

21bce5304-lab3b

February 7, 2024

Implementation of CART NAME: Rishikesh S REGNO: 21BCE5304

```
[ ]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

Classification

Dataset Description: This dataset is related to red variants of the Portuguese “Vinho Verde” wine. The dataset provides information about the amount of various chemicals present in wine and their effect on its quality. The datasets can be viewed as either classification or regression tasks. It's important to note that the classes are ordered and not balanced, meaning there are more normal wines than excellent or poor ones. The task is to predict the quality of wine using the given data.

This project is both simple and challenging, requiring the anticipation of wine quality. The complexity arises from the dataset having fewer samples and being highly imbalanced. The goal is to overcome these obstacles and build a good predictive model for wine quality classification.

Data Frame Columns: Input variables (based on physicochemical tests):

fixed acidity volatile acidity citric acid residual sugar chlorides free sulfur dioxide total sulfur dioxide density pH sulphates alcohol Output variable (based on sensory data): 12. quality (score between 0 and 10)

Exploratory Analytics

```
[ ]: data=pd.read_csv("Downloads/archive (5)/winequality-red.csv")
data.head()
```

```
[ ]:      fixed acidity  volatile acidity  citric acid  residual sugar  chlorides  \
0              7.4              0.70          0.00            1.9        0.076
1              7.8              0.88          0.00            2.6        0.098
2              7.8              0.76          0.04            2.3        0.092
3             11.2              0.28          0.56            1.9        0.075
4              7.4              0.70          0.00            1.9        0.076

      free sulfur dioxide  total sulfur dioxide  density  pH  sulphates  \
0              11.0              34.0    0.9978  3.51        0.56
1              25.0              67.0    0.9968  3.20        0.68
```

2	15.0	54.0	0.9970	3.26	0.65
3	17.0	60.0	0.9980	3.16	0.58
4	11.0	34.0	0.9978	3.51	0.56

	alcohol	quality
0	9.4	5
1	9.8	5
2	9.8	5
3	9.8	6
4	9.4	5

```
[ ]: data.columns
```

```
[ ]: Index(['fixed acidity', 'volatile acidity', 'citric acid', 'residual sugar',
          'chlorides', 'free sulfur dioxide', 'total sulfur dioxide', 'density',
          'pH', 'sulphates', 'alcohol', 'quality'],
          dtype='object')
```

```
[ ]: data.describe().transpose()
```

```
[ ]:
```

	count	mean	std	min	25% \
fixed acidity	1599.0	8.319637	1.741096	4.60000	7.1000
volatile acidity	1599.0	0.527821	0.179060	0.12000	0.3900
citric acid	1599.0	0.270976	0.194801	0.00000	0.0900
residual sugar	1599.0	2.538806	1.409928	0.90000	1.9000
chlorides	1599.0	0.087467	0.047065	0.01200	0.0700
free sulfur dioxide	1599.0	15.874922	10.460157	1.00000	7.0000
total sulfur dioxide	1599.0	46.467792	32.895324	6.00000	22.0000
density	1599.0	0.996747	0.001887	0.99007	0.9956
pH	1599.0	3.311113	0.154386	2.74000	3.2100
sulphates	1599.0	0.658149	0.169507	0.33000	0.5500
alcohol	1599.0	10.422983	1.065668	8.40000	9.5000
quality	1599.0	5.636023	0.807569	3.00000	5.0000

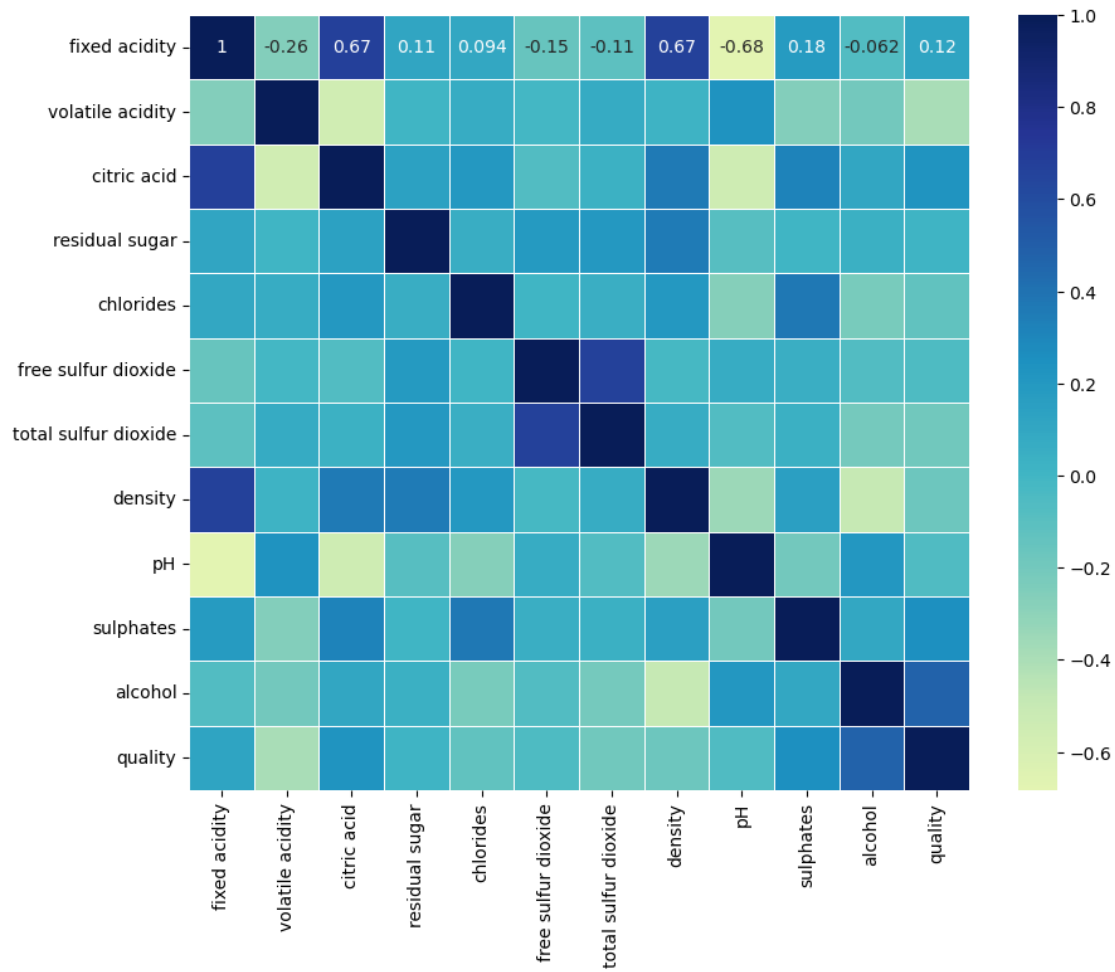
	50%	75%	max
fixed acidity	7.90000	9.200000	15.90000
volatile acidity	0.52000	0.640000	1.58000
citric acid	0.26000	0.420000	1.00000
residual sugar	2.20000	2.600000	15.50000
chlorides	0.07900	0.090000	0.61100
free sulfur dioxide	14.00000	21.000000	72.00000
total sulfur dioxide	38.00000	62.000000	289.00000
density	0.99675	0.997835	1.00369
pH	3.31000	3.400000	4.01000
sulphates	0.62000	0.730000	2.00000
alcohol	10.20000	11.100000	14.90000
quality	6.00000	6.000000	8.00000

```
[ ]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1599 entries, 0 to 1598
Data columns (total 12 columns):
#   Column                Non-Null Count  Dtype
---  -
0   fixed acidity          1599 non-null   float64
1   volatile acidity       1599 non-null   float64
2   citric acid            1599 non-null   float64
3   residual sugar         1599 non-null   float64
4   chlorides              1599 non-null   float64
5   free sulfur dioxide    1599 non-null   float64
6   total sulfur dioxide   1599 non-null   float64
7   density                1599 non-null   float64
8   pH                    1599 non-null   float64
9   sulphates              1599 non-null   float64
10  alcohol                1599 non-null   float64
11  quality                1599 non-null   int64
dtypes: float64(11), int64(1)
memory usage: 150.0 KB
```

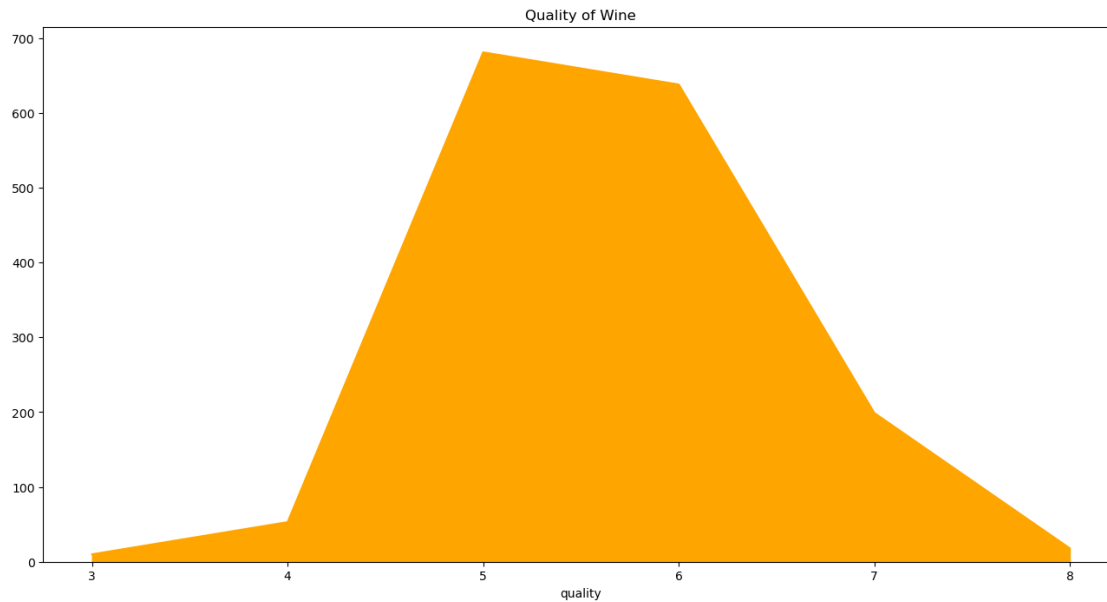
```
[ ]: plt.figure(figsize=(10,8))
     sns.heatmap(data.corr(),annot=True,lw=.5,center=0,cmap="YlGnBu")
```

```
[ ]: <Axes: >
```



```
[ ]: data['quality'].value_counts().sort_index().plot.  
      ↪ area(figsize=(16,8),title='Quality of Wine',color='orange')
```

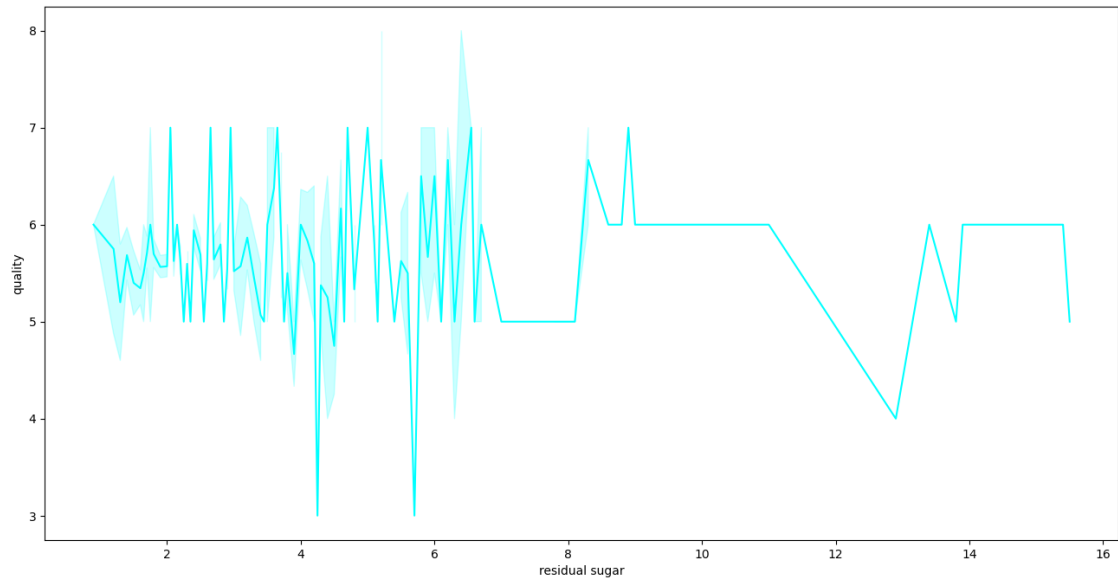
```
[ ]: <Axes: title={'center': 'Quality of Wine'}, xlabel='quality'>
```



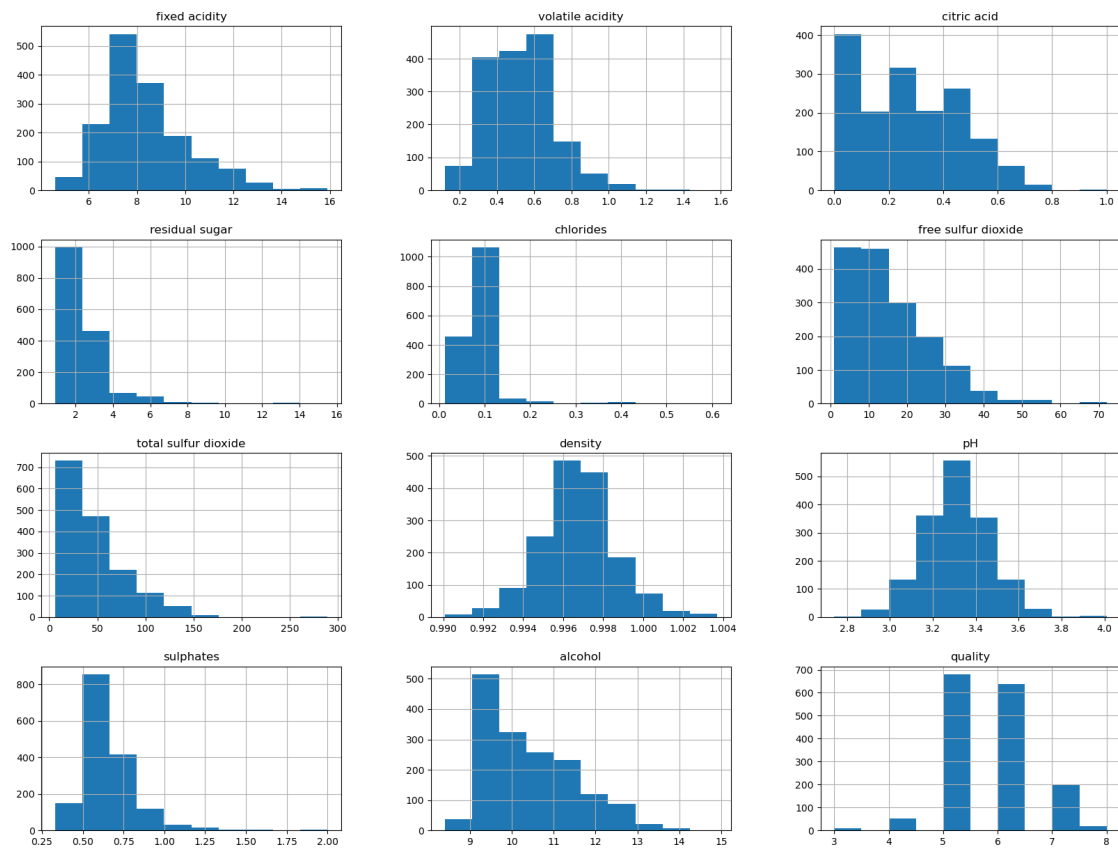
```
[ ]: plt.figure(figsize=(16,8))
      sns.lineplot(x='residual sugar',y='quality',data=data,color='cyan')
```

```
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```

```
[ ]: <Axes: xlabel='residual sugar', ylabel='quality'>
```



```
[ ]: data.hist(figsize=(20,15))
plt.show()
```



```
[ ]: cols_to_draw = ['fixed acidity', 'volatile acidity', 'citric acid', 'residual_
    ↪sugar',
                    'chlorides', 'free sulfur dioxide', 'total sulfur dioxide',
    ↪ 'density',
                    'pH', 'sulphates', 'alcohol']
cols = 3
rows = int(np.ceil(len(cols_to_draw) / cols))
fig, ax = plt.subplots(rows, cols, figsize=(16, rows * 5))
ax = ax.flatten()

quality_colors = ['tab:blue', 'tab:orange', 'tab:green', 'tab:red', 'tab:
    ↪purple', 'tab:brown', 'tab:pink']

for x, col in enumerate(cols_to_draw):
    for quality in range(1, 8):
        sns.kdeplot(data=data[data['quality'] == quality][col], ax=ax[x],
    ↪color=quality_colors[quality - 1],
                    common_norm=False, label=f'Quality {quality}')
    ax[x].set_title(f'{col} distribution')
    ax[x].set_xlabel(None)
    ax[x].legend()

plt.tight_layout()
plt.show()
```

```
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
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C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
```

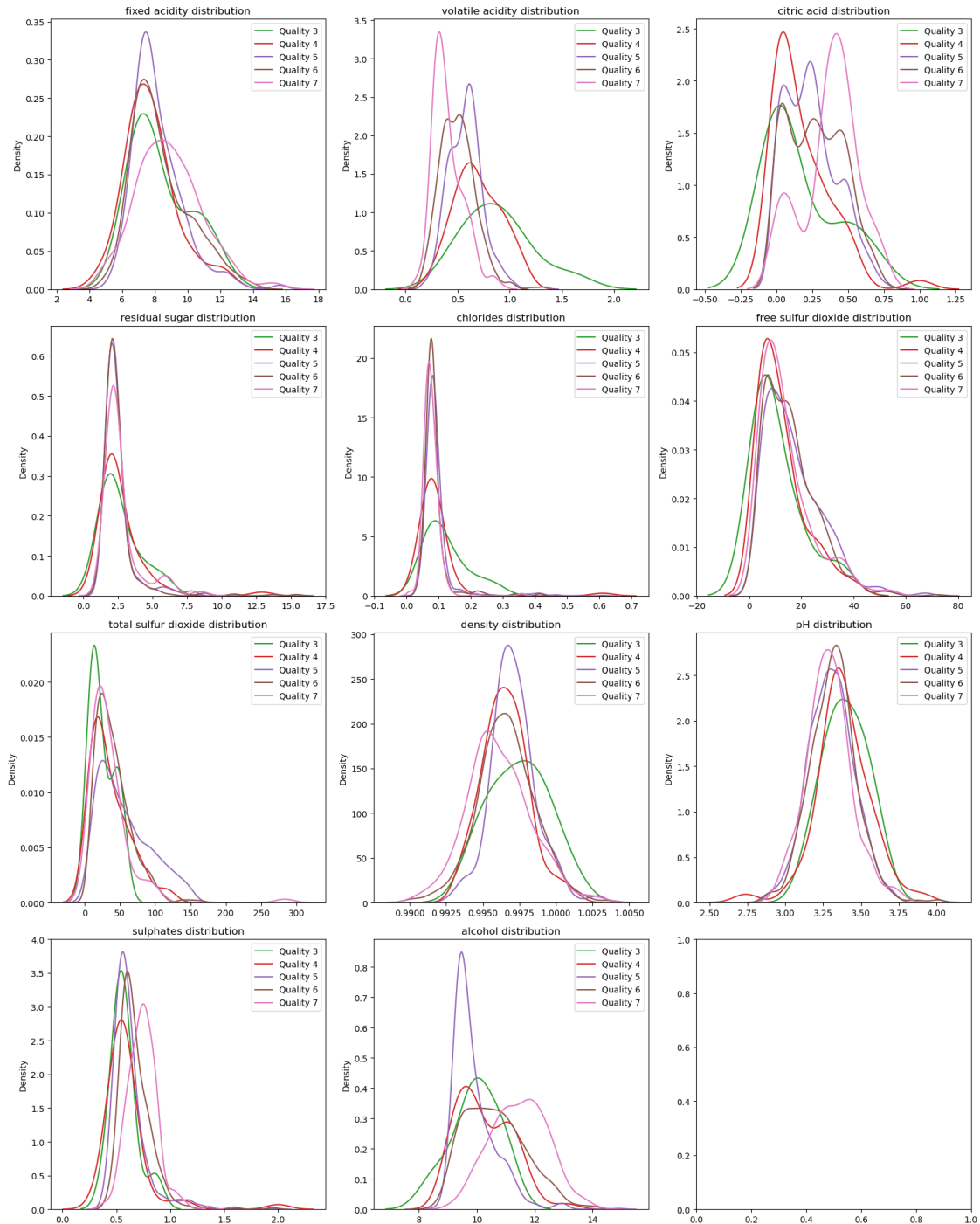

FutureWarning: use_inf_as_na option is deprecated and will be removed in a future version. Convert inf values to NaN before operating instead.

```
with pd.option_context('mode.use_inf_as_na', True):
```

C:\Users\gauth\anaconda3\Lib\site-packages\seaborn_oldcore.py:1119:

FutureWarning: use_inf_as_na option is deprecated and will be removed in a future version. Convert inf values to NaN before operating instead.

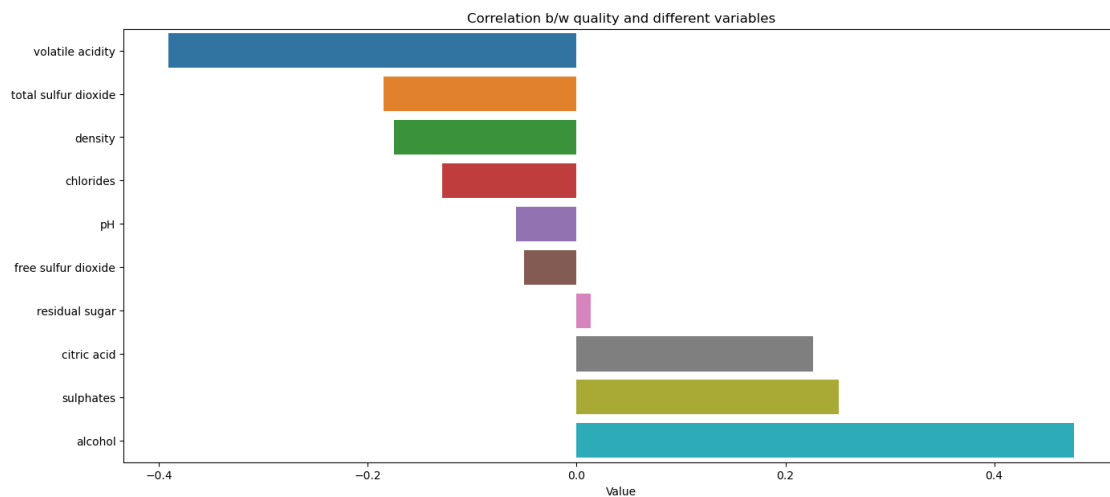
```
with pd.option_context('mode.use_inf_as_na', True):
```



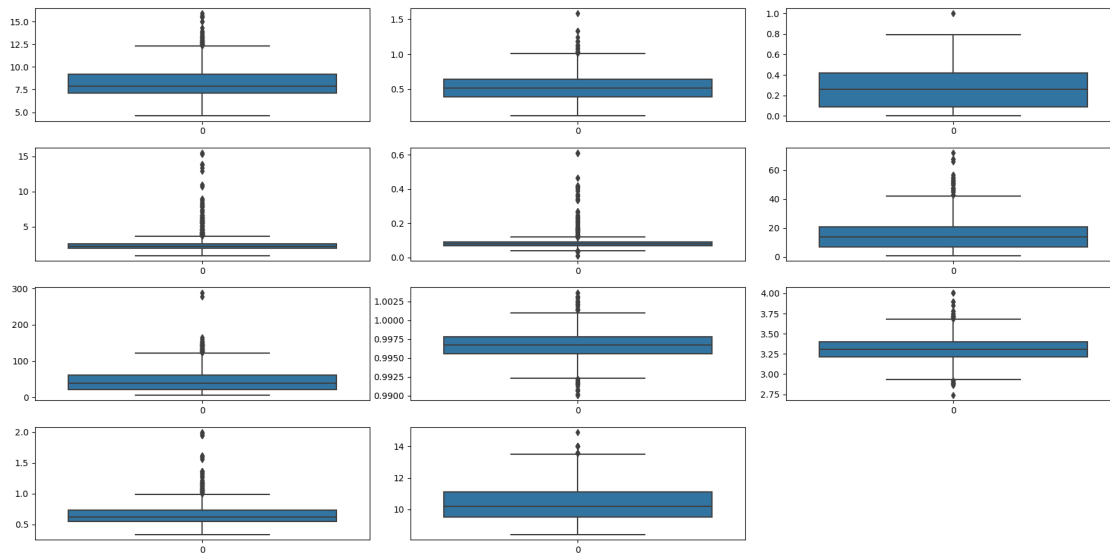
```
[ ]: d_corr=data.corr()['quality'][1:].drop('quality',axis=0)

plt.figure(figsize=(16,7))
plt.title('Correlation b/w quality and different variables')
sns.barplot(y=d_corr.sort_values().index,x=d_corr.sort_values().values)
plt.xlabel('Value')
```

```
[ ]: Text(0.5, 0, 'Value')
```



```
[ ]: plt.figure(figsize=(18,9))
o_count=1
for i in cols_to_draw:
    plt.subplot(4,3,o_count)
    sns.boxplot(data[i])
    o_count=o_count+1
plt.tight_layout()
```



```
[ ]: df=data.copy()
df.quality.value_counts()
```

```
[ ]: quality
5    681
6    638
7    199
4     53
8     18
3     10
Name: count, dtype: int64
```

```
[ ]: df['quality']=df['quality'].map({3: 'Bad',4: 'Bad',5: 'Bad',6: 'Good',7: 'Good',8:
↪ 'Good'})
df['quality'].value_counts()
```

```
[ ]: quality
Good    855
Bad     744
Name: count, dtype: int64
```

```
[ ]: from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
df['quality']=le.fit_transform(df['quality'])
df['quality'].value_counts()
```

```
[ ]: quality
1    855
```

```
0    744
Name: count, dtype: int64
```

```
[ ]: x=df.drop(['quality'],axis=1)
     y=df.quality
```

```
[ ]: from sklearn.model_selection import train_test_split
     x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.
     ↪25,random_state=30)
     print(x_train.shape)
     print(y_train.shape)
     print(x_test.shape)
     print(y_test.shape)
```

```
(1199, 11)
(1199,)
(400, 11)
(400,)
```

```
[ ]: from sklearn.preprocessing import StandardScaler
     sc=StandardScaler()
     x_train=sc.fit_transform(x_train)
     x_test=sc.fit_transform(x_test)
```

Methodology AND Result Analysis

```
[ ]: import pandas as pd
     from sklearn.tree import DecisionTreeClassifier
     from sklearn.metrics import accuracy_score
     from sklearn.model_selection import train_test_split
     import matplotlib.pyplot as plt
     from sklearn.tree import plot_tree

     # Assuming you have your data loaded and split into x_train, x_test, y_train,
     ↪y_test

     # Create a list to store results
     results_list = []
     # Create a list to store trained models
     models_list = []

     # Train five different decision tree models
     for i in range(1, 11, 2):
         max_depth = i

         # Using Gini impurity
         model_gini = DecisionTreeClassifier(max_depth=max_depth, random_state=42)
```

```

model_gini.fit(x_train, y_train)
models_list.append(model_gini)

# Using CART (Classification and Regression Trees)
model_cart = DecisionTreeClassifier(criterion='gini', max_depth=max_depth,
↳random_state=42)
model_cart.fit(x_train, y_train)
models_list.append(model_cart)

# Predictions for Gini impurity
y_train_preds_gini = model_gini.predict(x_train)
y_test_preds_gini = model_gini.predict(x_test)

# Predictions for CART
y_train_preds_cart = model_cart.predict(x_train)
y_test_preds_cart = model_cart.predict(x_test)

# Calculate accuracies for Gini impurity
train_accuracy_gini = accuracy_score(y_train, y_train_preds_gini)
test_accuracy_gini = accuracy_score(y_test, y_test_preds_gini)

# Calculate accuracies for CART
train_accuracy_cart = accuracy_score(y_train, y_train_preds_cart)
test_accuracy_cart = accuracy_score(y_test, y_test_preds_cart)

# Append results to the list
results_list.append({'Model': f'Decision Tree (Gini) {i}', 'Max Depth':
↳max_depth,
                    'Training Accuracy': train_accuracy_gini, 'Testing
↳Accuracy': test_accuracy_gini})
results_list.append({'Model': f'Decision Tree (CART) {i}', 'Max Depth':
↳max_depth,
                    'Training Accuracy': train_accuracy_cart, 'Testing
↳Accuracy': test_accuracy_cart})

# Create a DataFrame from the list
results_df = pd.DataFrame(results_list)

# Display the results as a table

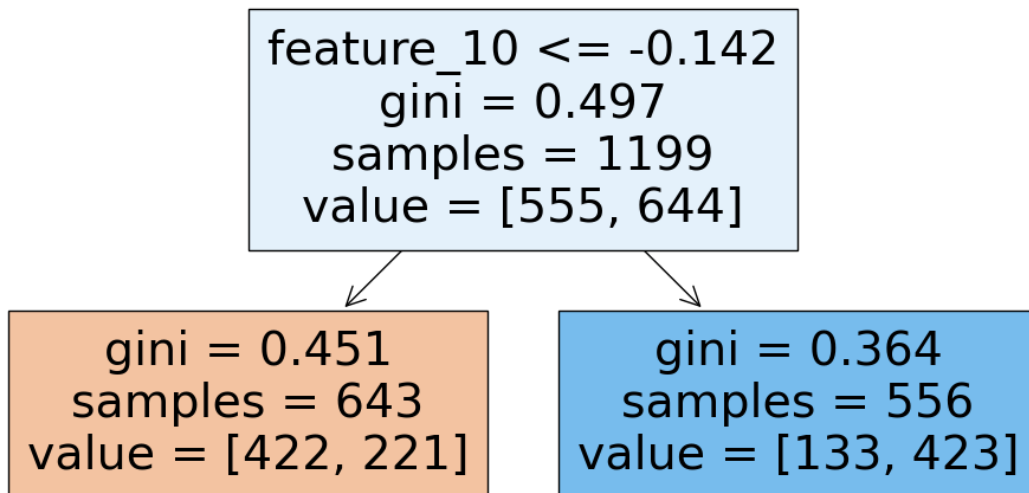
# Plot decision trees
for idx, model in enumerate(models_list):
    plt.figure(figsize=(12, 6))
    plot_tree(model, filled=True, feature_names=[f'feature_{i}' for i
↳in range(x_train.shape[1])])

```

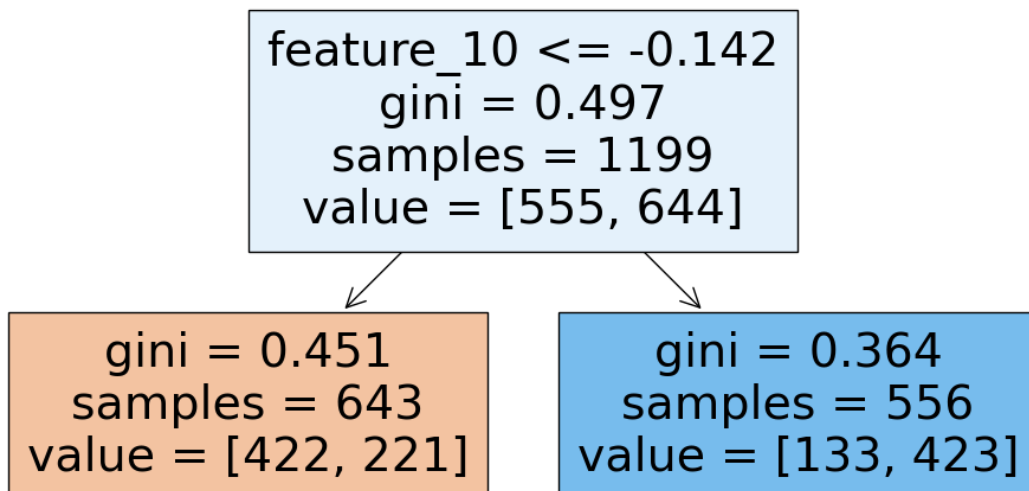


```
plt.title(f'Decision Tree (Depth={idx+1})')  
plt.show()
```

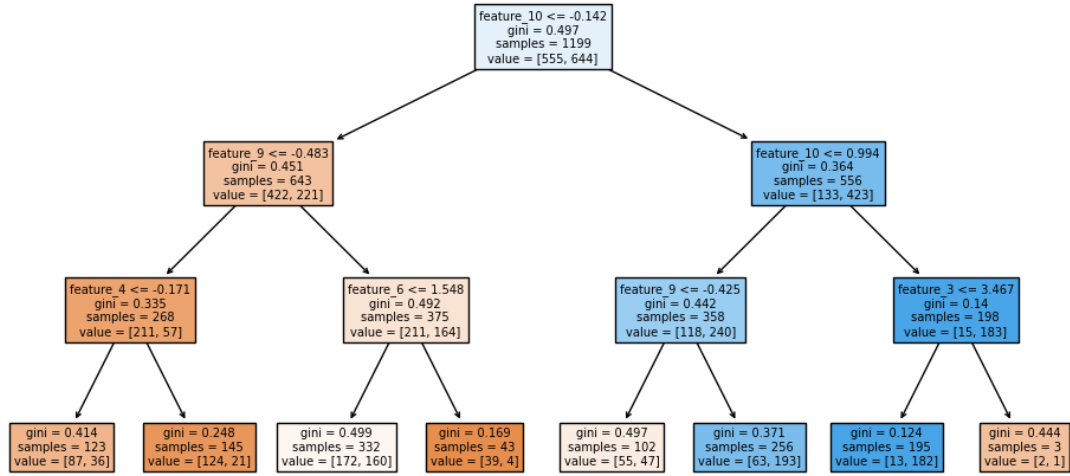
Decision Tree (Depth=1)



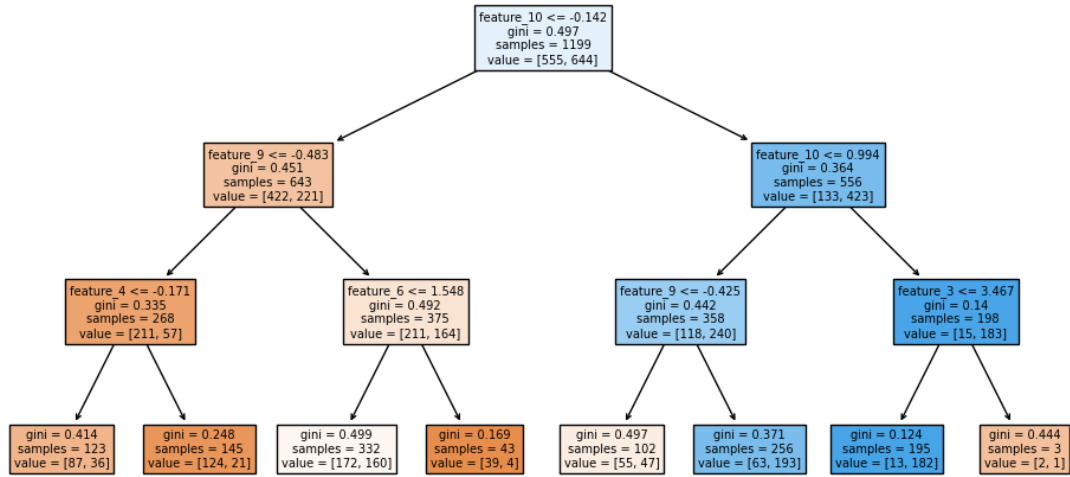
Decision Tree (Depth=2)



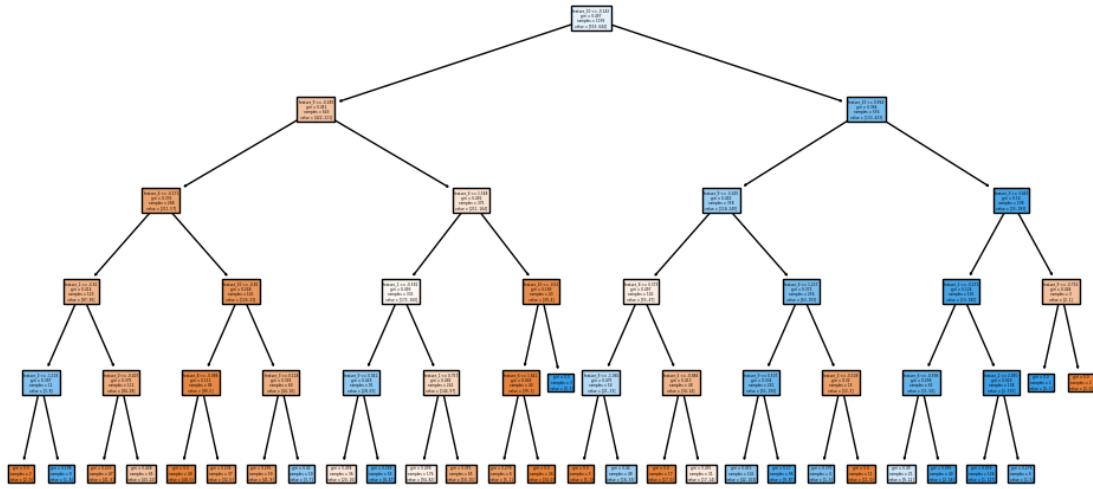
Decision Tree (Depth=3)



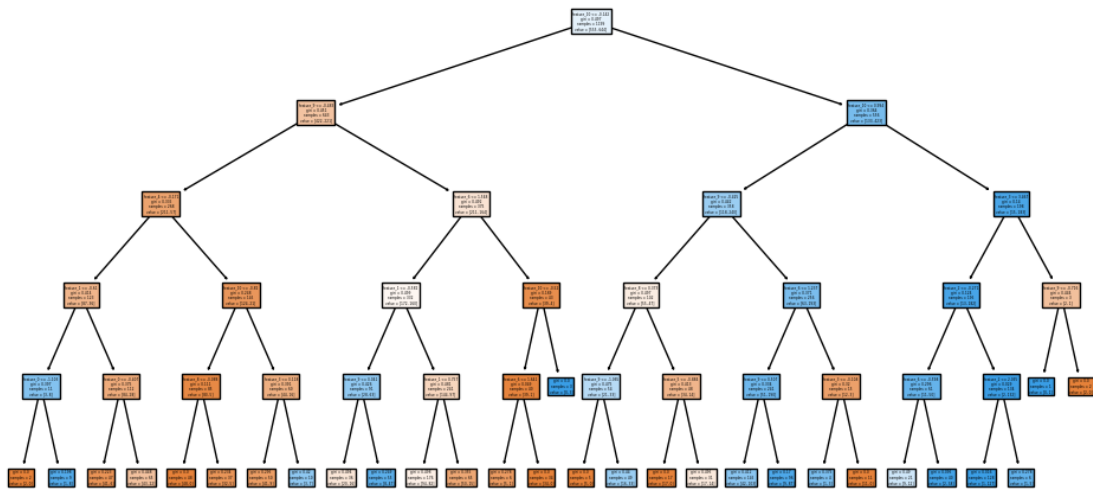
Decision Tree (Depth=4)



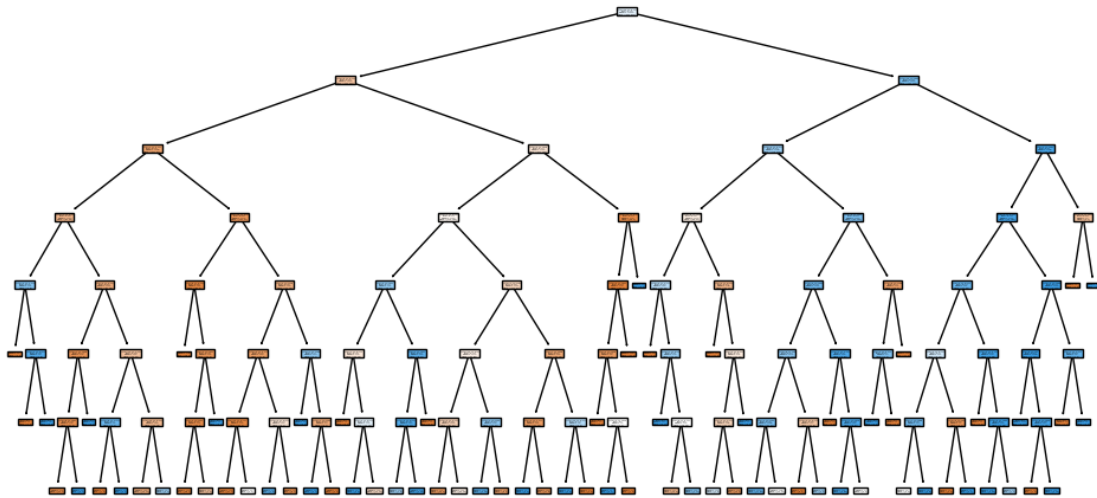
Decision Tree (Depth=5)



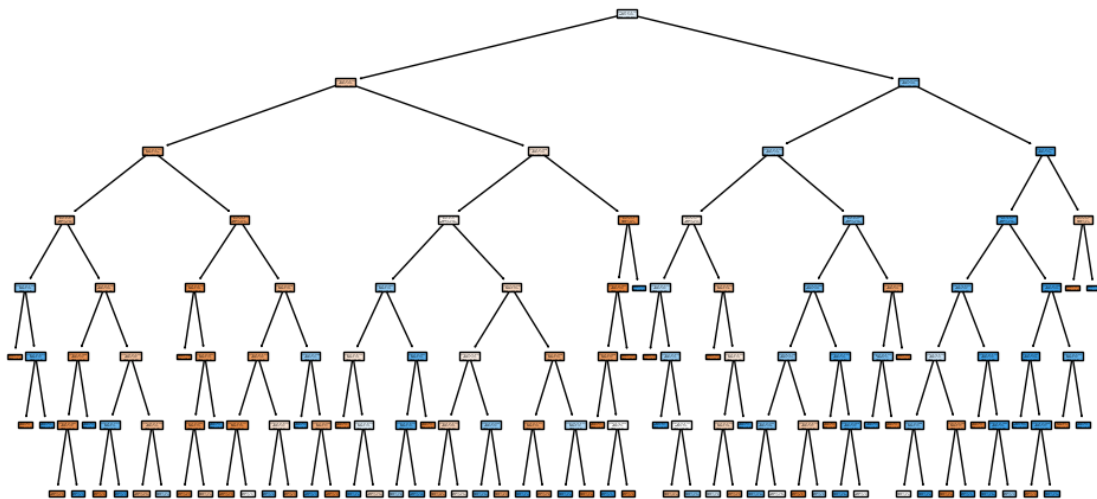
Decision Tree (Depth=6)

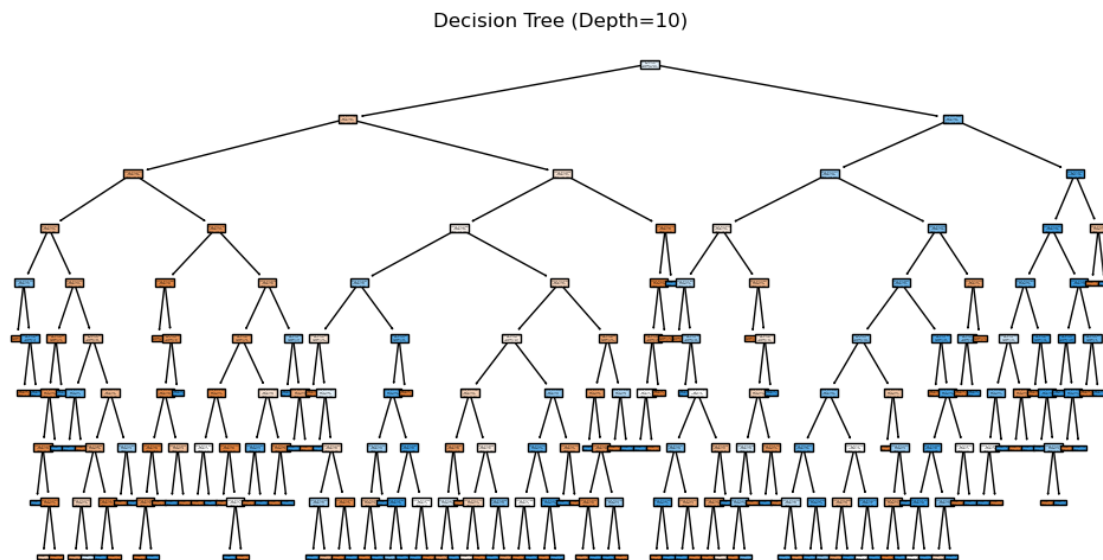
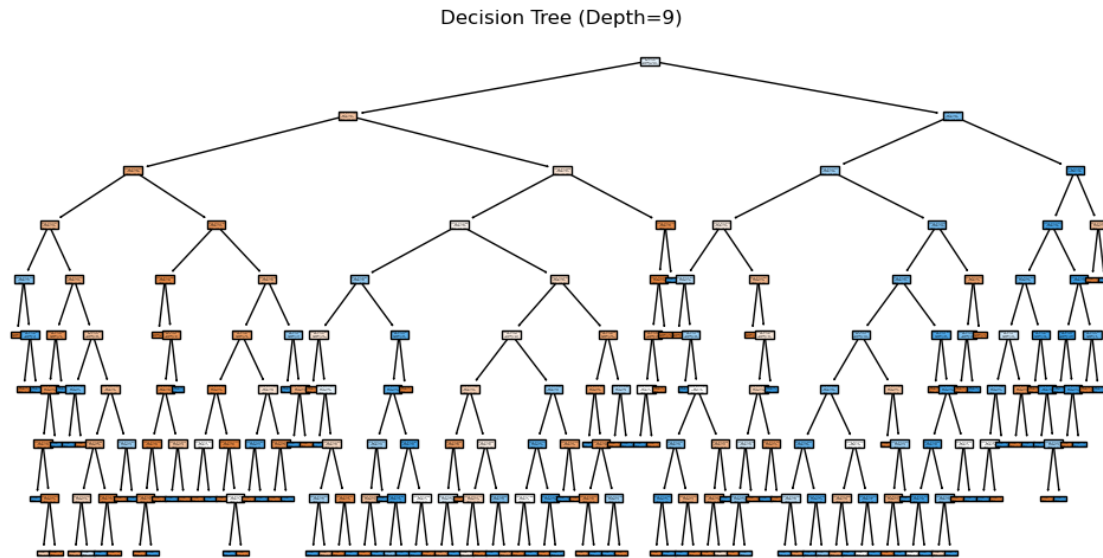


Decision Tree (Depth=7)



Decision Tree (Depth=8)





```
[ ]: results_df
```

```
[ ]:
      Model  Max Depth  Training Accuracy  Testing Accuracy
0  Decision Tree (Gini) 1           1      0.704754           0.690
1  Decision Tree (CART) 1           1      0.704754           0.690
2  Decision Tree (Gini) 3           3      0.712260           0.705
3  Decision Tree (CART) 3           3      0.712260           0.705
4  Decision Tree (Gini) 5           5      0.780651           0.725
```

5	Decision Tree (CART)	5	0.780651	0.725
6	Decision Tree (Gini)	7	0.855713	0.720
7	Decision Tree (CART)	7	0.855713	0.720
8	Decision Tree (Gini)	9	0.933278	0.725
9	Decision Tree (CART)	9	0.933278	0.725

Conclusion A maximum depth of 5 appears to be the optimal choice for these decision tree models, as it provides a good balance between training and testing accuracies without overfitting.

Regression

```
[ ]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```
[ ]: data=pd.read_csv("Downloads/insurance.csv")
```

Dataset Description The provided dataset consists of information on insurance charges for individuals along with their age, BMI (Body Mass Index), number of children, and age. Here's a description of each column:

age: Integer. Represents the age of the individual.

bmi: Float. Stands for Body Mass Index, a measure derived from the height and weight of the individual.

children: Integer. Represents the number of children or dependents covered by the insurance plan for the individual.

charges: Float. Represents the insurance charges (premiums) for each individual.

```
[ ]: **Exploratory Analytics**
```

```
[ ]: data.describe()
```

```
[ ]:
      age      bmi  children  charges
count  1338.000000  1338.000000  1338.000000  1338.000000
mean    39.207025   30.663397    1.094918  13270.422265
std     14.049960    6.098187    1.205493  12110.011237
min     18.000000   15.960000    0.000000   1121.873900
25%     27.000000   26.296250    0.000000   4740.287150
50%     39.000000   30.400000    1.000000   9382.033000
75%     51.000000   34.693750    2.000000  16639.912515
max     64.000000   53.130000    5.000000  63770.428010
```

```
[ ]: sns.pairplot(data)
```

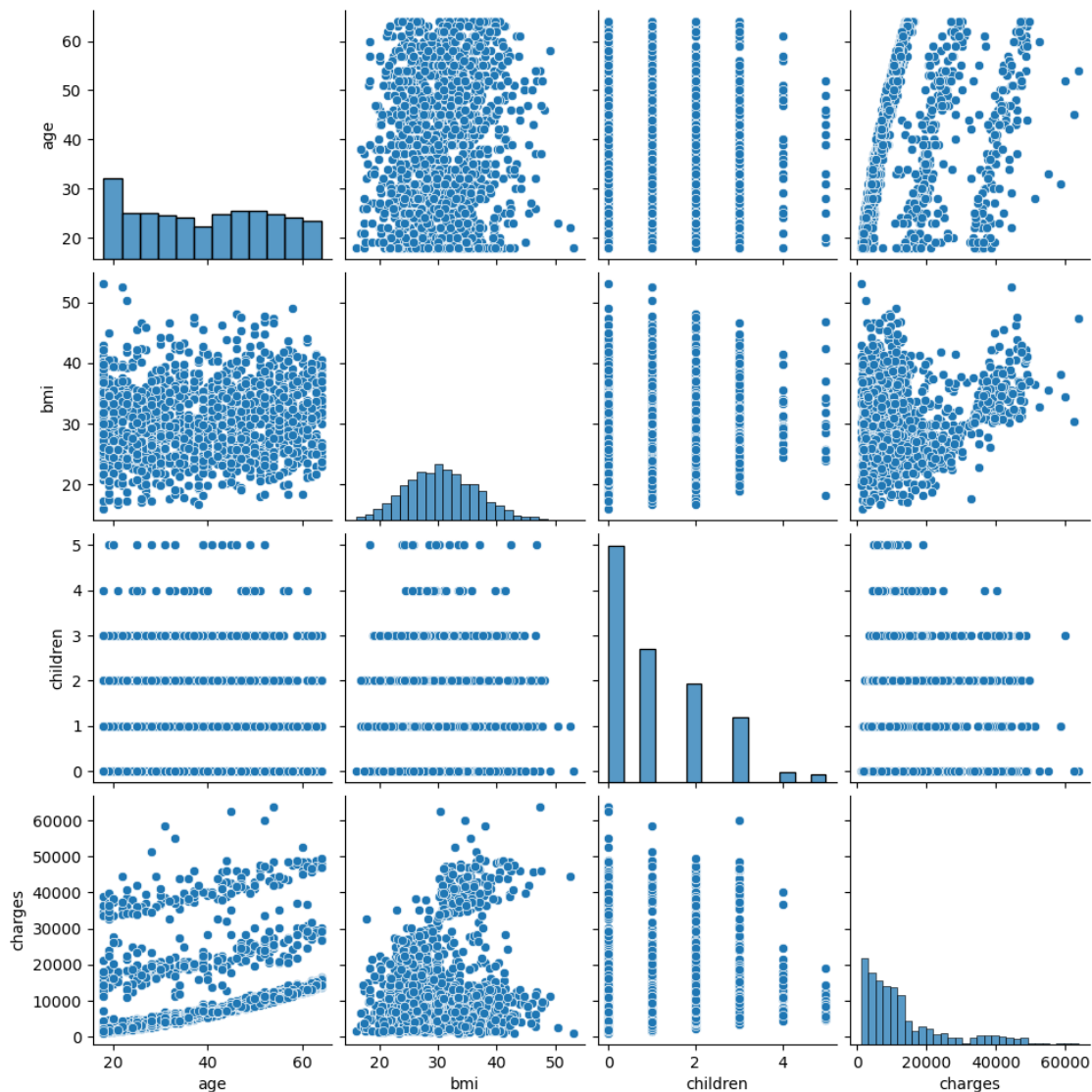
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a

```

future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):

```

```
[ ]: <seaborn.axisgrid.PairGrid at 0x2386169d6d0>
```



```
[ ]: sns.distplot(data['age'])
```

C:\Users\gauth\AppData\Local\Temp\ipykernel_2140\3262849815.py:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see <https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751>

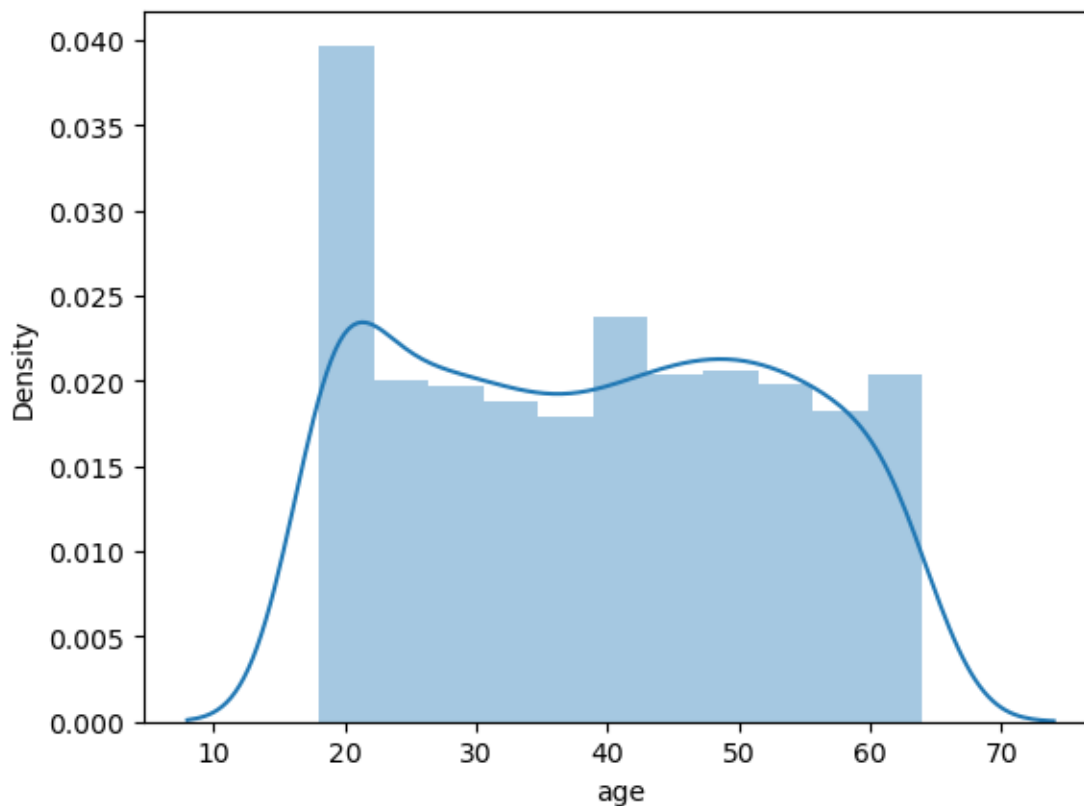
```
sns.distplot(data['age'])
```

C:\Users\gauth\anaconda3\Lib\site-packages\seaborn_oldcore.py:1119:

FutureWarning: use_inf_as_na option is deprecated and will be removed in a future version. Convert inf values to NaN before operating instead.

```
with pd.option_context('mode.use_inf_as_na', True):
```

```
[ ]: <Axes: xlabel='age', ylabel='Density'>
```



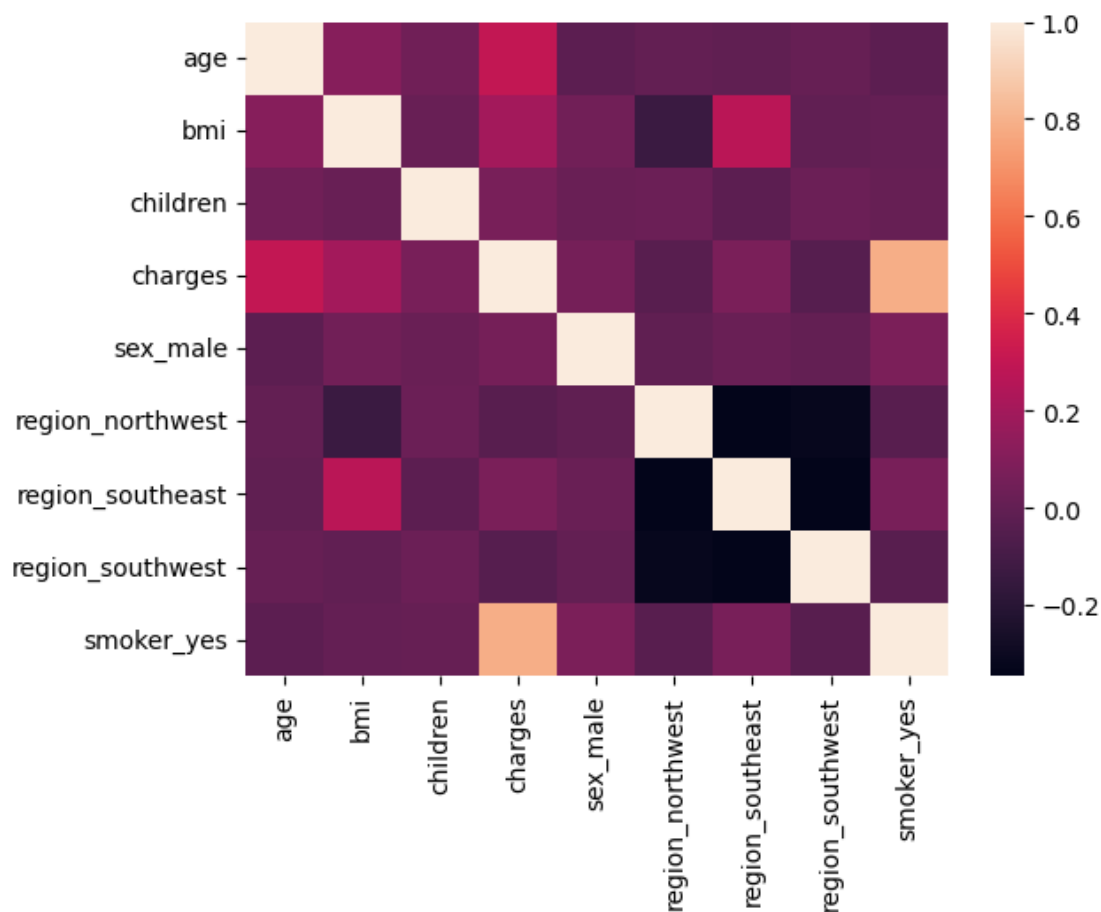

```
[ ]: from sklearn.preprocessing import OneHotEncoder
      encoded_data = data.copy()
```

```
data = pd.get_dummies(encoded_data, columns=['sex', 'region', 'smoker'],
                        drop_first=True)
```

```
[ ]: x = data.drop('charges', axis=1)
      y = data['charges']
```

```
[ ]: sns.heatmap(data.corr())
```

```
[ ]: <Axes: >
```



```
[ ]: 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 = 1)
```

```
[ ]: data.head()
```

```
[ ]:   age      bmi  children      charges  sex_male  region_northwest  \
0    19   27.900         0  16884.92400    False           False
1    18   33.770         1   1725.55230     True           False
2    28   33.000         3   4449.46200     True           False
3    33   22.705         0  21984.47061     True            True
4    32   28.880         0   3866.85520     True            True

      region_southeast  region_southwest  smoker_yes
0                False                True         True
1                True                False        False
2                True                False        False
3                False                False        False
4                False                False        False
```

Methodology AND Result Analysis

```
[ ]: from sklearn.tree import DecisionTreeRegressor, export_text
     from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score
```

```
[ ]: import pandas as pd
     from sklearn.model_selection import train_test_split
     from sklearn.tree import DecisionTreeRegressor, export_text
     from sklearn.metrics import mean_squared_error

# Define decision tree parameters
max_depth_values = [3, 5, None] # Depth values to iterate over
criteria = ['squared_error', 'friedman_mse'] # Split criterion

# Initialize an empty list to store results
result_list = []

# Counter for number of models
model_counter = 0

# Loop over different max_depth values for each criterion
for criterion_val in criteria:
    for max_depth in max_depth_values:
        # Initialize and fit the model
        model = DecisionTreeRegressor(max_depth=max_depth,
        ↪ criterion=criterion_val, random_state=42)
        model.fit(x_train, y_train)
```

```

# Predict on the test set
y_pred = model.predict(x_test)

# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
mae = mean_absolute_error(y_test, y_pred)
r_squared = r2_score(y_test, y_pred)

# Print the decision tree
model_counter += 1
print(f"Decision Tree {model_counter} (Max Depth: {max_depth},  

↳ Criterion: {criterion_val}):")
tree_text = export_text(model, feature_names=list(x.columns))
print(tree_text)
print()

# Append results to the result list
result_list.append({'Max Depth': max_depth, 'Criterion': criterion_val,  

↳ 'MSE': mse, 'MAE': mae, 'R-squared': r_squared})

# Convert the result list to a DataFrame
result_table = pd.DataFrame(result_list)

```

Decision Tree 1 (Max Depth: 3, Criterion: squared_error):

```

|--- smoker_yes <= 0.50
|   |--- age <= 43.50
|   |   |--- age <= 26.50
|   |   |   |--- value: [4042.61]
|   |   |--- age > 26.50
|   |   |   |--- value: [6599.95]
|   |--- age > 43.50
|   |   |--- age <= 51.50
|   |   |   |--- value: [10427.82]
|   |   |--- age > 51.50
|   |   |   |--- value: [13872.60]
|--- smoker_yes > 0.50
|   |--- bmi <= 30.01
|   |   |--- age <= 41.00
|   |   |   |--- value: [18540.38]
|   |   |--- age > 41.00
|   |   |   |--- value: [25245.72]
|   |--- bmi > 30.01
|   |   |--- age <= 42.00
|   |   |   |--- value: [38230.01]
|   |   |--- age > 42.00
|   |   |   |--- value: [45690.05]

```

Decision Tree 2 (Max Depth: 5, Criterion: squared_error):

```
|--- smoker_yes <= 0.50
|   |--- age <= 43.50
|   |   |--- age <= 26.50
|   |   |   |--- children <= 1.50
|   |   |   |   |--- age <= 22.50
|   |   |   |   |   |--- value: [2793.29]
|   |   |   |   |   |--- age > 22.50
|   |   |   |   |   |   |--- value: [4345.86]
|   |   |   |   |--- children > 1.50
|   |   |   |   |   |--- region_northwest <= 0.50
|   |   |   |   |   |   |--- value: [5371.66]
|   |   |   |   |   |   |--- region_northwest > 0.50
|   |   |   |   |   |   |   |--- value: [10592.59]
|   |   |   |--- age > 26.50
|   |   |   |   |--- age <= 36.50
|   |   |   |   |   |--- children <= 0.50
|   |   |   |   |   |   |--- value: [4441.25]
|   |   |   |   |   |   |--- children > 0.50
|   |   |   |   |   |   |   |--- value: [6530.26]
|   |   |   |   |--- age > 36.50
|   |   |   |   |   |--- children <= 3.50
|   |   |   |   |   |   |--- value: [7315.31]
|   |   |   |   |   |   |--- children > 3.50
|   |   |   |   |   |   |   |--- value: [10303.87]
|   |--- age > 43.50
|   |   |--- age <= 51.50
|   |   |   |--- age <= 46.50
|   |   |   |   |--- bmi <= 31.90
|   |   |   |   |   |--- value: [9946.75]
|   |   |   |   |   |--- bmi > 31.90
|   |   |   |   |   |   |--- value: [8408.55]
|   |   |   |--- age > 46.50
|   |   |   |   |--- region_southeast <= 0.50
|   |   |   |   |   |--- value: [11679.81]
|   |   |   |   |   |--- region_southeast > 0.50
|   |   |   |   |   |   |--- value: [9195.75]
|   |   |--- age > 51.50
|   |   |   |--- age <= 58.50
|   |   |   |   |--- children <= 1.50
|   |   |   |   |   |--- value: [12484.82]
|   |   |   |   |   |--- children > 1.50
|   |   |   |   |   |   |--- value: [14396.36]
|   |   |   |--- age > 58.50
|   |   |   |   |--- children <= 3.50
|   |   |   |   |   |--- value: [14866.24]
|   |   |   |   |   |--- children > 3.50
```

```
| | | | |--- value: [36580.28]
|--- smoker_yes > 0.50
| | |--- bmi <= 30.01
| | | |--- age <= 41.00
| | | | |--- age <= 19.50
| | | | |--- bmi <= 23.44
| | | | |--- value: [13676.32]
| | | | |--- bmi > 23.44
| | | | |--- value: [16993.18]
| | | |--- age > 19.50
| | | | |--- bmi <= 28.07
| | | | |--- value: [18522.75]
| | | | |--- bmi > 28.07
| | | | |--- value: [21490.44]
| | |--- age > 41.00
| | | |--- bmi <= 25.95
| | | | |--- age <= 44.50
| | | | |--- value: [20319.05]
| | | | |--- age > 44.50
| | | | |--- value: [24246.98]
| | | |--- bmi > 25.95
| | | | |--- bmi <= 26.10
| | | | |--- value: [38245.59]
| | | | |--- bmi > 26.10
| | | | |--- value: [26760.99]
|--- bmi > 30.01
| | |--- age <= 42.00
| | | |--- age <= 27.50
| | | | |--- bmi <= 35.61
| | | | |--- value: [34775.46]
| | | | |--- bmi > 35.61
| | | | |--- value: [38580.93]
| | | |--- age > 27.50
| | | | |--- bmi <= 35.15
| | | | |--- value: [38673.36]
| | | | |--- bmi > 35.15
| | | | |--- value: [42920.99]
| | |--- age > 42.00
| | | |--- bmi <= 46.81
| | | | |--- bmi <= 30.43
| | | | |--- value: [62592.87]
| | | | |--- bmi > 30.43
| | | | |--- value: [44976.10]
| | | |--- bmi > 46.81
| | | | |--- value: [63770.43]
```

Decision Tree 3 (Max Depth: None, Criterion: squared_error):

```

|--- smoker_yes <= 0.50
|   |--- age <= 43.50
|   |   |--- age <= 26.50
|   |   |   |--- children <= 1.50
|   |   |   |   |--- age <= 22.50
|   |   |   |   |   |--- bmi <= 28.26
|   |   |   |   |   |   |--- sex_male <= 0.50
|   |   |   |   |   |   |   |--- age <= 20.00
|   |   |   |   |   |   |   |   |--- bmi <= 21.65
|   |   |   |   |   |   |   |   |   |--- bmi <= 19.70
|   |   |   |   |   |   |   |   |   |   |--- bmi <= 18.20
|   |   |   |   |   |   |   |   |   |   |   |--- value: [1727.79]
|   |   |   |   |   |   |   |   |   |   |   |--- bmi > 18.20
|   |   |   |   |   |   |   |   |   |   |   |   |--- value: [1728.90]
|   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 19.70
|   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [1607.51]
|   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 21.65
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- children <= 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age <= 18.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- truncated branch of depth 3
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 18.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [2117.34]
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- children > 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- region_northwest <= 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [2201.10]
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- region_northwest > 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [2710.83]
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 20.00
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 23.74
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 22.66
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age <= 21.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- truncated branch of depth 2
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 21.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [2527.82]
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 22.66
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [2731.91]
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 23.74
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- children <= 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age <= 21.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [2007.94]
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 21.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- truncated branch of depth 2
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- children > 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [2597.78]
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- sex_male > 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 23.26
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- children <= 0.50
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- region_southwest <= 0.50

```

```
| | | | | | | | | |--- bmi <= 23.15  
| | | | | | | | | |--- truncated branch of depth 5  
| | | | | | | | | |--- bmi > 23.15  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- region_southwest > 0.50  
| | | | | | | | | |--- bmi <= 20.05  
| | | | | | | | | |--- value: [1241.57]  
| | | | | | | | | |--- bmi > 20.05  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- children > 0.50  
| | | | | | | | | |--- value: [1964.78]  
| | | | | | | |--- bmi > 23.26  
| | | | | | | |--- region_northwest <= 0.50  
| | | | | | | |--- age <= 19.50  
| | | | | | | |--- bmi <= 26.86  
| | | | | | | |--- truncated branch of depth 5  
| | | | | | | |--- bmi > 26.86  
| | | | | | | |--- value: [1252.41]  
| | | | | | | |--- age > 19.50  
| | | | | | | |--- age <= 21.50  
| | | | | | | |--- truncated branch of depth 3  
| | | | | | | |--- age > 21.50  
| | | | | | | |--- value: [1665.00]  
| | | | | | | |--- region_northwest > 0.50  
| | | | | | | |--- age <= 20.50  
| | | | | | | |--- value: [2221.56]  
| | | | | | | |--- age > 20.50  
| | | | | | | |--- value: [2045.69]  
| | | | | |--- bmi > 28.26  
| | | | | |--- age <= 18.50  
| | | | | |--- bmi <= 30.13  
| | | | | |--- bmi <= 30.07  
| | | | | |--- bmi <= 28.40  
| | | | | |--- value: [11272.33]  
| | | | | |--- bmi > 28.40  
| | | | | |--- sex_male <= 0.50  
| | | | | |--- value: [7323.73]  
| | | | | |--- sex_male > 0.50  
| | | | | |--- truncated branch of depth 2  
| | | | | |--- bmi > 30.07  
| | | | | |--- value: [21344.85]  
| | | | | |--- bmi > 30.13  
| | | | | |--- bmi <= 33.83  
| | | | | |--- region_southeast <= 0.50  
| | | | | |--- bmi <= 31.11  
| | | | | |--- value: [2203.74]  
| | | | | |--- bmi > 31.11  
| | | | | |--- truncated branch of depth 2
```

[illegible]


```
| | | | | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | | | | | |--- value: [1917.32]  
  
| | | | | | | | | | | | |--- age > 22.50  
| | | | | | | | | | | | |--- bmi <= 23.34  
| | | | | | | | | | | | |--- bmi <= 22.91  
| | | | | | | | | | | | |--- age <= 23.50  
| | | | | | | | | | | | |--- bmi <= 18.05  
| | | | | | | | | | | | |--- value: [2775.19]  
| | | | | | | | | | | | |--- bmi > 18.05  
| | | | | | | | | | | | |--- value: [21595.38]  
| | | | | | | | | | | | |--- age > 23.50  
| | | | | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | | | | |--- age <= 24.50  
| | | | | | | | | | | | |--- value: [2457.50]  
| | | | | | | | | | | | |--- age > 24.50  
| | | | | | | | | | | | |--- bmi <= 20.30  
| | | | | | | | | | | | |--- value: [3378.91]  
| | | | | | | | | | | | |--- bmi > 20.30  
| | | | | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | | | | |--- sex_male > 0.50  
| | | | | | | | | | | | |--- bmi <= 19.23  
| | | | | | | | | | | | |--- value: [2680.95]  
| | | | | | | | | | | | |--- bmi > 19.23  
| | | | | | | | | | | | |--- value: [2302.30]  
  
| | | | | | | | | | | | |--- bmi > 22.91  
| | | | | | | | | | | | |--- value: [25081.77]  
| | | | | | | | | | | | |--- bmi > 23.34  
| | | | | | | | | | | | |--- region_southwest <= 0.50  
| | | | | | | | | | | | |--- bmi <= 40.76  
| | | | | | | | | | | | |--- children <= 0.50  
| | | | | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | | | | |--- truncated branch of depth 5  
| | | | | | | | | | | | |--- sex_male > 0.50  
| | | | | | | | | | | | |--- truncated branch of depth 5  
| | | | | | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | | | | |--- sex_male > 0.50  
| | | | | | | | | | | | |--- truncated branch of depth 4  
| | | | | | | | | | | | |--- children > 0.50  
| | | | | | | | | | | | |--- bmi <= 29.31  
| | | | | | | | | | | | |--- bmi <= 27.49  
| | | | | | | | | | | | |--- value: [3309.79]  
| | | | | | | | | | | | |--- bmi > 27.49  
| | | | | | | | | | | | |--- value: [2902.91]  
| | | | | | | | | | | | |--- bmi > 29.31
```

```
| | | | | | | | | |--- bmi <= 33.20  
| | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | |--- bmi > 33.20  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | |--- bmi > 40.76  
| | | | | | | |--- region_southeast <= 0.50  
| | | | | | | |--- value: [17878.90]  
| | | | | | | |--- region_southeast > 0.50  
| | | | | | | |--- age <= 24.00  
| | | | | | | |--- bmi <= 46.15  
| | | | | | | |--- value: [1837.28]  
| | | | | | | |--- bmi > 46.15  
| | | | | | | |--- value: [2438.06]  
| | | | | | | |--- age > 24.00  
| | | | | | | |--- sex_male <= 0.50  
| | | | | | | |--- value: [3238.44]  
| | | | | | | |--- sex_male > 0.50  
| | | | | | | |--- value: [2927.06]  
| | | | | |--- region_southwest > 0.50  
| | | | | |--- age <= 24.50  
| | | | | |--- sex_male <= 0.50  
| | | | | |--- bmi <= 27.80  
| | | | | |--- value: [18955.22]  
| | | | | |--- bmi > 27.80  
| | | | | |--- value: [13126.68]  
| | | | | |--- sex_male > 0.50  
| | | | | |--- value: [1972.95]  
| | | | | |--- age > 24.50  
| | | | | |--- children <= 0.50  
| | | | | |--- value: [2632.99]  
| | | | | |--- children > 0.50  
| | | | | |--- value: [3410.32]  
| | | |--- children > 1.50  
| | | |--- region_northwest <= 0.50  
| | | |--- age <= 24.50  
| | | |--- bmi <= 21.84  
| | | |--- bmi <= 21.01  
| | | |--- bmi <= 20.09  
| | | |--- value: [4005.42]  
| | | |--- bmi > 20.09  
| | | |--- value: [3861.21]  
| | | |--- bmi > 21.01  
| | | |--- value: [11884.05]  
| | | |--- bmi > 21.84  
| | | |--- children <= 3.50  
| | | |--- age <= 21.50  
| | | |--- region_southeast <= 0.50  
| | | |--- bmi <= 24.57
```

```
| | | | | | | | | | |--- value: [2913.57]
| | | | | | | | | | |--- bmi > 24.57
| | | | | | | | | | |   |--- truncated branch of depth 3
| | | | | | | | | | |   |--- region_southeast > 0.50
| | | | | | | | | | |     |--- sex_male <= 0.50
| | | | | | | | | | |       |--- truncated branch of depth 3
| | | | | | | | | | |       |--- sex_male > 0.50
| | | | | | | | | | |         |--- truncated branch of depth 2
| | | | | | | | | | |         |--- age > 21.50
| | | | | | | | | | |           |--- bmi <= 31.40
| | | | | | | | | | |             |--- value: [4234.93]
| | | | | | | | | | |               |--- bmi > 31.40
| | | | | | | | | | |                 |--- bmi <= 34.69
| | | | | | | | | | |                   |--- truncated branch of depth 2
| | | | | | | | | | |                     |--- bmi > 34.69
| | | | | | | | | | |                       |--- truncated branch of depth 3
| | | | | | | | | | |                         |--- children > 3.50
| | | | | | | | | | |                           |--- age <= 19.50
| | | | | | | | | | |                             |--- bmi <= 29.98
| | | | | | | | | | |                               |--- value: [4687.80]
| | | | | | | | | | |                                 |--- bmi > 29.98
| | | | | | | | | | |                                   |--- value: [4561.19]
| | | | | | | | | | |                                     |--- age > 19.50
| | | | | | | | | | |                                       |--- bmi <= 33.56
| | | | | | | | | | |                                           |--- value: [4915.06]
| | | | | | | | | | |                                             |--- bmi > 33.56
| | | | | | | | | | |                                                 |--- value: [4830.63]
| | | | | | | | | | |--- age > 24.50
| | | | | | | | | | |   |--- region_southwest <= 0.50
| | | | | | | | | | |     |--- bmi <= 26.12
| | | | | | | | | | |       |--- value: [23241.47]
| | | | | | | | | | |         |--- bmi > 26.12
| | | | | | | | | | |           |--- sex_male <= 0.50
| | | | | | | | | | |             |--- children <= 3.00
| | | | | | | | | | |               |--- value: [4564.19]
| | | | | | | | | | |                 |--- children > 3.00
| | | | | | | | | | |                   |--- value: [24671.66]
| | | | | | | | | | |                     |--- sex_male > 0.50
| | | | | | | | | | |                       |--- age <= 25.50
| | | | | | | | | | |                         |--- value: [4504.66]
| | | | | | | | | | |                           |--- age > 25.50
| | | | | | | | | | |                             |--- value: [4661.29]
| | | | | | | | | | |--- region_southwest > 0.50
| | | | | | | | | | |   |--- children <= 4.00
| | | | | | | | | | |     |--- sex_male <= 0.50
| | | | | | | | | | |       |--- value: [4391.65]
| | | | | | | | | | |         |--- sex_male > 0.50
| | | | | | | | | | |           |--- age <= 25.50
```



```
| | | | | | | | | --- sex_male <= 0.50  
| | | | | | | | | |--- age <= 28.50  
| | | | | | | | | |    |-- region_southwest <= 0.50  
| | | | | | | | | |        |-- bmi <= 29.14  
| | | | | | | | | |            |-- value: [3558.62]  
| | | | | | | | | |            |-- bmi > 29.14  
| | | | | | | | | |                |-- value: [3171.61]  
| | | | | | | | | |    |-- region_southwest > 0.50  
| | | | | | | | | |        |-- bmi <= 24.95  
| | | | | | | | | |            |-- value: [2974.13]  
| | | | | | | | | |            |-- bmi > 24.95  
| | | | | | | | | |                |-- truncated branch of depth 2  
| | | | | | | | | |    |-- age > 28.50  
| | | | | | | | | |        |-- region_southwest <= 0.50  
| | | | | | | | | |            |-- bmi <= 28.60  
| | | | | | | | | |                |-- value: [3736.46]  
| | | | | | | | | |            |-- bmi > 28.60  
| | | | | | | | | |                |-- value: [3943.60]  
| | | | | | | | | |    |-- region_southwest > 0.50  
| | | | | | | | | |        |-- bmi <= 26.80  
| | | | | | | | | |            |-- value: [3353.28]  
| | | | | | | | | |            |-- bmi > 26.80  
| | | | | | | | | |                |-- value: [3554.20]  
| | | | | | | | | |    |-- sex_male > 0.50  
| | | | | | | | | |    |-- age <= 27.50  
| | | | | | | | | |        |-- bmi <= 26.80  
| | | | | | | | | |            |-- value: [2483.74]  
| | | | | | | | | |        |-- bmi > 26.80  
| | | | | | | | | |            |-- bmi <= 31.58  
| | | | | | | | | |                |-- value: [2494.02]  
| | | | | | | | | |            |-- bmi > 31.58  
| | | | | | | | | |                |-- truncated branch of depth 2  
| | | | | | | | | |    |-- age > 27.50  
| | | | | | | | | |        |-- age <= 28.50  
| | | | | | | | | |            |-- value: [3062.51]  
| | | | | | | | | |        |-- age > 28.50  
| | | | | | | | | |            |-- value: [2866.09]  
| | | | | | | | | |    |-- age > 30.50  
| | | | | | | | | |    |-- age <= 33.50  
| | | | | | | | | |        |-- bmi <= 21.14  
| | | | | | | | | |            |-- value: [4544.23]  
| | | | | | | | | |        |-- bmi > 21.14  
| | | | | | | | | |            |-- age <= 32.50  
| | | | | | | | | |                |-- bmi <= 30.97  
| | | | | | | | | |                    |-- truncated branch of depth 6  
| | | | | | | | | |                        |-- bmi > 30.97  
| | | | | | | | | |                            |-- value: [4347.02]  
| | | | | | | | | |                                |-- age > 32.50
```

```
| | | | | | | | | | | | |--- bmi <= 25.50  
| | | | | | | | | | | | |--- value: [4185.10]  
| | | | | | | | | | | | |--- bmi > 25.50  
| | | | | | | | | | | | |--- value: [4571.41]  
| | | | | | | | | | | | |--- age > 33.50  
| | | | | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | | | | |--- bmi <= 21.71  
| | | | | | | | | | | | |--- value: [5458.05]  
| | | | | | | | | | | | |--- bmi > 21.71  
| | | | | | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | | | | |--- sex_male > 0.50  
| | | | | | | | | | | | |--- bmi <= 25.54  
| | | | | | | | | | | | |--- value: [4500.34]  
| | | | | | | | | | | | |--- bmi > 25.54  
| | | | | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | | | | |--- value: [4402.23]  
| | | | | | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | | | | | |--- value: [4399.73]  
| | | | | | | | | | | | |--- bmi > 33.74  
| | | | | | | | | | | | |--- bmi <= 34.01  
| | | | | | | | | | | | |--- value: [19673.34]  
| | | | | | | | | | | | |--- bmi > 34.01  
| | | | | | | | | | | | |--- bmi <= 35.34  
| | | | | | | | | | | | |--- bmi <= 34.96  
| | | | | | | | | | | | |--- bmi <= 34.44  
| | | | | | | | | | | | |--- value: [3935.18]  
| | | | | | | | | | | | |--- bmi > 34.44  
| | | | | | | | | | | | |--- value: [4518.83]  
| | | | | | | | | | | | |--- bmi > 34.96  
| | | | | | | | | | | | |--- value: [12404.88]  
| | | | | | | | | | | | |--- bmi > 35.34  
| | | | | | | | | | | | |--- age <= 30.00  
| | | | | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | | | | |--- value: [3268.85]  
| | | | | | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | | | | | |--- value: [2689.50]  
| | | | | | | | | | | | |--- age > 30.00  
| | | | | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | | | | |--- value: [3989.84]  
| | | | | | | | | | | | |--- sex_male > 0.50  
| | | | | | | | | | | | |--- value: [4320.41]  
| | | | | | | | | | | | |--- children > 0.50  
| | | | | | | | | | | | |--- age <= 29.50  
| | | | | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | | | | |--- bmi <= 24.31
```

[illegible]

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```
| | | | | | | | | | | | |--- value: [6474.01]
| | | | | | | | | | | | |--- children > 0.50
| | | | | | | | | | | | |--- age <= 40.50
| | | | | | | | | | | | |--- truncated branch of depth 3
| | | | | | | | | | | | |--- age > 40.50
| | | | | | | | | | | | |--- truncated branch of depth 4
| | | | | | | | | | | | |--- region_northwest > 0.50
| | | | | | | | | | | | |--- bmi <= 40.99
| | | | | | | | | | | | |--- age <= 39.50
| | | | | | | | | | | | |--- value: [6373.56]
| | | | | | | | | | | | |--- age > 39.50
| | | | | | | | | | | | |--- age <= 41.50
| | | | | | | | | | | | |--- value: [7265.70]
| | | | | | | | | | | | |--- age > 41.50
| | | | | | | | | | | | |--- value: [7443.64]
| | | | | | | | | | | | |--- bmi > 40.99
| | | | | | | | | | | | |--- value: [28476.73]
| | | | | | | | | | | | |--- age > 42.50
| | | | | | | | | | | | |--- value: [19144.58]
| | | | | | | | | | | | |--- children > 3.50
| | | | | | | | | | | | |--- age <= 39.50
| | | | | | | | | | | | |--- region_southwest <= 0.50
| | | | | | | | | | | | |--- region_southeast <= 0.50
| | | | | | | | | | | | |--- value: [8965.80]
| | | | | | | | | | | | |--- region_southeast > 0.50
| | | | | | | | | | | | |--- bmi <= 29.10
| | | | | | | | | | | | |--- value: [8582.30]
| | | | | | | | | | | | |--- bmi > 29.10
| | | | | | | | | | | | |--- value: [8596.83]
| | | | | | | | | | | | |--- region_southwest > 0.50
| | | | | | | | | | | | |--- value: [7512.27]
| | | | | | | | | | | | |--- age > 39.50
| | | | | | | | | | | | |--- bmi <= 30.09
| | | | | | | | | | | | |--- region_southeast <= 0.50
| | | | | | | | | | | | |--- value: [15828.82]
| | | | | | | | | | | | |--- region_southeast > 0.50
| | | | | | | | | | | | |--- value: [14478.33]
| | | | | | | | | | | | |--- bmi > 30.09
| | | | | | | | | | | | |--- value: [8162.72]
| | | | | | | | | | | | |--- age > 43.50
| | | | | | | | | | | | |--- age <= 51.50
| | | | | | | | | | | | |--- age <= 46.50
| | | | | | | | | | | | |--- bmi <= 31.90
| | | | | | | | | | | | |--- bmi <= 27.57
| | | | | | | | | | | | |--- children <= 1.50
| | | | | | | | | | | | |--- children <= 0.50
| | | | | | | | | | | | |--- sex_male <= 0.50
| | | | | | | | | | | | |--- value: [7419.48]
```

```
| | | | | | | | | --- sex_male > 0.50  
| | | | | | | | | |--- value: [7222.79]  
| | | | | | | | | |--- children > 0.50  
| | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | |--- bmi <= 26.65  
| | | | | | | | | |    |   |--- truncated branch of depth 2  
| | | | | | | | | |    |   |--- bmi > 26.65  
| | | | | | | | | |    |   |--- value: [7626.99]  
| | | | | | | | | |    |   |--- sex_male > 0.50  
| | | | | | | | | |    |   |--- value: [7518.03]  
| | | | | | | | | |    |   |--- region_southeast > 0.50  
| | | | | | | | | |    |   |--- value: [7742.11]  
| | | | | | | | | |--- children > 1.50  
| | | | | | | | | |--- children <= 4.00  
| | | | | | | | | |--- age <= 45.50  
| | | | | | | | | |    |   |--- age <= 44.50  
| | | | | | | | | |    |   |--- bmi <= 21.99  
| | | | | | | | | |    |   |    |--- value: [8891.14]  
| | | | | | | | | |    |   |    |--- bmi > 21.99  
| | | | | | | | | |    |   |    |--- truncated branch of depth 3  
| | | | | | | | | |    |   |    |--- age > 44.50  
| | | | | | | | | |    |   |        |--- sex_male <= 0.50  
| | | | | | | | | |    |   |        |--- value: [9095.07]  
| | | | | | | | | |    |   |        |--- sex_male > 0.50  
| | | | | | | | | |    |   |            |--- truncated branch of depth 4  
| | | | | | | | | |    |   |            |--- age > 45.50  
| | | | | | | | | |    |       |--- region_northwest <= 0.50  
| | | | | | | | | |    |       |--- value: [9500.57]  
| | | | | | | | | |    |       |--- region_northwest > 0.50  
| | | | | | | | | |    |       |--- bmi <= 22.85  
| | | | | | | | | |    |       |    |--- value: [9193.84]  
| | | | | | | | | |    |       |    |--- bmi > 22.85  
| | | | | | | | | |    |       |    |--- value: [9301.89]  
| | | | | | | | | |--- children > 4.00  
| | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | |    |--- value: [10096.97]  
| | | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | | |    |--- value: [9788.87]  
| | | | | | | | |--- bmi > 27.57  
| | | | | | | | |--- region_southwest <= 0.50  
| | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |    |--- value: [32108.66]  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |    |--- age <= 44.50  
| | | | | | | | |    |    |--- value: [7421.19]  
| | | | | | | | |    |    |--- age > 44.50
```

```
| | | | | | | | | |--- bmi <= 29.07
| | | | | | | | | |--- value: [28340.19]
| | | | | | | | | |--- bmi > 29.07
| | | | | | | | | |--- value: [8413.46]
| | | | | | | | | |--- region_southeast > 0.50
| | | | | | | | | |--- bmi <= 31.24
| | | | | | | | | |--- sex_male <= 0.50
| | | | | | | | | |--- age <= 45.50
| | | | | | | | | |--- truncated branch of depth 2
| | | | | | | | | |--- age > 45.50
| | | | | | | | | |--- value: [8232.64]
| | | | | | | | | |--- sex_male > 0.50
| | | | | | | | | |--- value: [7731.43]
| | | | | | | | | |--- bmi > 31.24
| | | | | | | | | |--- value: [17929.30]
| | | | | | | | | |--- region_southwest > 0.50
| | | | | | | | | |--- age <= 45.50
| | | | | | | | | |--- sex_male <= 0.50
| | | | | | | | | |--- value: [8520.03]
| | | | | | | | | |--- sex_male > 0.50
| | | | | | | | | |--- value: [8027.97]
| | | | | | | | | |--- age > 45.50
| | | | | | | | | |--- bmi <= 30.50
| | | | | | | | | |--- bmi <= 29.55
| | | | | | | | | |--- value: [8823.28]
| | | | | | | | | |--- bmi > 29.55
| | | | | | | | | |--- value: [8825.09]
| | | | | | | | | |--- bmi > 30.50
| | | | | | | | | |--- value: [9414.92]
| | | | | | | | | |--- bmi > 31.90
| | | | | | | | | |--- bmi <= 36.06
| | | | | | | | | |--- age <= 45.50
| | | | | | | | | |--- region_northwest <= 0.50
| | | | | | | | | |--- bmi <= 32.72
| | | | | | | | | |--- value: [7633.72]
| | | | | | | | | |--- bmi > 32.72
| | | | | | | | | |--- region_southeast <= 0.50
| | | | | | | | | |--- sex_male <= 0.50
| | | | | | | | | |--- truncated branch of depth 2
| | | | | | | | | |--- sex_male > 0.50
| | | | | | | | | |--- value: [7445.92]
| | | | | | | | | |--- region_southeast > 0.50
| | | | | | | | | |--- value: [7147.47]
| | | | | | | | | |--- region_northwest > 0.50
| | | | | | | | | |--- children <= 1.00
| | | | | | | | | |--- value: [7731.86]
| | | | | | | | | |--- children > 1.00
| | | | | | | | | |--- value: [8116.27]
```

[illegible]

```
| | | | | | | | | |--- region_southwest > 0.50  
| | | | | | | | | |--- value: [8539.67]  
| | | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | | |--- value: [8428.07]  
| | | | | | | | | |--- age > 47.50  
| | | | | | | | | |--- value: [8269.04]  
| | | | | | | | |--- age > 48.50  
| | | | | | | | | |--- bmi <= 22.56  
| | | | | | | | | |--- bmi <= 22.47  
| | | | | | | | | |--- children <= 0.50  
| | | | | | | | | |--- value: [9361.33]  
| | | | | | | | | |--- children > 0.50  
| | | | | | | | | |--- value: [9182.17]  
| | | | | | | | | |--- bmi > 22.47  
| | | | | | | | | |--- value: [8688.86]  
| | | | | | | | |--- bmi > 22.56  
| | | | | | | | | |--- children <= 1.50  
| | | | | | | | | |--- value: [9566.99]  
| | | | | | | | | |--- children > 1.50  
| | | | | | | | | |--- value: [10156.78]  
| | | | | | | |--- bmi > 23.85  
| | | | | | | |--- bmi <= 25.38  
| | | | | | | | |--- children <= 0.50  
| | | | | | | | |--- value: [8534.67]  
| | | | | | | | |--- children > 0.50  
| | | | | | | | |--- children <= 1.50  
| | | | | | | | |--- value: [26236.58]  
| | | | | | | | |--- children > 1.50  
| | | | | | | | |--- value: [30284.64]  
| | | | | | | |--- bmi > 25.38  
| | | | | | | |--- bmi <= 27.09  
| | | | | | | |--- bmi <= 26.51  
| | | | | | | | |--- children <= 0.50  
| | | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | | |--- value: [8782.47]  
| | | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | | |--- value: [8827.21]  
| | | | | | | | |--- children > 0.50  
| | | | | | | | |--- children <= 1.50  
| | | | | | | | |--- value: [9282.48]  
| | | | | | | | |--- children > 1.50  
| | | | | | | | |--- value: [9225.26]  
| | | | | | | |--- bmi > 26.51  
| | | | | | | |--- bmi <= 26.84  
| | | | | | | |--- value: [9715.84]  
| | | | | | | |--- bmi > 26.84  
| | | | | | | |--- value: [10106.13]  
| | | | | | | |--- bmi > 27.09
```

```
| | | | | | | | |--- bmi <= 27.41  
| | | | | | | | |--- age <= 48.50  
| | | | | | | | |   |--- value: [9447.25]  
| | | | | | | | |   |--- age > 48.50  
| | | | | | | | |     |--- children <= 0.50  
| | | | | | | | |     |   |--- value: [25656.58]  
| | | | | | | | |     |   |--- children > 0.50  
| | | | | | | | |       |   |--- value: [26140.36]  
| | | | | | | | |--- bmi > 27.41  
| | | | | | | | |   |--- age <= 48.50  
| | | | | | | | |     |--- bmi <= 36.62  
| | | | | | | | |       |   |--- truncated branch of depth 9  
| | | | | | | | |       |   |--- bmi > 36.62  
| | | | | | | | |         |   |--- truncated branch of depth 2  
| | | | | | | | |         |--- age > 48.50  
| | | | | | | | |           |--- children <= 1.50  
| | | | | | | | |           |   |--- truncated branch of depth 8  
| | | | | | | | |           |   |--- children > 1.50  
| | | | | | | | |             |   |--- truncated branch of depth 6  
| | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | |   |--- children <= 0.50  
| | | | | | | | |     |--- age <= 50.50  
| | | | | | | | |       |   |--- bmi <= 28.44  
| | | | | | | | |       |     |--- sex_male <= 0.50  
| | | | | | | | |       |       |--- value: [8601.33]  
| | | | | | | | |       |     |--- sex_male > 0.50  
| | | | | | | | |       |       |--- value: [8442.67]  
| | | | | | | | |         |--- bmi > 28.44  
| | | | | | | | |         |--- bmi <= 30.41  
| | | | | | | | |         |   |--- value: [7789.64]  
| | | | | | | | |         |--- bmi > 30.41  
| | | | | | | | |           |   |--- sex_male <= 0.50  
| | | | | | | | |           |     |--- value: [8280.62]  
| | | | | | | | |           |   |--- sex_male > 0.50  
| | | | | | | | |             |   |--- bmi <= 36.35  
| | | | | | | | |             |     |--- value: [8124.41]  
| | | | | | | | |             |   |--- bmi > 36.35  
| | | | | | | | |               |   |--- value: [8125.78]  
| | | | | | | | |   |--- age > 50.50  
| | | | | | | | |     |--- value: [9283.56]  
| | | | | | | | |--- children > 0.50  
| | | | | | | | |   |--- children <= 2.50  
| | | | | | | | |     |--- age <= 48.50  
| | | | | | | | |       |   |--- children <= 1.50  
| | | | | | | | |       |     |--- value: [8547.69]  
| | | | | | | | |       |   |--- children > 1.50  
| | | | | | | | |         |   |--- value: [8978.19]  
| | | | | | | | |--- age > 48.50
```


[illegible]

```
| | | | | | | | | |--- age <= 53.50  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- age > 53.50  
| | | | | | | | | |--- value: [10704.47]  
| | | | | | | | |--- age > 55.50  
| | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | |--- age <= 56.50  
| | | | | | | | | |--- children <= 0.50  
| | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | |--- children > 0.50  
| | | | | | | | | |--- value: [12044.34]  
| | | | | | | | |--- age > 56.50  
| | | | | | | | | |--- bmi <= 28.61  
| | | | | | | | | |--- truncated branch of depth 5  
| | | | | | | | | |--- bmi > 28.61  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | |--- sex_male > 0.50  
| | | | | | | | |--- region_southwest <= 0.50  
| | | | | | | | |--- age <= 57.50  
| | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | |--- age > 57.50  
| | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | |--- region_southwest > 0.50  
| | | | | | | | |--- bmi <= 22.70  
| | | | | | | | | |--- value: [10577.09]  
| | | | | | | | |--- bmi > 22.70  
| | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | |--- bmi > 31.30  
| | | | | | | | |--- value: [27346.04]  
| | | | | | | | |--- bmi > 31.48  
| | | | | | | | |--- age <= 56.50  
| | | | | | | | |--- age <= 54.50  
| | | | | | | | |--- age <= 52.50  
| | | | | | | | |--- bmi <= 37.05  
| | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | |--- value: [9144.57]  
| | | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | | |--- value: [9140.95]  
| | | | | | | | |--- bmi > 37.05  
| | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | |--- value: [9634.54]  
| | | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | | |--- value: [9748.91]  
| | | | | | | | |--- age > 52.50  
| | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | |--- age <= 53.50  
| | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | |--- age > 53.50
```

[illegible]

```
| | | | | | | | --- sex_male <= 0.50  
| | | | | | | | |--- value: [24227.34]  
| | | | | | | | |--- sex_male > 0.50  
| | | | | | | | |--- bmi <= 40.32  
| | | | | | | | |   |--- value: [20709.02]  
| | | | | | | | |--- bmi > 40.32  
| | | | | | | | |   |--- bmi <= 40.66  
| | | | | | | | |     |--- value: [10982.50]  
| | | | | | | | |     |--- bmi > 40.66  
| | | | | | | | |       |--- truncated branch of depth 3  
| | | | | | | | |--- children > 1.50  
| | | | | | | | |   |--- region_southwest <= 0.50  
| | | | | | | | |     |--- bmi <= 36.29  
| | | | | | | | |       |--- region_northwest <= 0.50  
| | | | | | | | |         |--- age <= 54.50  
| | | | | | | | |           |--- bmi <= 32.25  
| | | | | | | | |             |--- children <= 2.50  
| | | | | | | | |               |--- truncated branch of depth 3  
| | | | | | | | |                 |--- children > 2.50  
| | | | | | | | |                   |--- truncated branch of depth 3  
| | | | | | | | |                     |--- bmi > 32.25  
| | | | | | | | |                       |--- value: [29186.48]  
| | | | | | | | |                         |--- age > 54.50  
| | | | | | | | |                           |--- age <= 55.50  
| | | | | | | | |                             |--- bmi <= 32.01  
| | | | | | | | |                               |--- value: [11881.97]  
| | | | | | | | |                                 |--- bmi > 32.01  
| | | | | | | | |                                   |--- value: [11987.17]  
| | | | | | | | |                                     |--- age > 55.50  
| | | | | | | | |                                       |--- region_southeast <= 0.50  
| | | | | | | | |                                           |--- truncated branch of depth 2  
| | | | | | | | |                                             |--- region_southeast > 0.50  
| | | | | | | | |                                                 |--- truncated branch of depth 2  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |   |--- age <= 53.00  
| | | | | | | | |     |--- children <= 2.50  
| | | | | | | | |       |--- value: [11187.66]  
| | | | | | | | |         |--- children > 2.50  
| | | | | | | | |           |--- value: [11289.11]  
| | | | | | | | |             |--- age > 53.00  
| | | | | | | | |               |--- age <= 55.00  
| | | | | | | | |                 |--- bmi <= 28.64  
| | | | | | | | |                   |--- value: [12475.35]  
| | | | | | | | |                     |--- bmi > 28.64  
| | | | | | | | |                       |--- value: [12495.29]  
| | | | | | | | |                         |--- age > 55.00  
| | | | | | | | |                           |--- value: [12643.38]  
| | | | | | | | |                             |--- bmi > 36.29
```

[illegible]

```

| | | |--- age > 58.50
| | | | |--- children <= 3.50
| | | | | |--- children <= 0.50
| | | | | | |--- bmi <= 26.03
| | | | | | | |--- bmi <= 25.65
| | | | | | | | |--- region_southeast <= 0.50
| | | | | | | | |--- age <= 62.50
| | | | | | | | |--- age <= 59.50
| | | | | | | | | |--- truncated branch of depth 2
| | | | | | | | | |--- age > 59.50
| | | | | | | | | | |--- truncated branch of depth 4
| | | | | | | | |--- age > 62.50
| | | | | | | | |--- bmi <= 22.37
| | | | | | | | | |--- value: [14449.85]
| | | | | | | | |--- bmi > 22.37
| | | | | | | | | |--- value: [14451.84]
| | | | | | | | |--- region_southeast > 0.50
| | | | | | | | | |--- value: [24513.09]
| | | | | | | | |--- bmi > 25.65
| | | | | | | | | |--- value: [28923.14]
| | | | | | | |--- bmi > 26.03
| | | | | | | | |--- bmi <= 31.40
| | | | | | | | |--- age <= 60.50
| | | | | | | | |--- sex_male <= 0.50
| | | | | | | | | |--- region_southwest <= 0.50
| | | | | | | | | | |--- truncated branch of depth 3
| | | | | | | | | | |--- region_southwest > 0.50
| | | | | | | | | | |--- truncated branch of depth 2
| | | | | | | | |--- sex_male > 0.50
| | | | | | | | |--- bmi <= 27.59
| | | | | | | | | |--- value: [11743.30]
| | | | | | | | |--- bmi > 27.59
| | | | | | | | | |--- truncated branch of depth 2
| | | | | | | | |--- age > 60.50
| | | | | | | | |--- bmi <= 27.31
| | | | | | | | |--- age <= 63.50
| | | | | | | | | |--- value: [14256.19]
| | | | | | | | |--- age > 63.50
| | | | | | | | | |--- value: [14394.56]
| | | | | | | | |--- bmi > 27.31
| | | | | | | | |--- bmi <= 28.26
| | | | | | | | | |--- value: [13041.92]
| | | | | | | | |--- bmi > 28.26
| | | | | | | | | |--- truncated branch of depth 4
| | | | | | | |--- bmi > 31.40
| | | | | | | | |--- age <= 59.50
| | | | | | | | |--- region_southeast <= 0.50
| | | | | | | | | |--- value: [21797.00]

```

[illegible]

[illegible]


```
| | | | | | | | |--- bmi <= 28.59  
| | | | | | | | |--- value: [17468.98]  
| | | | | | | | |--- bmi > 28.59  
| | | | | | | | |--- value: [17748.51]  
| | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | |--- value: [18223.45]  
| | | | | | | | |--- region_southwest > 0.50  
| | | | | | | | |--- value: [16884.92]  
| | | | | | | | |---- sex_male > 0.50  
| | | | | | | | |--- bmi <= 28.39  
| | | | | | | | |--- age <= 18.50  
| | | | | | | | |--- value: [15518.18]  
| | | | | | | | |--- age > 18.50  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- value: [16297.85]  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |--- value: [16450.89]  
| | | | | | | | |---- bmi > 28.39  
| | | | | | | | |--- value: [17352.68]  
| | | | | | | | |--- age > 19.50  
| | | | | | | | |---- bmi <= 28.07  
| | | | | | | | |---- age <= 29.50  
| | | | | | | | |---- region_southeast <= 0.50  
| | | | | | | | |---- region_southwest <= 0.50  
| | | | | | | | |---- bmi <= 25.46  
| | | | | | | | |---- age <= 26.50  
| | | | | | | | |---- age <= 23.50  
| | | | | | | | |---- truncated branch of depth 2  
| | | | | | | | |---- age > 23.50  
| | | | | | | | |---- value: [14455.64]  
| | | | | | | | |---- age > 26.50  
| | | | | | | | |---- bmi <= 19.00  
| | | | | | | | |---- value: [15006.58]  
| | | | | | | | |---- bmi > 19.00  
| | | | | | | | |---- truncated branch of depth 3  
| | | | | | | | |---- bmi > 25.46  
| | | | | | | | |---- value: [17560.38]  
| | | | | | | | |---- region_southwest > 0.50  
| | | | | | | | |---- bmi <= 24.55  
| | | | | | | | |---- value: [20167.34]  
| | | | | | | | |---- bmi > 24.55  
| | | | | | | | |---- value: [16232.85]  
| | | | | | | | |---- region_southeast > 0.50  
| | | | | | | | |---- bmi <= 24.59  
| | | | | | | | |---- children <= 1.50  
| | | | | | | | |---- value: [26125.67]  
| | | | | | | | |---- children > 1.50  
| | | | | | | | |---- value: [17663.14]
```

[illegible]

```
| | | | | | | | | |--- age <= 32.00  
| | | | | | | | | |--- value: [19199.94]  
| | | | | | | | | |--- age > 32.00  
| | | | | | | | | |--- value: [19040.88]  
| | | | |---- bmi > 28.07  
| | | | | |--- age <= 24.50  
| | | | | | |--- bmi <= 29.16  
| | | | | | |--- value: [35147.53]  
| | | | | | |--- bmi > 29.16  
| | | | | | |--- value: [18648.42]  
| | | | | |--- age > 24.50  
| | | | | | |--- age <= 31.50  
| | | | | | |--- children <= 2.00  
| | | | | | |--- region_northwest <= 0.50  
| | | | | | |--- age <= 30.50  
| | | | | | | |--- value: [19521.97]  
| | | | | | |--- age > 30.50  
| | | | | | | |--- value: [19350.37]  
| | | | | | |--- region_northwest > 0.50  
| | | | | | | |--- value: [18310.74]  
| | | | | | |--- children > 2.00  
| | | | | | |--- bmi <= 29.20  
| | | | | | | |--- value: [20745.99]  
| | | | | | |--- bmi > 29.20  
| | | | | | | |--- value: [19933.46]  
| | | | | | |--- age > 31.50  
| | | | | | |--- region_southeast <= 0.50  
| | | | | | |--- bmi <= 29.11  
| | | | | | |--- children <= 2.50  
| | | | | | | |--- value: [21082.16]  
| | | | | | |--- children > 2.50  
| | | | | | | |--- value: [21472.48]  
| | | | | | |--- bmi > 29.11  
| | | | | | | |--- value: [22462.04]  
| | | | | | |--- region_southeast > 0.50  
| | | | | | | |--- value: [19719.69]  
| | | | |---- age > 41.00  
| | | | | |--- bmi <= 25.95  
| | | | | | |--- age <= 44.50  
| | | | | | |--- bmi <= 24.67  
| | | | | | |--- region_southeast <= 0.50  
| | | | | | |--- sex_male <= 0.50  
| | | | | | |--- age <= 43.50  
| | | | | | |--- bmi <= 21.71  
| | | | | | | |--- value: [19798.05]  
| | | | | | |--- bmi > 21.71  
| | | | | | | |--- value: [19964.75]  
| | | | | | |--- age > 43.50
```

[illegible]

```

| | | | |--- bmi > 26.10
| | | | |   |--- age <= 56.50
| | | | |     |--- sex_male <= 0.50
| | | | |       |--- age <= 45.00
| | | | |         |--- region_northwest <= 0.50
| | | | |           |--- value: [22478.60]
| | | | |             |--- region_northwest > 0.50
| | | | |               |--- age <= 42.50
| | | | |                 |--- value: [21348.71]
| | | | |                   |--- age > 42.50
| | | | |                     |--- value: [21774.32]
| | | | |                       |--- age > 45.00
| | | | |                         |--- region_southeast <= 0.50
| | | | |                           |--- bmi <= 26.86
| | | | |                             |--- value: [23401.31]
| | | | |                               |--- bmi > 26.86
| | | | |                                 |--- age <= 48.50
| | | | |                                   |--- value: [24535.70]
| | | | |                                     |--- age > 48.50
| | | | |                                       |--- value: [24520.26]
| | | | |                                         |--- region_southeast > 0.50
| | | | |                                           |--- value: [23065.42]
| | | | |                                             |--- sex_male > 0.50
| | | | |                                               |--- age <= 45.00
| | | | |                                                 |--- bmi <= 29.15
| | | | |                                                   |--- age <= 42.50
| | | | |                                                     |--- value: [32787.46]
| | | | |                                                       |--- age > 42.50
| | | | |                                                         |--- value: [37829.72]
| | | | |                                                           |--- bmi > 29.15
| | | | |                                                             |--- value: [22144.03]
| | | | |                                                               |--- age > 45.00
| | | | |                                                                 |--- bmi <= 27.03
| | | | |                                                                   |--- value: [26109.33]
| | | | |                                                                     |--- bmi > 27.03
| | | | |                                                                       |--- age <= 47.50
| | | | |                                                                           |--- region_southwest <= 0.50
| | | | |                                                                               |--- value: [24915.22]
| | | | |                                                                                 |--- region_southwest > 0.50
| | | | |                                                                                     |--- value: [25309.49]
| | | | |                                                                                         |--- age > 47.50
| | | | |                                                                                             |--- age <= 50.00
| | | | |                                                                                                 |--- value: [23568.27]
| | | | |                                                                                                     |--- age > 50.00
| | | | |                                                                                                         |--- value: [24393.62]
| | | | |                                                                                                             |--- age > 56.50
| | | | |                                                                                                                 |--- bmi <= 29.82
| | | | |                                                                                                                     |--- age <= 59.00

```

```
| | | | | | | | |--- bmi <= 29.39  
| | | | | | | | |--- value: [27218.44]  
| | | | | | | | |--- bmi > 29.39  
| | | | | | | | |--- value: [27533.91]  
| | | | | | | |--- age > 59.00  
| | | | | | | |--- bmi <= 26.79  
| | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | |--- value: [28101.33]  
| | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | |--- value: [27808.73]  
| | | | | | | |--- bmi > 26.79  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- value: [29523.17]  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |--- bmi <= 26.93  
| | | | | | | | |--- value: [29330.98]  
| | | | | | | | |--- bmi > 26.93  
| | | | | | | | |--- truncated branch of depth 3  
| | | | | | | |--- bmi > 29.82  
| | | | | | | |--- age <= 60.00  
| | | | | | | |--- value: [30184.94]  
| | | | | | | |--- age > 60.00  
| | | | | | | |--- value: [30942.19]  
|--- bmi > 30.01  
| |--- age <= 42.00  
| | |--- age <= 27.50  
| | | |--- bmi <= 35.61  
| | | | |--- bmi <= 31.70  
| | | | |--- bmi <= 30.88  
| | | | |--- region_southeast <= 0.50  
| | | | |--- age <= 21.00  
| | | | | |--- sex_male <= 0.50  
| | | | | | |--- value: [33307.55]  
| | | | | | |--- sex_male > 0.50  
| | | | | | |--- value: [33475.82]  
| | | | | |--- age > 21.00  
| | | | | |--- bmi <= 30.30  
| | | | | | |--- value: [33900.65]  
| | | | | |--- bmi > 30.30  
| | | | | | |--- value: [33907.55]  
| | | | | |--- region_southeast > 0.50  
| | | | | |--- value: [32548.34]  
| | | | |--- bmi > 30.88  
| | | | |--- age <= 25.50  
| | | | |--- region_southwest <= 0.50  
| | | | |--- region_southeast <= 0.50  
| | | | | |--- value: [34254.05]  
| | | | |--- region_southeast > 0.50
```

[illegible]

[illegible]


```
| | | | | | | | --- sex_male <= 0.50  
| | | | | | | | |--- value: [37079.37]  
| | | | | | | | |--- sex_male > 0.50  
| | | | | | | | |--- bmi <= 32.60  
| | | | | | | | |   |--- value: [35491.64]  
| | | | | | | | |--- bmi > 32.60  
| | | | | | | | |   |--- value: [36197.70]  
| | | | | | | | |--- children > 1.50  
| | | | | | | | |   |--- age <= 36.50  
| | | | | | | | |     |--- bmi <= 33.75  
| | | | | | | | |       |--- value: [38415.47]  
| | | | | | | | |     |--- bmi > 33.75  
| | | | | | | | |       |--- value: [39983.43]  
| | | | | | | | |   |--- age > 36.50  
| | | | | | | | |     |--- bmi <= 31.78  
| | | | | | | | |       |--- value: [39597.41]  
| | | | | | | | |     |--- bmi > 31.78  
| | | | | | | | |       |--- sex_male <= 0.50  
| | | | | | | | |         |--- bmi <= 33.79  
| | | | | | | | |           |--- value: [40003.33]  
| | | | | | | | |         |--- bmi > 33.79  
| | | | | | | | |           |--- value: [39836.52]  
| | | | | | | | |       |--- sex_male > 0.50  
| | | | | | | | |         |--- value: [40182.25]  
| | | | | | | | |--- bmi > 35.15  
| | | | | | | | |   |--- region_northwest <= 0.50  
| | | | | | | | |     |--- age <= 28.50  
| | | | | | | | |       |--- value: [51194.56]  
| | | | | | | | |     |--- age > 28.50  
| | | | | | | | |       |--- bmi <= 40.14  
| | | | | | | | |         |--- bmi <= 35.51  
| | | | | | | | |           |--- value: [44585.46]  
| | | | | | | | |         |--- bmi > 35.51  
| | | | | | | | |           |--- age <= 33.00  
| | | | | | | | |             |--- children <= 1.00  
| | | | | | | | |               |--- value: [36950.26]  
| | | | | | | | |             |--- children > 1.00  
| | | | | | | | |               |--- truncated branch of depth 2  
| | | | | | | | |                 |--- age > 33.00  
| | | | | | | | |                   |--- children <= 2.00  
| | | | | | | | |                     |--- truncated branch of depth 4  
| | | | | | | | |                       |--- children > 2.00  
| | | | | | | | |                         |--- value: [41949.24]  
| | | | | | | | |--- bmi > 40.14  
| | | | | | | | |   |--- bmi <= 44.75  
| | | | | | | | |     |--- value: [43753.34]  
| | | | | | | | |     |--- bmi > 44.75  
| | | | | | | | |       |--- value: [46113.51]
```

```
| | | | |--- region_northwest > 0.50  
| | | | |--- value: [55135.40]  
| | | | |--- age > 42.00  
| | | | |--- bmi <= 46.81  
| | | | |--- bmi <= 30.43  
| | | | |--- value: [62592.87]  
| | | | |--- bmi > 30.43  
| | | | |--- age <= 56.50  
| | | | |--- bmi <= 36.75  
| | | | |--- bmi <= 33.37  
| | | | |--- age <= 49.50  
| | | | |--- region_southeast <= 0.50  
| | | | |--- children <= 2.00  
| | | | |--- truncated branch of depth 2  
| | | | |--- children > 2.00  
| | | | |--- value: [40720.55]  
| | | | |--- region_southeast > 0.50  
| | | | |--- value: [40974.16]  
| | | | |--- age > 49.50  
| | | | |--- bmi <= 31.31  
| | | | |--- age <= 54.50  
| | | | |--- value: [41999.52]  
| | | | |--- age > 54.50  
| | | | |--- value: [42303.69]  
| | | | |--- bmi > 31.31  
| | | | |--- bmi <= 32.06  
| | | | |--- value: [41097.16]  
| | | | |--- bmi > 32.06  
| | | | |--- value: [41919.10]  
| | | | |--- bmi > 33.37  
| | | | |--- age <= 50.50  
| | | | |--- bmi <= 36.33  
| | | | |--- bmi <= 34.40  
| | | | |--- value: [42856.84]  
| | | | |--- bmi > 34.40  
| | | | |--- truncated branch of depth 5  
| | | | |--- bmi > 36.33  
| | | | |--- age <= 46.00  
| | | | |--- value: [42760.50]  
| | | | |--- age > 46.00  
| | | | |--- value: [42969.85]  
| | | | |--- age > 50.50  
| | | | |--- bmi <= 34.16  
| | | | |--- bmi <= 33.87  
| | | | |--- value: [43921.18]  
| | | | |--- bmi > 33.87  
| | | | |--- value: [43254.42]  
| | | | |--- bmi > 34.16
```

```
| | | | | | | | | |--- age <= 52.50  
| | | | | | | | | |--- value: [44641.20]  
| | | | | | | | | |--- age > 52.50  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- bmi > 36.75  
| | | | | | | | | |--- age <= 43.50  
| | | | | | | | | |--- bmi <= 42.13  
| | | | | | | | | |--- value: [42560.43]  
| | | | | | | | | |--- bmi > 42.13  
| | | | | | | | | |--- value: [45863.21]  
| | | | | | | | | |--- age > 43.50  
| | | | | | | | | |--- age <= 45.00  
| | | | | | | | | |--- value: [48885.14]  
| | | | | | | | | |--- age > 45.00  
| | | | | | | | | |--- age <= 53.50  
| | | | | | | | | |--- children <= 1.00  
| | | | | | | | | |--- value: [44400.41]  
| | | | | | | | | |--- children > 1.00  
| | | | | | | | | |--- truncated branch of depth 4  
| | | | | | | | | |--- age > 53.50  
| | | | | | | | | |--- value: [48549.18]  
| | | | | | | | | |--- age > 56.50  
| | | | | | | | | |--- bmi <= 32.62  
| | | | | | | | | |--- children <= 1.00  
| | | | | | | | | |--- bmi <= 31.59  
| | | | | | | | | |--- value: [43578.94]  
| | | | | | | | | |--- bmi > 31.59  
| | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | |--- value: [45710.21]  
| | | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | | |--- value: [45008.96]  
| | | | | | | | | |--- children > 1.00  
| | | | | | | | | |--- age <= 61.00  
| | | | | | | | | |--- value: [46130.53]  
| | | | | | | | | |--- age > 61.00  
| | | | | | | | | |--- region_southwest <= 0.50  
| | | | | | | | | |--- value: [46718.16]  
| | | | | | | | | |--- region_southwest > 0.50  
| | | | | | | | | |--- value: [47305.31]  
| | | | | | | | | |--- bmi > 32.62  
| | | | | | | | | |--- bmi <= 33.30  
| | | | | | | | | |--- value: [52590.83]  
| | | | | | | | | |--- bmi > 33.30  
| | | | | | | | | |--- bmi <= 37.33  
| | | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- sex male > 0.50
```



```

| |--- age <= 43.50
| | |--- age <= 26.50
| | | |--- children <= 1.50
| | | | |--- age <= 22.50
| | | | | |--- value: [2793.29]
| | | | |--- age > 22.50
| | | | | |--- value: [4345.86]
| | | |--- children > 1.50
| | | | |--- region_northwest <= 0.50
| | | | | |--- value: [5371.66]
| | | | |--- region_northwest > 0.50
| | | | | |--- value: [10592.59]
| | |--- age > 26.50
| | | |--- age <= 36.50
| | | | |--- children <= 0.50
| | | | | |--- value: [4441.25]
| | | | |--- children > 0.50
| | | | | |--- value: [6530.26]
| | | |--- age > 36.50
| | | | |--- children <= 3.50
| | | | | |--- value: [7315.31]
| | | | |--- children > 3.50
| | | | | |--- value: [10303.87]
| |--- age > 43.50
| | |--- age <= 51.50
| | | |--- age <= 46.50
| | | | |--- bmi <= 31.90
| | | | | |--- value: [9946.75]
| | | | |--- bmi > 31.90
| | | | | |--- value: [8408.55]
| | | |--- age > 46.50
| | | | |--- region_southeast <= 0.50
| | | | | |--- value: [11679.81]
| | | | |--- region_southeast > 0.50
| | | | | |--- value: [9195.75]
| | |--- age > 51.50
| | | |--- age <= 58.50
| | | | |--- children <= 1.50
| | | | | |--- value: [12484.82]
| | | | |--- children > 1.50
| | | | | |--- value: [14396.36]
| | | |--- age > 58.50
| | | | |--- children <= 3.50
| | | | | |--- value: [14866.24]
| | | | |--- children > 3.50
| | | | | |--- value: [36580.28]
|--- smoker_yes > 0.50
| |--- bmi <= 30.01

```

```

|   |   |--- age <= 41.00
|   |   |   |--- age <= 19.50
|   |   |   |   |--- bmi <= 23.44
|   |   |   |   |   |--- value: [13676.32]
|   |   |   |   |   |--- bmi > 23.44
|   |   |   |   |   |   |--- value: [16993.18]
|   |   |   |   |--- age > 19.50
|   |   |   |   |   |--- bmi <= 28.07
|   |   |   |   |   |   |--- value: [18522.75]
|   |   |   |   |   |   |--- bmi > 28.07
|   |   |   |   |   |   |   |--- value: [21490.44]
|   |   |   |--- age > 41.00
|   |   |   |   |--- bmi <= 25.95
|   |   |   |   |   |--- age <= 44.50
|   |   |   |   |   |   |--- value: [20319.05]
|   |   |   |   |   |   |--- age > 44.50
|   |   |   |   |   |   |   |--- value: [24246.98]
|   |   |   |   |--- bmi > 25.95
|   |   |   |   |   |--- bmi <= 26.10
|   |   |   |   |   |   |--- value: [38245.59]
|   |   |   |   |   |   |--- bmi > 26.10
|   |   |   |   |   |   |   |--- value: [26760.99]
|   |--- bmi > 30.01
|   |   |--- age <= 42.00
|   |   |   |--- age <= 27.50
|   |   |   |   |--- bmi <= 35.61
|   |   |   |   |   |--- value: [34775.46]
|   |   |   |   |   |--- bmi > 35.61
|   |   |   |   |   |   |--- value: [38580.93]
|   |   |   |--- age > 27.50
|   |   |   |   |--- bmi <= 35.15
|   |   |   |   |   |--- value: [38673.36]
|   |   |   |   |   |--- bmi > 35.15
|   |   |   |   |   |   |--- value: [42920.99]
|   |   |--- age > 42.00
|   |   |   |--- bmi <= 46.81
|   |   |   |   |--- bmi <= 30.43
|   |   |   |   |   |--- value: [62592.87]
|   |   |   |   |   |--- bmi > 30.43
|   |   |   |   |   |   |--- value: [44976.10]
|   |   |   |--- bmi > 46.81
|   |   |   |   |--- value: [63770.43]

```

Decision Tree 6 (Max Depth: None, Criterion: friedman_mse):

```

|--- smoker_yes <= 0.50
|   |--- age <= 43.50
|   |   |--- age <= 26.50

```

```

| | | |--- children <= 1.50
| | | |   |--- age <= 22.50
| | | |     |--- bmi <= 28.26
| | | |       |--- sex_male <= 0.50
| | | |         |--- age <= 20.00
| | | |           |--- bmi <= 21.65
| | | |             |--- region_southeast <= 0.50
| | | |               |--- bmi <= 18.20
| | | |                 |--- value: [1727.79]
| | | |                   |--- bmi > 18.20
| | | |                     |--- value: [1728.90]
| | | |                       |--- region_southeast > 0.50
| | | |                         |--- value: [1607.51]
| | | |                           |--- bmi > 21.65
| | | |                             |--- children <= 0.50
| | | |                               |--- age <= 18.50
| | | |                                 |--- truncated branch of depth 3
| | | |                                   |--- age > 18.50
| | | |                                     |--- value: [2117.34]
| | | |                                       |--- children > 0.50
| | | |                                         |--- region_northwest <= 0.50
| | | |                                           |--- value: [2201.10]
| | | |                                             |--- region_northwest > 0.50
| | | |                                               |--- value: [2710.83]
| | | |                                                 |--- age > 20.00
| | | |                                                   |--- bmi <= 23.74
| | | |                                                     |--- bmi <= 22.66
| | | |                                                       |--- age <= 21.50
| | | |                                                         |--- truncated branch of depth 2
| | | |                                                           |--- age > 21.50
| | | |                                                             |--- value: [2527.82]
| | | |                                                               |--- bmi > 22.66
| | | |                                                                 |--- value: [2731.91]
| | | |                                                                   |--- bmi > 23.74
| | | |                                                                     |--- children <= 0.50
| | | |                                                                       |--- age <= 21.50
| | | |                                                                           |--- value: [2007.94]
| | | |                                                                             |--- age > 21.50
| | | |                                                                               |--- truncated branch of depth 2
| | | |                                                                                 |--- children > 0.50
| | | |                                                                                     |--- value: [2597.78]
| | | |                                                                                         |--- sex_male > 0.50
| | | |                                                                                             |--- bmi <= 23.26
| | | |                                                                                                 |--- children <= 0.50
| | | |                                                                                                     |--- region_southwest <= 0.50
| | | |                                                                                                         |--- bmi <= 23.15
| | | |                                                                                                             |--- truncated branch of depth 5
| | | |                                                                                                                 |--- bmi > 23.15

```

```
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- region_southwest > 0.50  
| | | | | | | | | |--- bmi <= 20.05  
| | | | | | | | | |--- value: [1241.57]  
| | | | | | | | | |--- bmi > 20.05  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- children > 0.50  
| | | | | | | | | |--- value: [1964.78]  
| | | | | | | | |--- bmi > 23.26  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- age <= 19.50  
| | | | | | | | | |--- bmi <= 26.86  
| | | | | | | | | |--- truncated branch of depth 5  
| | | | | | | | | |--- bmi > 26.86  
| | | | | | | | | |--- value: [1252.41]  
| | | | | | | | |--- age > 19.50  
| | | | | | | | | |--- age <= 21.50  
| | | | | | | | | |--- truncated branch of depth 3  
| | | | | | | | | |--- age > 21.50  
| | | | | | | | | |--- value: [1665.00]  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |--- children <= 0.50  
| | | | | | | | | |--- value: [2045.69]  
| | | | | | | | |--- children > 0.50  
| | | | | | | | | |--- value: [2221.56]  
| | | | | | | | |--- bmi > 28.26  
| | | | | | | | |--- age <= 18.50  
| | | | | | | | |--- bmi <= 30.13  
| | | | | | | | |--- bmi <= 30.07  
| | | | | | | | |--- bmi <= 28.40  
| | | | | | | | | |--- value: [11272.33]  
| | | | | | | | |--- bmi > 28.40  
| | | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | | |--- value: [7323.73]  
| | | | | | | | | |--- sex_male > 0.50  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | |--- bmi > 30.07  
| | | | | | | | |--- value: [21344.85]  
| | | | | | | | |--- bmi > 30.13  
| | | | | | | | |--- bmi <= 33.83  
| | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | | |--- bmi <= 31.11  
| | | | | | | | | |--- value: [2203.74]  
| | | | | | | | | |--- bmi > 31.11  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | |--- bmi <= 30.63  
| | | | | | | | |--- value: [1131.51]
```


[illegible]

```

| | | | |--- age > 22.50
| | | | |   |--- bmi <= 23.34
| | | | |     |--- bmi <= 22.91
| | | | |       |--- age <= 23.50
| | | | |         |--- bmi <= 18.05
| | | | |           |--- value: [2775.19]
| | | | |             |--- bmi > 18.05
| | | | |               |--- value: [21595.38]
| | | | |                 |--- age > 23.50
| | | | |                   |--- sex_male <= 0.50
| | | | |                     |--- age <= 24.50
| | | | |                       |--- value: [2457.50]
| | | | |                         |--- age > 24.50
| | | | |                           |--- bmi <= 20.30
| | | | |                             |--- value: [3378.91]
| | | | |                               |--- bmi > 20.30
| | | | |                                 |--- truncated branch of depth 3
| | | | |                                   |--- sex_male > 0.50
| | | | |                                     |--- bmi <= 19.23
| | | | |                                       |--- value: [2680.95]
| | | | |                                         |--- bmi > 19.23
| | | | |                                           |--- value: [2302.30]
| | | | |                                             |--- bmi > 22.91
| | | | |                                               |--- value: [25081.77]
| | | | |--- bmi > 23.34
| | | | |   |--- region_southwest <= 0.50
| | | | |     |--- bmi <= 40.76
| | | | |       |--- children <= 0.50
| | | | |         |--- region_southeast <= 0.50
| | | | |           |--- sex_male <= 0.50
| | | | |             |--- truncated branch of depth 5
| | | | |               |--- sex_male > 0.50
| | | | |                 |--- truncated branch of depth 5
| | | | |                   |--- region_southeast > 0.50
| | | | |                     |--- sex_male <= 0.50
| | | | |                       |--- truncated branch of depth 3
| | | | |                         |--- sex_male > 0.50
| | | | |                           |--- truncated branch of depth 4
| | | | |                             |--- children > 0.50
| | | | |                               |--- bmi <= 29.31
| | | | |                                 |--- bmi <= 27.49
| | | | |                                   |--- value: [3309.79]
| | | | |                                     |--- bmi > 27.49
| | | | |                                       |--- value: [2902.91]
| | | | |                                         |--- bmi > 29.31
| | | | |                                           |--- bmi <= 33.20
| | | | |                                             |--- truncated branch of depth 3
| | | | |                                               |--- bmi > 33.20

```


[illegible]

[illegible]

```
| | | | | | | | | | | --- bmi <= 29.14  
| | | | | | | | | | | | --- value: [3558.62]  
| | | | | | | | | | | | --- bmi > 29.14  
| | | | | | | | | | | | | --- value: [3171.61]  
| | | | | | | | | | | | | --- region_southwest > 0.50  
| | | | | | | | | | | | | --- bmi <= 24.95  
| | | | | | | | | | | | | | --- value: [2974.13]  
| | | | | | | | | | | | | | --- bmi > 24.95  
| | | | | | | | | | | | | | --- truncated branch of depth 2  
| | | | | | | | | | | --- age > 28.50  
| | | | | | | | | | | | --- region_southwest <= 0.50  
| | | | | | | | | | | | | --- bmi <= 28.60  
| | | | | | | | | | | | | | --- value: [3736.46]  
| | | | | | | | | | | | | | --- bmi > 28.60  
| | | | | | | | | | | | | | --- value: [3943.60]  
| | | | | | | | | | | | | | --- region_southwest > 0.50  
| | | | | | | | | | | | | | --- bmi <= 26.80  
| | | | | | | | | | | | | | --- value: [3353.28]  
| | | | | | | | | | | | | | --- bmi > 26.80  
| | | | | | | | | | | | | | --- value: [3554.20]  
| | | | | | | | | | --- sex_male > 0.50  
| | | | | | | | | | | --- age <= 27.50  
| | | | | | | | | | | | --- bmi <= 26.80  
| | | | | | | | | | | | | --- value: [2483.74]  
| | | | | | | | | | | | | --- bmi > 26.80  
| | | | | | | | | | | | | | --- bmi <= 31.58  
| | | | | | | | | | | | | | --- value: [2494.02]  
| | | | | | | | | | | | | | --- bmi > 31.58  
| | | | | | | | | | | | | | --- truncated branch of depth 2  
| | | | | | | | | | | --- age > 27.50  
| | | | | | | | | | | | --- age <= 28.50  
| | | | | | | | | | | | | --- value: [3062.51]  
| | | | | | | | | | | | | --- age > 28.50  
| | | | | | | | | | | | | | --- value: [2866.09]  
| | | | | | | | | | --- age > 30.50  
| | | | | | | | | | | --- age <= 33.50  
| | | | | | | | | | | | --- bmi <= 21.14  
| | | | | | | | | | | | | --- value: [4544.23]  
| | | | | | | | | | | | | --- bmi > 21.14  
| | | | | | | | | | | | | --- age <= 32.50  
| | | | | | | | | | | | | | --- bmi <= 30.97  
| | | | | | | | | | | | | | --- truncated branch of depth 6  
| | | | | | | | | | | | | | --- bmi > 30.97  
| | | | | | | | | | | | | | --- value: [4347.02]  
| | | | | | | | | | | | | | --- age > 32.50  
| | | | | | | | | | | | | | --- bmi <= 25.50  
| | | | | | | | | | | | | | --- value: [4185.10]  
| | | | | | | | | | | | | | --- bmi > 25.50
```

```
| | | | | | | | |--- age > 33.50  
| | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | |--- bmi <= 21.71  
| | | | | | | | |   |--- value: [5458.05]  
| | | | | | | | |--- bmi > 21.71  
| | | | | | | | |   |--- region_northwest <= 0.50  
| | | | | | | | |     |--- truncated branch of depth 3  
| | | | | | | | |     |--- region_northwest > 0.50  
| | | | | | | | |       |--- truncated branch of depth 3  
| | | | | | | | |         |--- sex_male > 0.50  
| | | | | | | | |           |--- bmi <= 25.54  
| | | | | | | | |             |--- value: [4500.34]  
| | | | | | | | |               |--- bmi > 25.54  
| | | | | | | | |                 |--- region_southeast <= 0.50  
| | | | | | | | |                   |--- value: [4402.23]  
| | | | | | | | |                     |--- region_southeast > 0.50  
| | | | | | | | |                       |--- value: [4399.73]  
  
| | | | | | | | |--- bmi > 33.74  
| | | | | | | | |   |--- bmi <= 34.01  
| | | | | | | | |     |--- value: [19673.34]  
| | | | | | | | |       |--- bmi > 34.01  
| | | | | | | | |         |--- bmi <= 35.34  
| | | | | | | | |           |--- age <= 33.50  
| | | | | | | | |             |--- value: [12404.88]  
| | | | | | | | |               |--- age > 33.50  
| | | | | | | | |                 |--- bmi <= 34.44  
| | | | | | | | |                   |--- value: [3935.18]  
| | | | | | | | |                     |--- bmi > 34.44  
| | | | | | | | |                       |--- value: [4518.83]  
| | | | | | | | |--- bmi > 35.34  
| | | | | | | | |   |--- age <= 30.00  
| | | | | | | | |     |--- region_southeast <= 0.50  
| | | | | | | | |       |--- value: [3268.85]  
| | | | | | | | |         |--- region_southeast > 0.50  
| | | | | | | | |           |--- value: [2689.50]  
| | | | | | | | |             |--- age > 30.00  
| | | | | | | | |               |--- sex_male <= 0.50  
| | | | | | | | |                 |--- value: [3989.84]  
| | | | | | | | |                   |--- sex_male > 0.50  
| | | | | | | | |                     |--- value: [4320.41]  
  
| | | | | | | | |--- children > 0.50  
| | | | | | | | |   |--- age <= 29.50  
| | | | | | | | |     |--- region_southeast <= 0.50  
| | | | | | | | |       |--- bmi <= 24.31  
| | | | | | | | |         |--- children <= 2.50  
| | | | | | | | |           |--- region_southwest <= 0.50  
| | | | | | | | |             |--- region_northwest <= 0.50
```

[illegible]

[illegible]

```
| | | | | | | | | |--- age > 30.50  
| | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | |--- bmi > 38.87  
| | | | | | | | | |--- age <= 32.50  
| | | | | | | | | |--- truncated branch of depth 4  
| | | | | | | | | |--- age > 32.50  
| | | | | | | | | |--- truncated branch of depth 5  
| | | | | | | | |--- age > 36.50  
| | | | | | | | |--- children <= 3.50  
| | | | | | | | |--- bmi <= 35.68  
| | | | | | | | |--- children <= 2.50  
| | | | | | | | |--- bmi <= 21.77  
| | | | | | | | |--- age <= 39.50  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- bmi <= 18.62  
| | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | |--- bmi > 18.62  
| | | | | | | | |--- value: [7133.90]  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |--- value: [5855.90]  
| | | | | | | | |--- age > 39.50  
| | | | | | | | |--- value: [13725.47]  
| | | | | | | | |--- bmi > 21.77  
| | | | | | | | |--- bmi <= 29.72  
| | | | | | | | |--- age <= 38.50  
| | | | | | | | |--- children <= 0.50  
| | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | |--- children > 0.50  
| | | | | | | | |--- truncated branch of depth 6  
| | | | | | | | |--- age > 38.50  
| | | | | | | | |--- children <= 1.50  
| | | | | | | | |--- truncated branch of depth 7  
| | | | | | | | |--- children > 1.50  
| | | | | | | | |--- truncated branch of depth 5  
| | | | | | | | |--- bmi > 29.72  
| | | | | | | | |--- bmi <= 29.80  
| | | | | | | | |--- value: [20420.60]  
| | | | | | | | |--- bmi > 29.80  
| | | | | | | | |--- age <= 42.50  
| | | | | | | | |--- truncated branch of depth 9  
| | | | | | | | |--- age > 42.50  
| | | | | | | | |--- truncated branch of depth 4  
| | | | | | | | |--- children > 2.50  
| | | | | | | | |--- age <= 38.50  
| | | | | | | | |--- sex_male <= 0.50  
| | | | | | | | |--- bmi <= 29.10  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- value: [7151.09]
```

```
| | | | | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | | | | |---- value: [7281.51]  
| | | | | | | | | | | |---- bmi > 29.10  
| | | | | | | | | | | |---- value: [7537.16]  
| | | | | | | | | | | |---- sex_male > 0.50  
| | | | | | | | | | | |---- age <= 37.50  
| | | | | | | | | | | |---- bmi <= 26.79  
| | | | | | | | | | | |---- value: [6985.51]  
| | | | | | | | | | | |---- bmi > 26.79  
| | | | | | | | | | | |---- value: [6796.86]  
| | | | | | | | | | | |---- age > 37.50  
| | | | | | | | | | | |---- value: [6652.53]  
| | | | | | | | | | | |---- age > 38.50  
| | | | | | | | | | | |---- age <= 40.50  
| | | | | | | | | | | |---- bmi <= 30.85  
| | | | | | | | | | | |---- bmi <= 23.32  
| | | | | | | | | | | |---- truncated branch of depth 2  
| | | | | | | | | | | |---- bmi > 23.32  
| | | | | | | | | | | |---- truncated branch of depth 2  
| | | | | | | | | | | |---- bmi > 30.85  
| | | | | | | | | | | |---- region_southwest <= 0.50  
| | | | | | | | | | | |---- value: [7682.67]  
| | | | | | | | | | | |---- region_southwest > 0.50  
| | | | | | | | | | | |---- truncated branch of depth 2  
| | | | | | | | | | | |---- age > 40.50  
| | | | | | | | | | | |---- region_northwest <= 0.50  
| | | | | | | | | | | |---- bmi <= 33.78  
| | | | | | | | | | | |---- value: [8538.29]  
| | | | | | | | | | | |---- bmi > 33.78  
| | | | | | | | | | | |---- value: [8522.00]  
| | | | | | | | | | | |---- region_northwest > 0.50  
| | | | | | | | | | | |---- value: [8410.05]  
| | | | | | | | | | | |---- bmi > 35.68  
| | | | | | | | | | | |---- age <= 42.50  
| | | | | | | | | | | |---- region_northwest <= 0.50  
| | | | | | | | | | | |---- age <= 37.50  
| | | | | | | | | | | |---- bmi <= 41.36  
| | | | | | | | | | | |---- value: [19214.71]  
| | | | | | | | | | | |---- bmi > 41.36  
| | | | | | | | | | | |---- value: [6435.62]  
| | | | | | | | | | | |---- age > 37.50  
| | | | | | | | | | | |---- children <= 0.50  
| | | | | | | | | | | |---- region_southwest <= 0.50  
| | | | | | | | | | | |---- truncated branch of depth 5  
| | | | | | | | | | | |---- region_southwest > 0.50  
| | | | | | | | | | | |---- value: [6474.01]  
| | | | | | | | | | | |---- children > 0.50  
| | | | | | | | | | | |---- age <= 40.50
```



```
| | | | | | | | |--- age <= 45.00  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- bmi <= 26.65  
| | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | |--- bmi > 26.65  
| | | | | | | | |--- value: [7626.99]  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |--- value: [7518.03]  
| | | | | | | | |--- age > 45.00  
| | | | | | | | |--- value: [7742.11]  
| | | | | | | |--- children > 1.50  
| | | | | | | |--- children <= 4.00  
| | | | | | | |--- age <= 45.50  
| | | | | | | |--- age <= 44.50  
| | | | | | | |--- bmi <= 21.99  
| | | | | | | | |--- value: [8891.14]  
| | | | | | | |--- bmi > 21.99  
| | | | | | | | |--- truncated branch of depth 3  
| | | | | | | |--- age > 44.50  
| | | | | | | |--- sex_male <= 0.50  
| | | | | | | | |--- value: [9095.07]  
| | | | | | | |--- sex_male > 0.50  
| | | | | | | | |--- truncated branch of depth 4  
| | | | | | | |--- age > 45.50  
| | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- value: [9500.57]  
| | | | | | | |--- region_northwest > 0.50  
| | | | | | | |--- bmi <= 22.85  
| | | | | | | | |--- value: [9193.84]  
| | | | | | | |--- bmi > 22.85  
| | | | | | | | |--- value: [9301.89]  
| | | | | | | |--- children > 4.00  
| | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | |--- value: [10096.97]  
| | | | | | | |--- region_southeast > 0.50  
| | | | | | | | |--- value: [9788.87]  
| | | | | | | |--- bmi > 27.57  
| | | | | | | |--- region_southwest <= 0.50  
| | | | | | | |--- region_southeast <= 0.50  
| | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |--- value: [32108.66]  
| | | | | | | |--- region_northwest > 0.50  
| | | | | | | |--- age <= 44.50  
| | | | | | | | |--- value: [7421.19]  
| | | | | | | |--- age > 44.50  
| | | | | | | |--- bmi <= 29.07  
| | | | | | | | |--- value: [28340.19]  
| | | | | | | |--- bmi > 29.07
```

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```
| | | | | | | | |--- bmi > 32.82  
| | | | | | | | |---- bmi <= 33.58  
| | | | | | | | |---- bmi <= 33.39  
| | | | | | | | |---- value: [8334.46]  
| | | | | | | | |---- bmi > 33.39  
| | | | | | | | |---- value: [8334.59]  
| | | | | | | | |---- bmi > 33.58  
| | | | | | | | |---- value: [8823.99]  
| | | | | | | | |---- bmi > 36.06  
| | | | | | | | |---- bmi <= 36.72  
| | | | | | | | |---- bmi <= 36.39  
| | | | | | | | |---- value: [8527.53]  
| | | | | | | | |---- bmi > 36.39  
| | | | | | | | |---- value: [12797.21]  
| | | | | | | | |---- bmi > 36.72  
| | | | | | | | |---- bmi <= 39.90  
| | | | | | | | |---- children <= 0.50  
| | | | | | | | |---- region_northwest <= 0.50  
| | | | | | | | |---- value: [7448.40]  
| | | | | | | | |---- region_northwest > 0.50  
| | | | | | | | |---- value: [6948.70]  
| | | | | | | | |---- children > 0.50  
| | | | | | | | |---- age <= 45.00  
| | | | | | | | |---- value: [8023.14]  
| | | | | | | | |---- age > 45.00  
| | | | | | | | |---- value: [8347.16]  
| | | | | | | | |---- bmi > 39.90  
| | | | | | | | |---- sex_male <= 0.50  
| | | | | | | | |---- children <= 2.50  
| | | | | | | | |---- value: [9432.93]  
| | | | | | | | |---- children > 2.50  
| | | | | | | | |---- value: [9704.67]  
| | | | | | | | |---- sex_male > 0.50  
| | | | | | | | |---- region_northwest <= 0.50  
| | | | | | | | |---- value: [8944.12]  
| | | | | | | | |---- region_northwest > 0.50  
| | | | | | | | |---- value: [8733.23]  
| | | | | | | | |---- age > 46.50  
| | | | | | | | |---- region_southeast <= 0.50  
| | | | | | | | |---- bmi <= 23.85  
| | | | | | | | |---- age <= 48.50  
| | | | | | | | |---- children <= 0.50  
| | | | | | | | |---- value: [8269.04]  
| | | | | | | | |---- children > 0.50  
| | | | | | | | |---- region_northwest <= 0.50  
| | | | | | | | |---- sex_male <= 0.50  
| | | | | | | | |---- value: [8539.67]  
| | | | | | | | |---- sex male > 0.50
```

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```
| | | | | | | | | | --- age > 48.50  
| | | | | | | | | | |--- bmi <= 27.23  
| | | | | | | | | | | |--- value: [26140.36]  
| | | | | | | | | | |--- bmi > 27.23  
| | | | | | | | | | | |--- value: [25656.58]  
| | | | | | | | | |--- bmi > 27.41  
| | | | | | | | | | |--- age <= 48.50  
| | | | | | | | | | | |--- bmi <= 36.62  
| | | | | | | | | | | |--- truncated branch of depth 9  
| | | | | | | | | | | |--- bmi > 36.62  
| | | | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | | |--- age > 48.50  
| | | | | | | | | | | |--- children <= 1.50  
| | | | | | | | | | | |--- truncated branch of depth 8  
| | | | | | | | | | | |--- children > 1.50  
| | | | | | | | | | | |--- truncated branch of depth 6  
| | | | | |--- region_southeast > 0.50  
| | | | | | |--- children <= 0.50  
| | | | | | | |--- age <= 50.50  
| | | | | | | |--- bmi <= 28.44  
| | | | | | | |--- sex_male <= 0.50  
| | | | | | | | |--- value: [8601.33]  
| | | | | | | | |--- sex_male > 0.50  
| | | | | | | | |--- value: [8442.67]  
| | | | | | | |--- bmi > 28.44  
| | | | | | | |--- bmi <= 30.41  
| | | | | | | | |--- value: [7789.64]  
| | | | | | | |--- bmi > 30.41  
| | | | | | | |--- sex_male <= 0.50  
| | | | | | | | |--- value: [8280.62]  
| | | | | | | |--- sex_male > 0.50  
| | | | | | | | |--- bmi <= 36.35  
| | | | | | | | |--- value: [8124.41]  
| | | | | | | | |--- bmi > 36.35  
| | | | | | | | |--- value: [8125.78]  
| | | | | | | |--- age > 50.50  
| | | | | | | |--- value: [9283.56]  
| | | | | |--- children > 0.50  
| | | | | | |--- children <= 2.50  
| | | | | | | |--- age <= 48.50  
| | | | | | | |--- children <= 1.50  
| | | | | | | | |--- value: [8547.69]  
| | | | | | | |--- children > 1.50  
| | | | | | | | |--- value: [8978.19]  
| | | | | | | |--- age > 48.50  
| | | | | | | |--- sex_male <= 0.50  
| | | | | | | |--- bmi <= 44.39  
| | | | | | | |--- bmi <= 30.64
```

```
| | | | | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | | | | |--- bmi > 30.64  
| | | | | | | | | | | | |--- truncated branch of depth 2  
| | | | | | | | | | | | |--- bmi > 44.39  
| | | | | | | | | | | | |--- value: [9549.57]  
| | | | | | | | | | | | |--- sex_male > 0.50  
| | | | | | | | | | | | |--- age <= 50.50  
| | | | | | | | | | | | |--- bmi <= 40.92  
| | | | | | | | | | | | |--- value: [9048.03]  
| | | | | | | | | | | | |--- bmi > 40.92  
| | | | | | | | | | | | |--- value: [9058.73]  
| | | | | | | | | | | | |--- age > 50.50  
| | | | | | | | | | | | |--- bmi <= 33.00  
| | | | | | | | | | | | |--- value: [9377.90]  
| | | | | | | | | | | | |--- bmi > 33.00  
| | | | | | | | | | | | |--- value: [9386.16]  
| | | | | | | | | | | | |--- children > 2.50  
| | | | | | | | | | | | |--- children <= 3.50  
| | | | | | | | | | | | |--- value: [10702.64]  
| | | | | | | | | | | | |--- children > 3.50  
| | | | | | | | | | | | |--- value: [10977.21]  
| | |--- age > 51.50  
| | |--- age <= 58.50  
| | |--- children <= 1.50  
| | |--- bmi <= 31.48  
| | |--- bmi <= 31.30  
| | |--- age <= 55.50  
| | |--- bmi <= 26.89  
| | |--- bmi <= 24.45  
| | |--- age <= 54.50  
| | |--- truncated branch of depth 3  
| | |--- age > 54.50  
| | |--- value: [10791.96]  
| | |--- bmi > 24.45  
| | |--- region_northwest <= 0.50  
| | |--- truncated branch of depth 3  
| | |--- region_northwest > 0.50  
| | |--- value: [10355.64]  
| | |--- bmi > 26.89  
| | |--- region_southwest <= 0.50  
| | |--- age <= 52.50  
| | |--- truncated branch of depth 2  
| | |--- age > 52.50  
| | |--- truncated branch of depth 5  
| | |--- region_southwest > 0.50  
| | |--- age <= 53.50  
| | |--- truncated branch of depth 2  
| | |--- age > 53.50
```

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```
| | | | | --- bmi > 28.07  
| | | | | | --- age <= 24.50  
| | | | | | | --- bmi <= 29.16  
| | | | | | | | --- value: [35147.53]  
| | | | | | | | --- bmi > 29.16  
| | | | | | | | | --- value: [18648.42]  
| | | | | | --- age > 24.50  
| | | | | | | --- age <= 31.50  
| | | | | | | | --- children <= 2.00  
| | | | | | | | | --- region_northwest <= 0.50  
| | | | | | | | | | --- children <= 0.50  
| | | | | | | | | | | --- value: [19350.37]  
| | | | | | | | | | | --- children > 0.50  
| | | | | | | | | | | | --- value: [19521.97]  
| | | | | | | | | | | --- region_northwest > 0.50  
| | | | | | | | | | | | --- value: [18310.74]  
| | | | | | | | | --- children > 2.00  
| | | | | | | | | --- bmi <= 29.20  
| | | | | | | | | | --- value: [20745.99]  
| | | | | | | | | --- bmi > 29.20  
| | | | | | | | | | --- value: [19933.46]  
| | | | | | | | --- age > 31.50  
| | | | | | | | --- region_southeast <= 0.50  
| | | | | | | | | --- bmi <= 29.11  
| | | | | | | | | | --- children <= 2.50  
| | | | | | | | | | | --- value: [21082.16]  
| | | | | | | | | | | --- children > 2.50  
| | | | | | | | | | | | --- value: [21472.48]  
| | | | | | | | | --- bmi > 29.11  
| | | | | | | | | | --- value: [22462.04]  
| | | | | | | | --- region_southeast > 0.50  
| | | | | | | | | --- value: [19719.69]  
| | | | | --- age > 41.00  
| | | | | | --- bmi <= 25.95  
| | | | | | | --- age <= 44.50  
| | | | | | | | --- bmi <= 24.67  
| | | | | | | | --- region_southeast <= 0.50  
| | | | | | | | | --- sex_male <= 0.50  
| | | | | | | | | --- age <= 43.50  
| | | | | | | | | | --- bmi <= 21.71  
| | | | | | | | | | | --- value: [19798.05]  
| | | | | | | | | | | --- bmi > 21.71  
| | | | | | | | | | | | --- value: [19964.75]  
| | | | | | | | | --- age > 43.50  
| | | | | | | | | | --- value: [19594.81]  
| | | | | | | | --- sex_male > 0.50  
| | | | | | | | | --- value: [21259.38]
```

```
| | | | | | |--- region_southeast > 0.50  
| | | | | | |--- age <= 42.50  
| | | | | | |--- value: [19515.54]  
| | | | | | |--- age > 42.50  
| | | | | | |--- value: [18767.74]  
| | | | | | |--- bmi > 24.67  
| | | | | | |--- bmi <= 24.99  
| | | | | | |--- value: [21880.82]  
| | | | | | |--- bmi > 24.99  
| | | | | | |--- value: [21771.34]  
| | | | | | |--- age > 44.50  
| | | | | | |--- children <= 0.50  
| | | | | | |--- bmi <= 23.33  
| | | | | | |--- value: [35069.37]  
| | | | | | |--- bmi > 23.33  
| | | | | | |--- bmi <= 24.09  
| | | | | | |--- value: [26926.51]  
| | | | | | |--- bmi > 24.09  
| | | | | | |--- value: [21223.68]  
| | | | | | |--- children > 0.50  
| | | | | | |--- age <= 48.00  
| | | | | | |--- children <= 1.50  
| | | | | | |--- region_northwest <= 0.50  
| | | | | | |--- value: [21978.68]  
| | | | | | |--- region_northwest > 0.50  
| | | | | | |--- value: [21677.28]  
| | | | | | |--- children > 1.50  
| | | | | | |--- value: [21098.55]  
| | | | | | |--- age > 48.00  
| | | | | | |--- bmi <= 23.67  
| | | | | | |--- value: [22218.11]  
| | | | | | |--- bmi > 23.67  
| | | | | | |--- children <= 2.50  
| | | | | | |--- region_southeast <= 0.50  
| | | | | | |--- region_southwest <= 0.50  
| | | | | | |--- truncated branch of depth 3  
| | | | | | |--- region_southwest > 0.50  
| | | | | | |--- value: [23306.55]  
| | | | | | |--- region_southeast > 0.50  
| | | | | | |--- value: [24667.42]  
| | | | | | |--- children > 2.50  
| | | | | | |--- value: [25382.30]  
| | | | | | |--- bmi > 25.95  
| | | | | | |--- bmi <= 26.10  
| | | | | | |--- value: [38245.59]  
| | | | | | |--- bmi > 26.10  
| | | | | | |--- age <= 56.50  
| | | | | | |--- sex male <= 0.50
```

```
| | | | | | | | --- age <= 45.00  
| | | | | | | |   |--- region_northwest <= 0.50  
| | | | | | | |     |--- value: [22478.60]  
| | | | | | | |   |--- region_northwest > 0.50  
| | | | | | | |     |--- age <= 42.50  
| | | | | | | |       |--- value: [21348.71]  
| | | | | | | |     |--- age > 42.50  
| | | | | | | |       |--- value: [21774.32]  
| | | | | | | |   |--- age > 45.00  
| | | | | | | |     |--- children <= 0.50  
| | | | | | | |       |--- value: [23065.42]  
| | | | | | | |     |--- children > 0.50  
| | | | | | | |       |--- bmi <= 26.86  
| | | | | | | |         |--- value: [23401.31]  
| | | | | | | |       |--- bmi > 26.86  
| | | | | | | |         |--- age <= 48.50  
| | | | | | | |           |--- value: [24535.70]  
| | | | | | | |         |--- age > 48.50  
| | | | | | | |           |--- value: [24520.26]  
| | | | | | | |   |--- sex_male > 0.50  
| | | | | | | |     |--- age <= 45.00  
| | | | | | | |       |--- bmi <= 29.15  
| | | | | | | |         |--- bmi <= 28.05  
| | | | | | | |           |--- value: [37829.72]  
| | | | | | | |         |--- bmi > 28.05  
| | | | | | | |           |--- value: [32787.46]  
| | | | | | | |       |--- bmi > 29.15  
| | | | | | | |         |--- value: [22144.03]  
| | | | | | | |   |--- age > 45.00  
| | | | | | | |     |--- bmi <= 27.03  
| | | | | | | |       |--- value: [26109.33]  
| | | | | | | |     |--- bmi > 27.03  
| | | | | | | |       |--- age <= 47.50  
| | | | | | | |         |--- region_northwest <= 0.50  
| | | | | | | |           |--- value: [25309.49]  
| | | | | | | |         |--- region_northwest > 0.50  
| | | | | | | |           |--- value: [24915.22]  
| | | | | | | |       |--- age > 47.50  
| | | | | | | |         |--- age <= 50.00  
| | | | | | | |           |--- value: [23568.27]  
| | | | | | | |         |--- age > 50.00  
| | | | | | | |           |--- value: [24393.62]  
| | | | | | | |   |--- age > 56.50  
| | | | | | | |     |--- children <= 2.00  
| | | | | | | |       |--- age <= 59.00  
| | | | | | | |         |--- bmi <= 29.39  
| | | | | | | |           |--- value: [27218.44]  
| | | | | | | |       |--- bmi > 29.39
```

```
| | | | | | | | |--- age > 59.00  
| | | | | | | | |--- bmi <= 26.79  
| | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | |   |--- value: [28101.33]  
| | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | |   |--- value: [27808.73]  
| | | | | | | | |--- bmi > 26.79  
| | | | | | | | |--- region_northwest <= 0.50  
| | | | | | | | |   |--- value: [29523.17]  
| | | | | | | | |--- region_northwest > 0.50  
| | | | | | | | |   |--- bmi <= 26.93  
| | | | | | | | |     |--- value: [29330.98]  
| | | | | | | | |   |--- bmi > 26.93  
| | | | | | | | |     |--- truncated branch of depth 3  
| | | | | | | | |--- children > 2.00  
| | | | | | | | |--- age <= 60.00  
| | | | | | | | |   |--- value: [30184.94]  
| | | | | | | | |--- age > 60.00  
| | | | | | | | |   |--- value: [30942.19]  
|--- bmi > 30.01  
|   |--- age <= 42.00  
|   |   |--- age <= 27.50  
|   |   |   |--- bmi <= 35.61  
|   |   |   |   |--- bmi <= 31.70  
|   |   |   |   |--- bmi <= 30.88  
|   |   |   |   |--- region_southeast <= 0.50  
|   |   |   |   |--- age <= 21.00  
|   |   |   |   |   |--- sex_male <= 0.50  
|   |   |   |   |   |   |--- value: [33307.55]  
|   |   |   |   |   |   |--- sex_male > 0.50  
|   |   |   |   |   |   |   |--- value: [33475.82]  
|   |   |   |   |   |--- age > 21.00  
|   |   |   |   |   |   |--- bmi <= 30.30  
|   |   |   |   |   |   |   |--- value: [33900.65]  
|   |   |   |   |   |   |   |--- bmi > 30.30  
|   |   |   |   |   |   |   |   |--- value: [33907.55]  
|   |   |   |   |   |--- region_southeast > 0.50  
|   |   |   |   |   |   |--- value: [32548.34]  
|   |   |   |--- bmi > 30.88  
|   |   |   |   |--- age <= 25.50  
|   |   |   |   |   |--- region_southwest <= 0.50  
|   |   |   |   |   |--- age <= 21.00  
|   |   |   |   |   |   |--- value: [34303.17]  
|   |   |   |   |   |   |--- age > 21.00  
|   |   |   |   |   |   |   |--- value: [34254.05]  
|   |   |   |   |   |--- region_southwest > 0.50  
|   |   |   |   |   |   |--- value: [34166.27]
```

```
| | | | | | | | --- age > 25.50  
| | | | | | | | |--- region_southeast <= 0.50  
| | | | | | | | |   |-- value: [34838.87]  
| | | | | | | | |--- region_southeast > 0.50  
| | | | | | | | |   |-- value: [34806.47]  
  
| | | | | | | | |--- bmi > 31.70  
| | | | | | | | |   |-- children <= 1.00  
| | | | | | | | |     |-- region_northwest <= 0.50  
| | | | | | | | |       |-- bmi <= 35.25  
| | | | | | | | |         |-- age <= 18.50  
| | | | | | | | |           |-- value: [33732.69]  
| | | | | | | | |           |-- age > 18.50  
| | | | | | | | |             |-- bmi <= 34.01  
| | | | | | | | |               |-- truncated branch of depth 2  
| | | | | | | | |                 |-- bmi > 34.01  
| | | | | | | | |                   |-- value: [34828.65]  
| | | | | | | | |                     |-- bmi > 35.25  
| | | | | | | | |                       |-- value: [35585.58]  
| | | | | | | | |                         |-- region_northwest > 0.50  
| | | | | | | | |                           |-- value: [36898.73]  
  
| | | | | | | | |--- children > 1.00  
| | | | | | | | |   |-- age <= 21.00  
| | | | | | | | |     |-- value: [36397.58]  
| | | | | | | | |   |-- age > 21.00  
| | | | | | | | |     |-- children <= 2.50  
| | | | | | | | |       |-- age <= 24.00  
| | | | | | | | |         |-- value: [36021.01]  
| | | | | | | | |         |-- age > 24.00  
| | | | | | | | |           |-- age <= 25.50  
| | | | | | | | |             |-- value: [36124.57]  
| | | | | | | | |             |-- age > 25.50  
| | | | | | | | |               |-- value: [36085.22]  
| | | | | | | | |                 |-- children > 2.50  
| | | | | | | | |                   |-- value: [36189.10]  
  
| | | | | | | | |--- bmi > 35.61  
| | | | | | | | |   |-- bmi <= 48.73  
| | | | | | | | |     |-- bmi <= 41.14  
| | | | | | | | |       |-- age <= 19.50  
| | | | | | | | |         |-- region_southeast <= 0.50  
| | | | | | | | |           |-- value: [36219.41]  
| | | | | | | | |           |-- region_southeast > 0.50  
| | | | | | | | |             |-- value: [36149.48]  
| | | | | | | | |             |-- age > 19.50  
| | | | | | | | |               |-- region_southeast <= 0.50  
| | | | | | | | |                 |-- bmi <= 36.15  
| | | | | | | | |                   |-- value: [37465.34]  
| | | | | | | | |                   |-- bmi > 36.15  
| | | | | | | | |                     |-- age <= 21.50
```


[illegible]

[illegible]

```

| | | |--- bmi <= 46.81
| | | |   |--- bmi <= 30.43
| | | |   |   |--- value: [62592.87]
| | | |   |--- bmi > 30.43
| | | |   |   |--- age <= 56.50
| | | |   |   |   |--- bmi <= 36.75
| | | |   |   |   |   |--- bmi <= 33.37
| | | |   |   |   |   |   |--- age <= 49.50
| | | |   |   |   |   |   |   |--- region_southeast <= 0.50
| | | |   |   |   |   |   |   |   |--- children <= 2.00
| | | |   |   |   |   |   |   |   |   |--- truncated branch of depth 2
| | | |   |   |   |   |   |   |   |   |--- children > 2.00
| | | |   |   |   |   |   |   |   |   |   |--- value: [40720.55]
| | | |   |   |   |   |   |   |   |   |   |--- region_southeast > 0.50
| | | |   |   |   |   |   |   |   |   |   |   |--- value: [40974.16]
| | | |   |   |   |   |   |   |   |   |   |--- age > 49.50
| | | |   |   |   |   |   |   |   |   |   |   |--- bmi <= 31.31
| | | |   |   |   |   |   |   |   |   |   |   |   |--- age <= 54.50
| | | |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [41999.52]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 54.50
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [42303.69]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 31.31
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 32.06
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [41097.16]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 32.06
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [41919.10]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 33.37
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age <= 50.50
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 36.33
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 34.40
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [42856.84]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 34.40
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- truncated branch of depth 5
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 36.33
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age <= 46.00
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [42760.50]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 46.00
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [42969.85]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 50.50
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 34.16
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi <= 33.87
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [43921.18]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 33.87
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [43254.42]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- bmi > 34.16
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age <= 52.50
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- value: [44641.20]
| | | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |--- age > 52.50

```

[illegible]

```

| | | | | | | | | | | | |--- value: [46599.11]
| | | | | | | | | | | | |--- age > 62.00
| | | | | | | | | | | | |--- truncated branch of depth 2
| | | | | | | | | | | | |--- bmi > 37.33
| | | | | | | | | | | | |--- bmi <= 40.41
| | | | | | | | | | | | |--- sex_male <= 0.50
| | | | | | | | | | | | |--- value: [48824.45]
| | | | | | | | | | | | |--- sex_male > 0.50
| | | | | | | | | | | | |--- value: [48173.36]
| | | | | | | | | | | | |--- bmi > 40.41
| | | | | | | | | | | | |--- age <= 59.50
| | | | | | | | | | | | |--- truncated branch of depth 2
| | | | | | | | | | | | |--- age > 59.50
| | | | | | | | | | | | |--- value: [48673.56]
| | | |--- bmi > 46.81
| | | |--- value: [63770.43]

```

```
[ ]: result_table
```

```
[ ]:
Max Depth      Criterion      MSE      MAE  R-squared
0          3.0  squared_error  2.078248e+07  2690.276900  0.860782
1          5.0  squared_error  2.119546e+07  2491.107164  0.858016
2         NaN  squared_error  3.946485e+07  2886.418592  0.735633
3          3.0  friedman_mse  2.078248e+07  2690.276900  0.860782
4          5.0  friedman_mse  2.119546e+07  2491.107164  0.858016
5         NaN  friedman_mse  3.974123e+07  2905.321888  0.733782

```

```
[ ]: **Conclusion**
```