systems.

Patient Engagement: Engage patients in their own healthcare by providing them with personalized health insights and recommendations.

Reducing Healthcare Costs: Improve the efficiency of healthcare systems by reducing unnecessary tests and treatments through more accurate prognosis and diagnosis.

Research and Drug Development: Assist researchers in identifying potential drug candidates or treatment strategies based on AI analysis of disease pathways and patient data.

Public Health Planning: Help public health officials and organizations plan for disease outbreaks, resource allocation, and prevention strategies.

Chronic Disease Management: Aid in the management of chronic diseases by providing ongoing monitoring and early warnings of potential complications.

Telemedicine: Enable remote monitoring and diagnosis, particularly in underserved or remote areas.

Quality of Life Improvement: Enhance the quality of life for patients by enabling proactive and preventive healthcare rather than just reactive treatment.

In summary, the primary objective of using AI for disease prognosis is to improve healthcare outcomes, reduce costs, and enhance the overall quality of care by providing more accurate, personalized, and timely information to healthcare providers, researchers, and patients. AI has the potential to transform the healthcare industry by making disease prognosis and management more data-driven and patient-centric.

Code: -

AI model for diesease prognosis

import libraries

In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix,accuracy_score
%matplotlib inline
```

Exploratory Data Analysis

In [29]:
```
df=pd.read_csv("diabetes_prediction_dataset.csv")
df.head()

# Assuming you have a DataFrame 'df' with a 'gender' column
df['gender'] = df['gender'].map({'Male': 0, 'Female': 1})
df['smoking_history'] = df['smoking_history'].map({'never': 0, 'No Info': 1,'c
df
```

Out[29]:

	gender	age	hypertension	heart_disease	smoking_history	bmi	HbA1c_level	blood_gl
0	1.0	80.0	0	1	0.0	25.19	6.6	
1	1.0	54.0	0	0	1.0	27.32	6.6	
2	0.0	28.0	0	0	0.0	27.32	5.7	
3	1.0	36.0	0	0	2.0	23.45	5.0	
4	0.0	76.0	1	1	2.0	20.14	4.8	
...	...	...	...	...	...	...	...	
99995	1.0	80.0	0	0	1.0	27.32	6.2	
99996	1.0	2.0	0	0	1.0	17.37	6.5	
99997	0.0	66.0	0	0	3.0	27.83	5.7	
99998	1.0	24.0	0	0	0.0	35.42	4.0	
99999	1.0	57.0	0	0	2.0	22.43	6.6	

100000 rows × 9 columns

In [30]:
```
df.describe()
```

Out[30]:

	gender	age	hypertension	heart_disease	smoking_history	bı
count	99982.000000	100000.000000	100000.00000	100000.000000	89549.000000	100000.0000(
mean	0.585625	41.885856	0.07485	0.039420	0.920658	27.3207(
std	0.492616	22.516840	0.26315	0.194593	0.952396	6.6367(
min	0.000000	0.080000	0.00000	0.000000	0.000000	10.0100(
25%	0.000000	24.000000	0.00000	0.000000	0.000000	23.6300(
50%	1.000000	43.000000	0.00000	0.000000	1.000000	27.3200(
75%	1.000000	60.000000	0.00000	0.000000	1.000000	29.5800(
max	1.000000	80.000000	1.00000	1.000000	3.000000	95.6900(

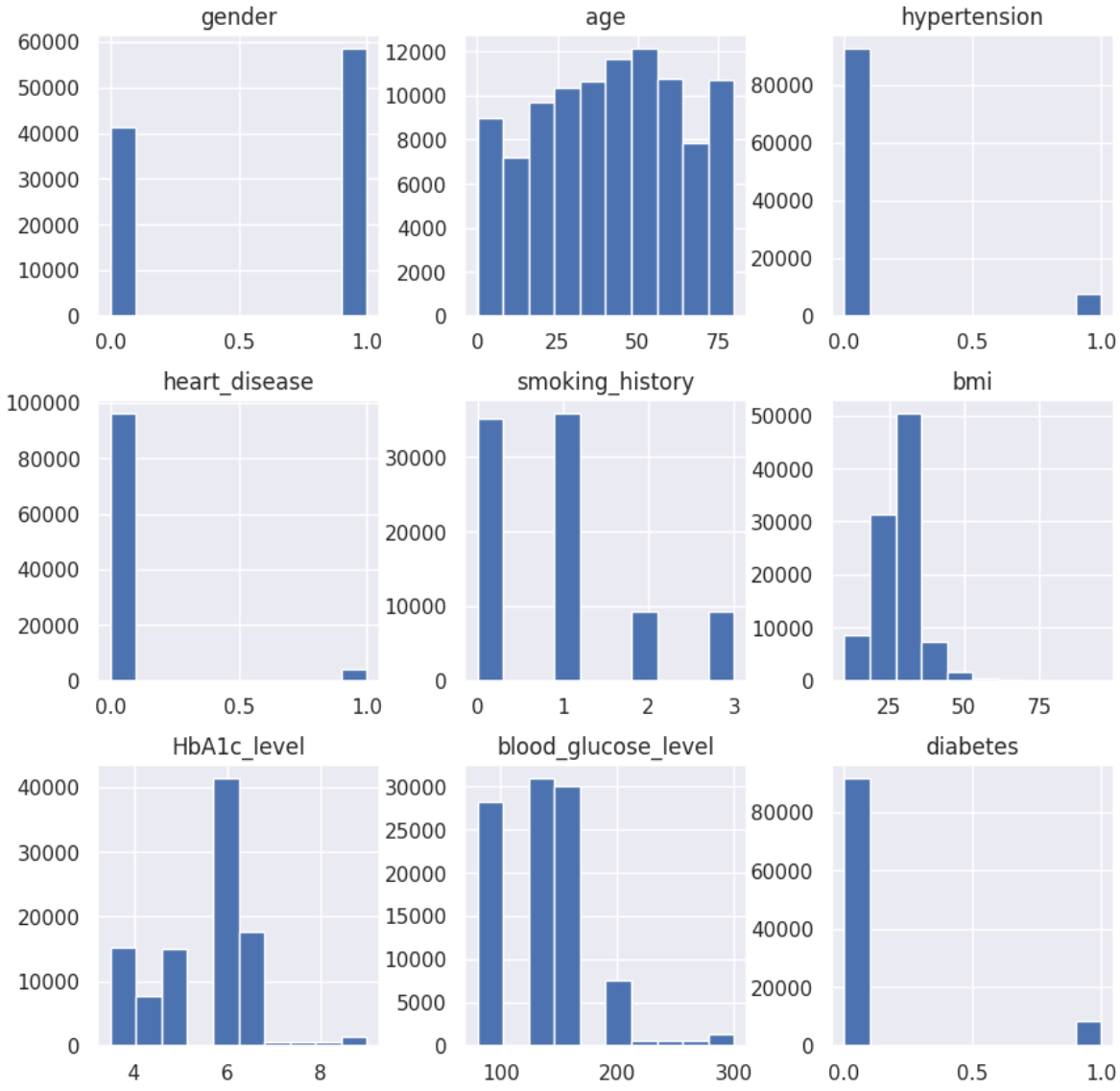
In [31]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100000 entries, 0 to 99999
Data columns (total 9 columns):
 #   Column               Non-Null Count   Dtype  
---  ------               --------------   -----  
 0   gender               99982 non-null   float64
 1   age                  100000 non-null  float64
 2   hypertension         100000 non-null  int64  
 3   heart_disease        100000 non-null  int64  
 4   smoking_history      89549 non-null   float64
 5   bmi                  100000 non-null  float64
 6   HbA1c_level          100000 non-null  float64
 7   blood_glucose_level  100000 non-null  int64  
 8   diabetes             100000 non-null  int64  
dtypes: float64(5), int64(4)
memory usage: 6.9 MB
```

In [32]:
```
df.isnull().values.any()
```

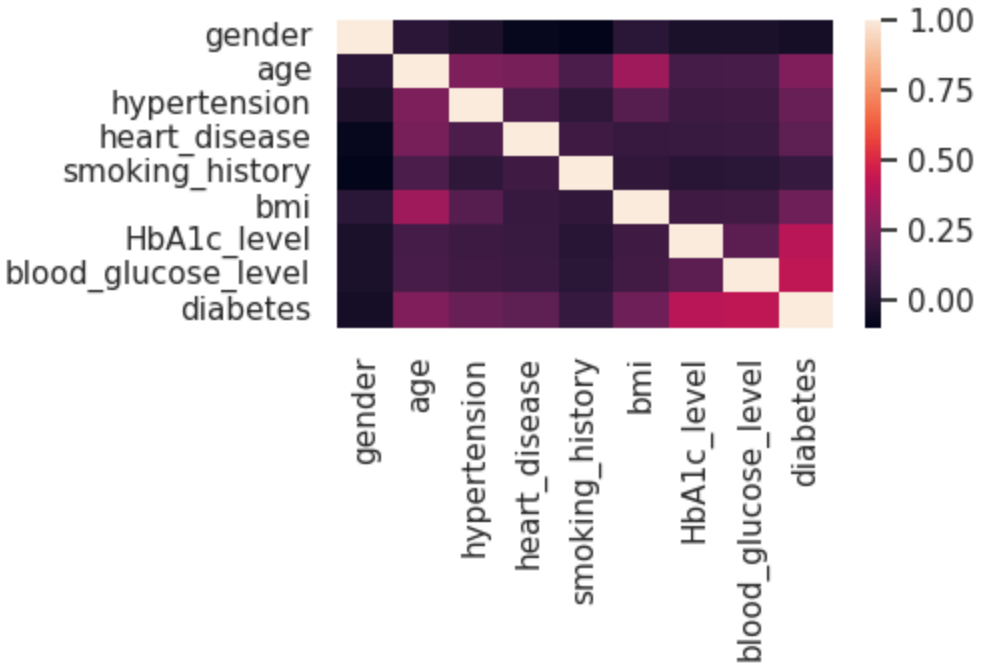
Out[32]: True

In [33]:
```
#histogram
df.hist(bins=10,figsize=(10,10))
plt.show()
```



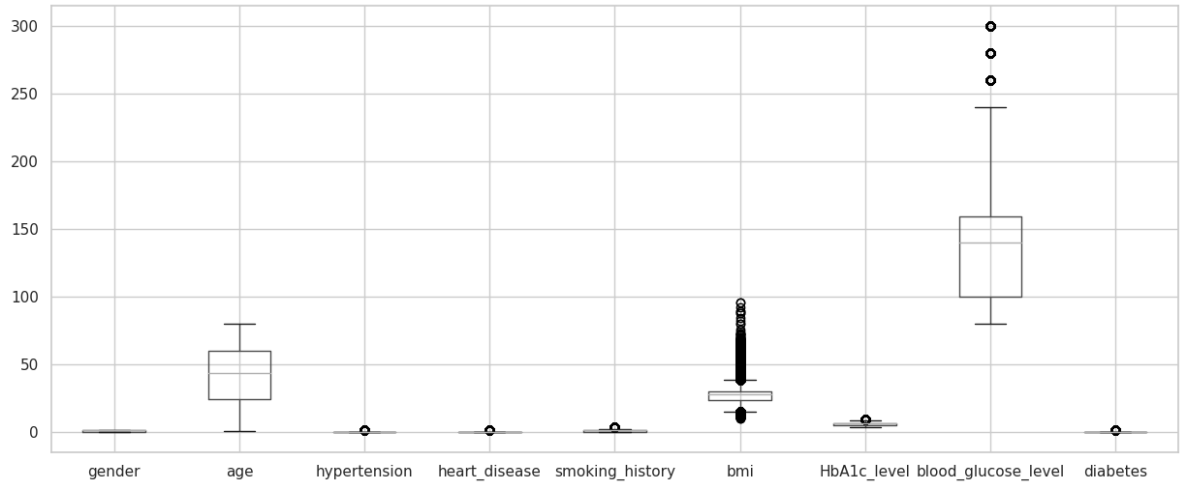
In [34]:
```
#correlation
sns.heatmap(df.corr())
```

Out[34]: <Axes: >



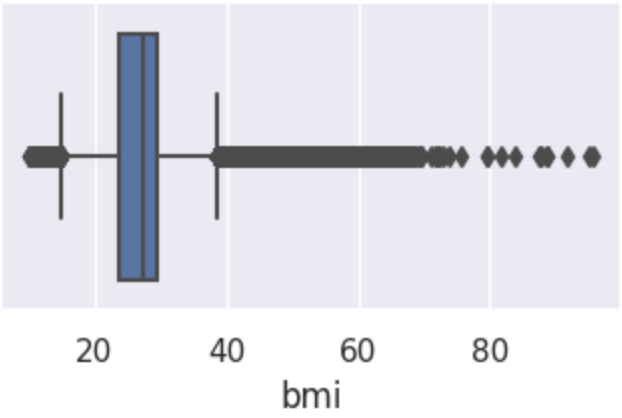
In [35]:
```
#box plot for outlier visualization
sns.set(style="whitegrid")
df.boxplot(figsize=(15,6))
```

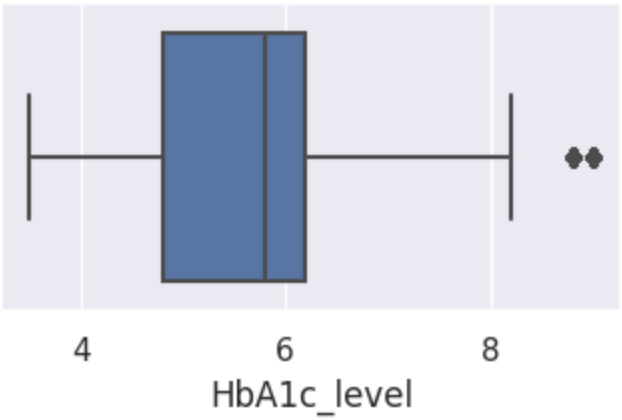
Out[35]: <Axes: >

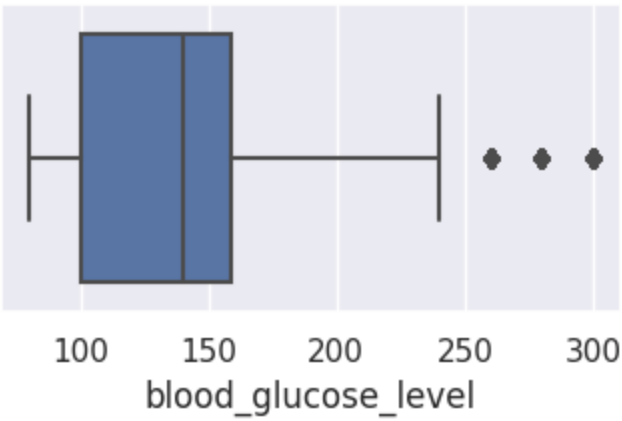


In [36]:
```
#box plot
sns.set(style="whitegrid")

sns.set(rc={'figure.figsize':(4,2)})
sns.boxplot(x=df['bmi'])
plt.show()
sns.boxplot(x=df['HbA1c_level'])
plt.show()
sns.boxplot(x=df['blood_glucose_level'])
plt.show()
```







In [37]:
```
#outlier remove

Q1=df.quantile(0.25)
Q3=df.quantile(0.75)
IQR=Q3-Q1

print("---Q1--- \n",Q1)
print("\n---Q3--- \n",Q3)
print("\n---IQR---\n",IQR)
#print((df < (Q1 - 1.5 * IQR))|(df > (Q3 + 1.5 * IQR)))
```

```
---Q1---
 gender                   0.00
age                      24.00
hypertension              0.00
heart_disease             0.00
smoking_history           0.00
bmi                      23.63
HbA1c_level               4.80
blood_glucose_level     100.00
diabetes                  0.00
Name: 0.25, dtype: float64

---Q3---
 gender                   1.00
age                      60.00
hypertension              0.00
heart_disease             0.00
smoking_history           1.00
bmi                      29.58
HbA1c_level               6.20
blood_glucose_level     159.00
diabetes                  0.00
Name: 0.75, dtype: float64

---IQR---
 gender                   1.00
age                      36.00
hypertension              0.00
heart_disease             0.00
smoking_history           1.00
bmi                       5.95
HbA1c_level               1.40
blood_glucose_level      59.00
diabetes                  0.00
dtype: float64
```

In [38]:
```
#outlier remove
df_out = df[~((df < (Q1 - 1.5 * IQR)) |(df > (Q3 + 1.5 * IQR))).any(axis=1)]
df.shape,df_out.shape
#more than 80 records deleted
```

Out[38]:
```
((100000, 9), (73074, 9))
```

Extract Features and Targets

In [39]:
```
X=df_out.drop(columns=['bmi'])
y=df_out['bmi']

df['gender'] = df['gender'].map({'Male': 0, 'Female': 1})
```

Splitting train test data 80 20 ratio

In [40]:
```
from sklearn.model_selection import train_test_split
train_X,test_X,train_y,test_y=train_test_split(X,y,test_size=0.2)
```

In [41]:
```
train_X.shape,test_X.shape,train_y.shape,test_y.shape
```

Out[41]: ((58459, 8), (14615, 8), (58459,), (14615,))

Build the model

In [44]:
```
# Import necessary libraries for regression
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score

# Create and train a Linear Regression model
regressor = LinearRegression()
regressor.fit(train_X_imputed, train_y)

# Make predictions on the test set
y_pred = regressor.predict(test_X_imputed)

# Evaluate the model's performance for regression
mse = mean_squared_error(test_y, y_pred)
r2 = r2_score(test_y, y_pred)

# Print the results
print(f'Mean Squared Error (MSE): {mse}')
print(f'R-squared (R2): {r2}')
```

```
Mean Squared Error (MSE): 19.986489149471122
R-squared (R2): 0.16260340310313903
```

In [ ]:
```
```

Google Collaboratory Link: -

AIHC-EXPT4

Conclusion: -

Thus we have successfully performed AI for prognosis of a diseases