Disease Predition from Medical Data

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, OneHotEncoder
from sklearn.compose import ColumnTransformer
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report, confusion_matrix, roc_auc_score
from sklearn.pipeline import Pipeline
```

```
from google.colab import drive
# Mount Google Drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
# Load the dataset
data = pd.read_csv("drive/My Drive/ML_internship/ML_Task03/healthcare-dataset-stroke-data.csv")

# Display basic information about the dataset
print("Basic Information about the Dataset:")
print(data.info())

# Display the first few rows of the dataset
print("\nFirst few rows of the dataset:")
print(data.head())
```

```
Basic Information about the Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5110 entries, 0 to 5109
Data columns (total 12 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   id                 5110 non-null   int64  
 1   gender             5110 non-null   object 
 2   age                5110 non-null   float64
 3   hypertension       5110 non-null   int64  
 4   heart_disease      5110 non-null   int64  
 5   ever_married       5110 non-null   object 
 6   work_type          5110 non-null   object 
 7   Residence_type     5110 non-null   object 
 8   avg_glucose_level  5110 non-null   float64
 9   bmi                4909 non-null   float64
 10  smoking_status     5110 non-null   object 
 11  stroke             5110 non-null   int64  
dtypes: float64(3), int64(4), object(5)
memory usage: 479.2+ KB
None

First few rows of the dataset:
      id  gender   age  hypertension  heart_disease ever_married  \
0   9046    Male  67.0             0              1          Yes   
1  51676  Female  61.0             0              0          Yes   
2  31112    Male  80.0             0              1          Yes   
3  60182  Female  49.0             0              0          Yes   
4   1665  Female  79.0             1              0          Yes   

       work_type Residence_type  avg_glucose_level   bmi   smoking_status  \
0        Private          Urban             228.69  36.6  formerly smoked   
1  Self-employed          Rural             202.21   NaN     never smoked   
2        Private          Rural             105.92  32.5     never smoked   
3        Private          Urban             171.23  34.4           smokes   
4  Self-employed          Rural             174.12  24.0     never smoked   

   stroke  
0       1  
1       1  
2       1  
3       1  
4       1  
```

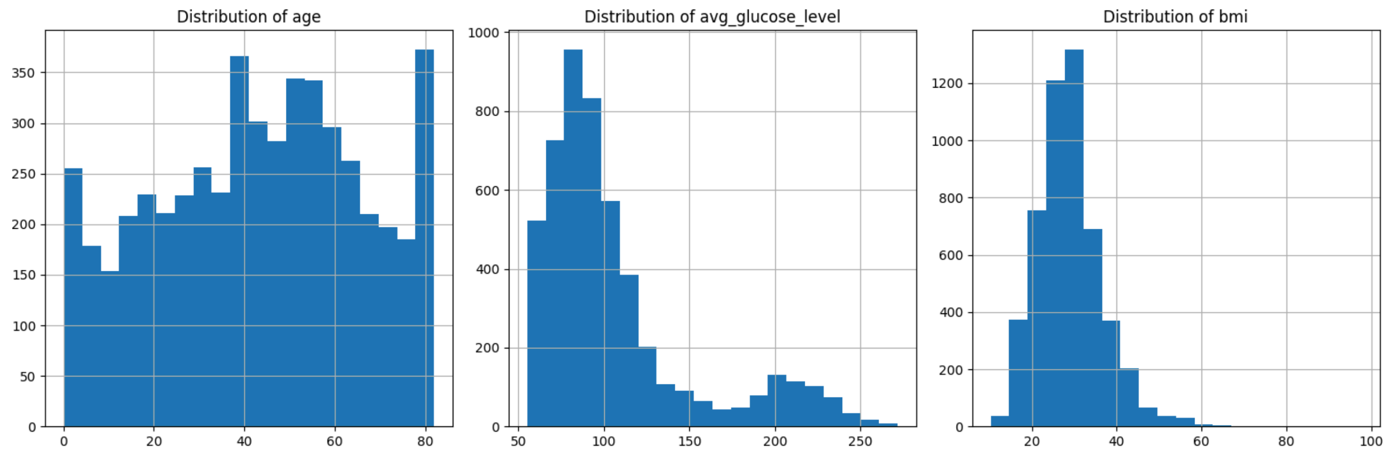
Data Preprocess

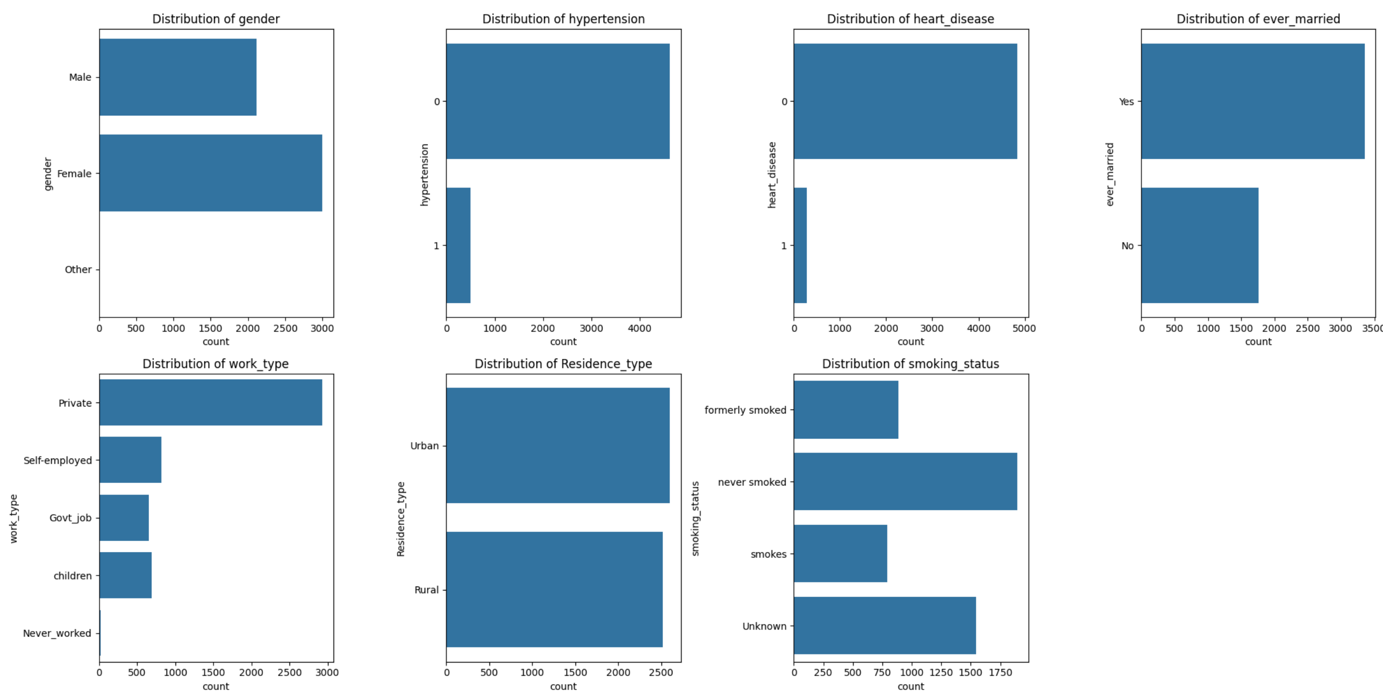
```
# Handling missing values for 'bmi'
median_bmi = data['bmi'].median()
data['bmi'].fillna(median_bmi, inplace=True)
```

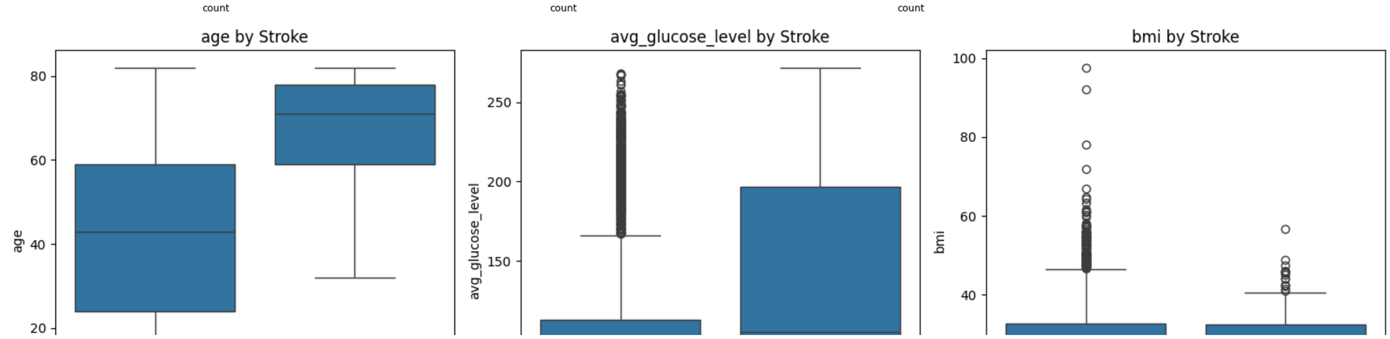
```
<ipython-input-6-eee5454a4cf6>:3: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignme
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting valu

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].me


  data['bmi'].fillna(median_bmi, inplace=True)
```

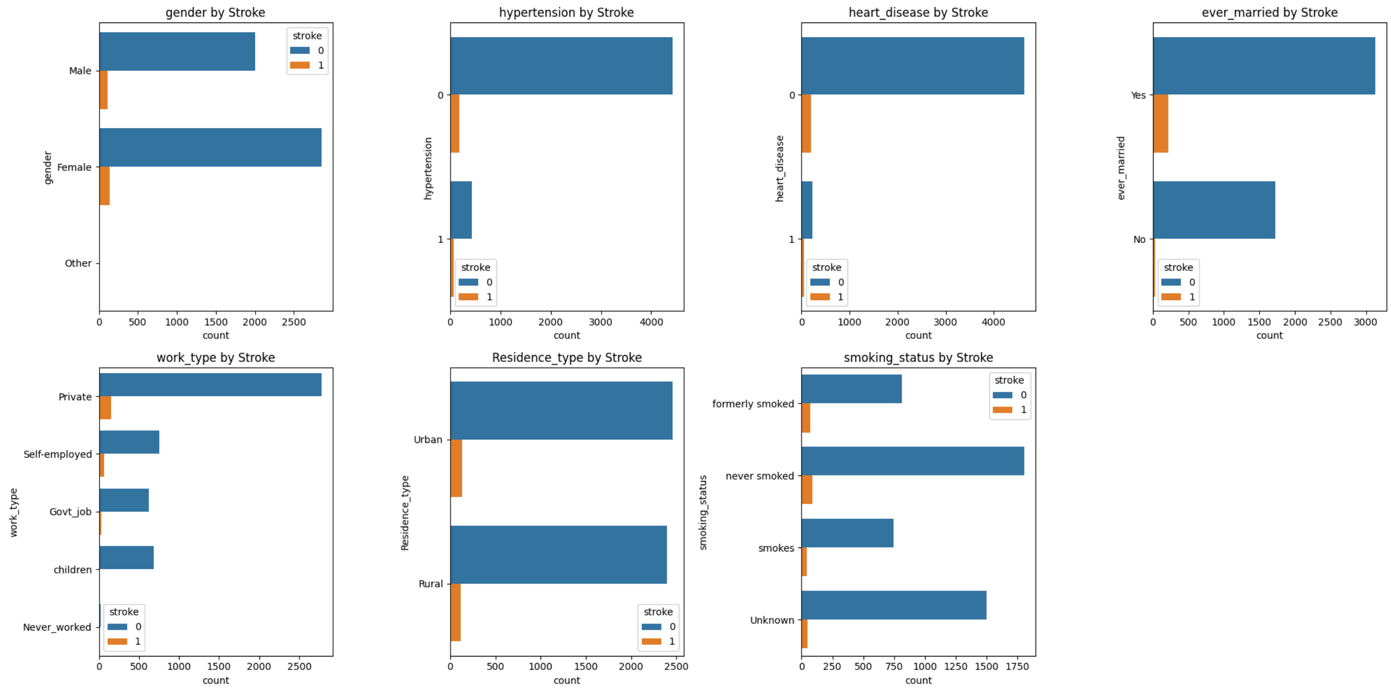
```
# Descriptive statistics for numerical variables
print("\nDescriptive Statistics for Numerical Features:")
print(data.describe())

# Plotting histograms for the numerical variables
numerical_features = ['age', 'avg_glucose_level', 'bmi']
plt.figure(figsize=(15, 5))
for i, feature in enumerate(numerical_features, 1):
    plt.subplot(1, 3, i)
    data[feature].hist(bins=20)
    plt.title(f'Distribution of {feature}')
plt.tight_layout()
plt.show()

# Visualizing the distribution of categorical variables
categorical_features = ['gender', 'hypertension', 'heart_disease', 'ever_married',
                        'work_type', 'Residence_type', 'smoking_status']
plt.figure(figsize=(20, 10))
for i, feature in enumerate(categorical_features, 1):
    plt.subplot(2, 4, i)
    sns.countplot(y=feature, data=data)
    plt.title(f'Distribution of {feature}')
plt.tight_layout()
plt.show()

# Visualizing the relationship between different variables and stroke occurrence
# For numerical features
plt.figure(figsize=(15, 5))
for i, feature in enumerate(numerical_features, 1):
    plt.subplot(1, 3, i)
    sns.boxplot(x='stroke', y=feature, data=data)
    plt.title(f'{feature} by Stroke')
plt.tight_layout()
plt.show()

# For categorical features
plt.figure(figsize=(20, 10))
for i, feature in enumerate(categorical_features, 1):
    plt.subplot(2, 4, i)
    sns.countplot(y=feature, hue='stroke', data=data)
    plt.title(f'{feature} by Stroke')
plt.tight_layout()
plt.show()
```

```
Descriptive Statistics for Numerical Features:
                 id           age  hypertension  heart_disease  \
count   5110.000000  5110.000000   5110.000000    5110.000000
mean   36517.829354    43.226614      0.097456       0.054012
std    21161.721625    22.612647      0.296607       0.226063
min       67.000000     0.080000      0.000000       0.000000
25%    17741.250000    25.000000      0.000000       0.000000
50%    36932.000000    45.000000      0.000000       0.000000
75%    54682.000000    61.000000      0.000000       0.000000
max    72940.000000    82.000000      1.000000       1.000000

       avg_glucose_level          bmi       stroke
count        5110.000000  5110.000000  5110.000000
mean          106.147677    28.862035     0.048728
std            45.283560     7.699562     0.215320
min            55.120000    10.300000     0.000000
25%            77.245000    23.800000     0.000000
50%            91.885000    28.100000     0.000000
75%           114.090000    32.800000     0.000000
max           271.740000    97.600000     1.000000
```









Encoding Categorical Variables

```
# Features and target variable
X = data.drop(['id', 'stroke'], axis=1)
y = data['stroke']

# Encoding categorical variables using OneHotEncoder
categorical_features = ['gender', 'ever_married', 'work_type', 'Residence_type', 'smoking_status']
numerical_features = ['age', 'hypertension', 'heart_disease', 'avg_glucose_level', 'bmi']

# Preprocessing pipelines for both numerical and categorical data
preprocessor = ColumnTransformer(
    transformers=[
        ('num', StandardScaler(), numerical_features),
        ('cat', OneHotEncoder(), categorical_features)
    ])
```

Splitting the Data into Training and Test Sets

```
# Split the dataset into training and test set
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, stratify=y, random_state=42)
```

Model Training and Evaluation

```
# Create and train the Logistic Regression model
lr_model = Pipeline(steps=[('preprocessor', preprocessor),
                           ('classifier', LogisticRegression())])
lr_model.fit(X_train, y_train)

# Evaluate the model performance on training data
train_accuracy = lr_model.score(X_train, y_train)
print(f'\nTraining Accuracy: {train_accuracy:.2f}')
```

```
# Evaluate the model performance on test data
test_accuracy = lr_model.score(X_test, y_test)
print(f'Test Accuracy: {test_accuracy:.2f}')

# Classification report and confusion matrix
y_test_pred = lr_model.predict(X_test)
print("\nClassification Report for Test Data:")
print(classification_report(y_test, y_test_pred))

print("Confusion Matrix for Test Data:")
print(confusion_matrix(y_test, y_test_pred))

# ROC-AUC score
test_roc_auc = roc_auc_score(y_test, lr_model.predict_proba(X_test)[:, 1])
print(f'Test ROC-AUC Score: {test_roc_auc:.2f}')
```

```
Training Accuracy: 0.95
Test Accuracy: 0.95

Classification Report for Test Data:
              precision    recall  f1-score   support

           0       0.95      1.00      0.98       972
           1       1.00      0.02      0.04        50

    accuracy                           0.95      1022
   macro avg       0.98      0.51      0.51      1022
weighted avg       0.95      0.95      0.93      1022

Confusion Matrix for Test Data:
[[972   0]
 [ 49   1]]
Test ROC-AUC Score: 0.84
```

```
# Visualizing the ROC curve
from sklearn.metrics import roc_curve

fpr, tpr, _ = roc_curve(y_test, lr_model.predict_proba(X_test)[:, 1])
plt.figure()
plt.plot(fpr, tpr, color='darkorange', lw=2, label=f'ROC curve (area = {test_roc_auc:.2f})')
plt.plot([0, 1], [0, 1], color='navy', lw=2, linestyle='--')
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('Receiver Operating Characteristic Curve')
plt.legend(loc="lower right")
plt.show()
```