# 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
```

# Classifiation

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
                                                                pH sulphates
                                                     density
     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
                                                                          0.58
                        17.0
                                               60.0
                                                      0.9980
                                                              3.16
     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
                                     0.270976
                                                 0.194801
                                                           0.00000
                                                                      0.0900
                            1599.0
     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
                            1599.0
                                     3.311113
                                                 0.154386
                                                           2.74000
                                                                      3.2100
     рΗ
     sulphates
                            1599.0
                                     0.658149
                                                 0.169507
                                                           0.33000
                                                                      0.5500
     alcohol
                                    10.422983
                                                                      9.5000
                            1599.0
                                                 1.065668
                                                           8.40000
     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
                                       0.420000
                                                    1.00000
                             0.26000
     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
     Нq
                             3.31000
                                       3.400000
                                                    4.01000
     sulphates
                             0.62000
                                       0.730000
                                                    2.00000
     alcohol
                            10.20000
                                      11.100000
                                                   14.90000
```

8.00000

6.000000

6.00000

quality

# []: data.info()

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1599 entries, 0 to 1598
Data columns (total 12 columns):
```

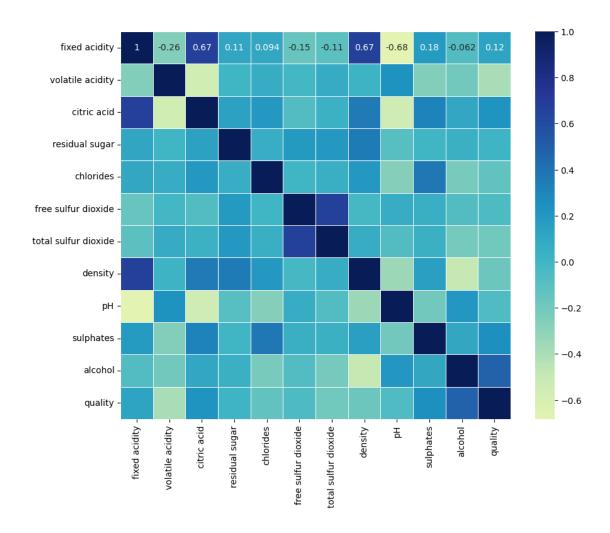
#	Column	Non-Null Count	Dtype					
0	fixed acidity	1599 non-null	float64					
1	volatile acidity	1599 non-null	float64					
2	citric acid	1599 non-null	float64					
3	residual sugar	1599 non-null	float64					
4	chlorides	1599 non-null	float64					
5	free sulfur dioxide	1599 non-null	float64					
6	total sulfur dioxide	1599 non-null	float64					
7	density	1599 non-null	float64					
8	рН	1599 non-null	float64					
9	sulphates	1599 non-null	float64					
10	alcohol	1599 non-null	float64					
11	quality	1599 non-null	int64					
d+v = 0, $f = 0 + 6/(11)$ , $i = 0 + 6/(1)$								

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")
```

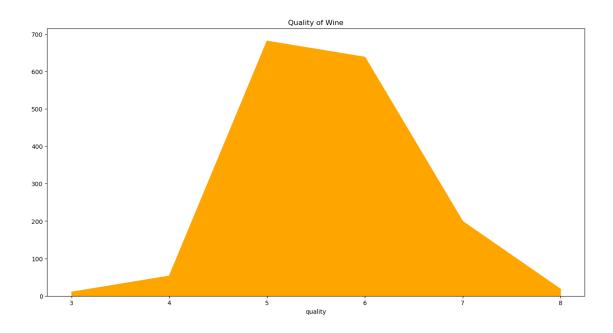
[]: <Axes: >



```
[]: data['quality'].value_counts().sort_index().plot.

→area(figsize=(16,8),title='Quality of Wine',color='orange')
```

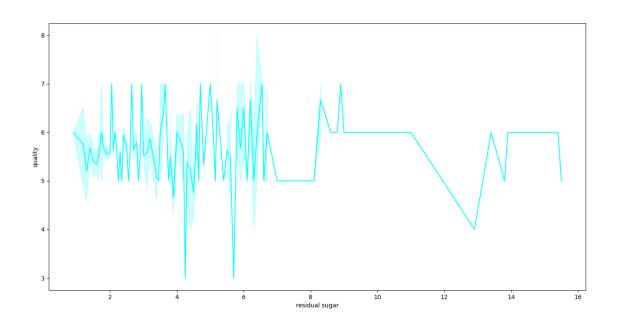
[]: <Axes: title={'center': 'Quality of Wine'}, xlabel='quality'>



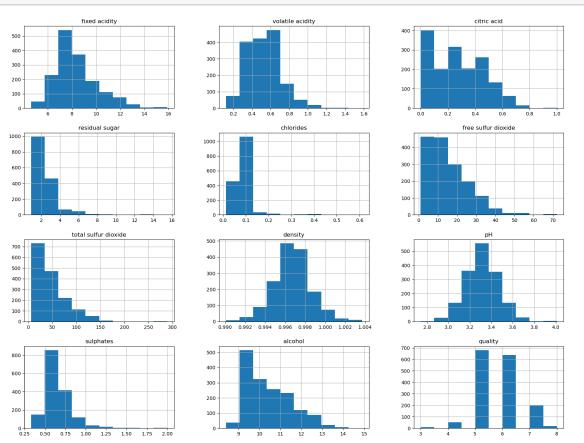
```
[]: plt.figure(figsize=(16,8))
sns.lineplot(x='residual sugar',y='quality',data=data,color='cyan')
```

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



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



```
⇔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()
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[]: cols\_to\_draw = ['fixed acidity', 'volatile acidity', 'citric acid', 'residual\_

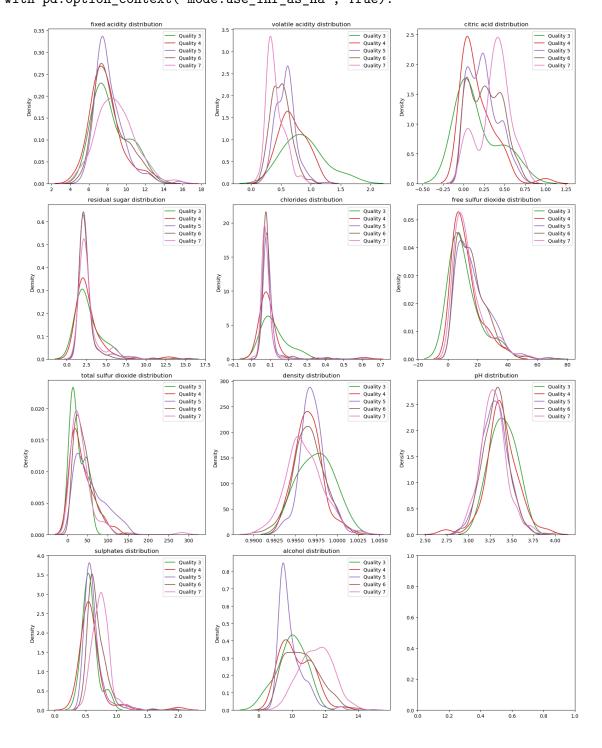
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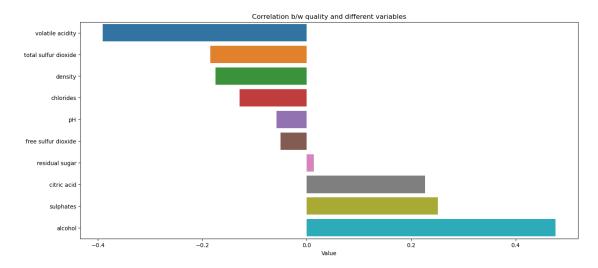
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future version. Convert inf values to NaN before operating instead.
 with pd.option\_context('mode.use\_inf\_as\_na', True):
C:\Users\gauth\anaconda3\Lib\site-packages\seaborn\\_oldcore.py:1119:
FutureWarning: use\_inf\_as\_na option is deprecated 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):



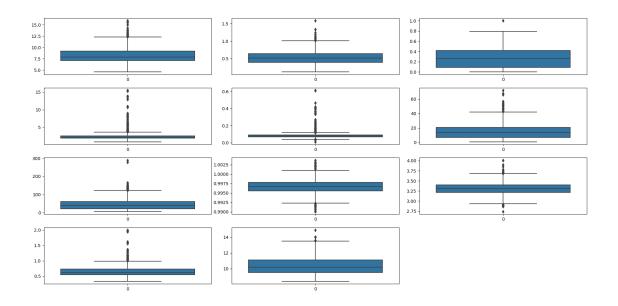
```
[]: d_corr=data.corr()['quality'][1:].drop('quality',axis=0)

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
          638
     6
          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
             744
     Bad
     Name: count, dtype: int64
[]: from sklearn.preprocessing import LabelEncoder
     le=LabelEncoder()
     df['quality'] = le.fit_transform(df['quality'])
     df['quality'].value_counts()
[]: quality
          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.
      425, 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,_u
 →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=['feature_{}'.format(i) for iu
 →in range(x_train.shape[1])])
```

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

## Decision Tree (Depth=1)

feature\_10 <= -0.142 gini = 0.497 samples = 1199 value = [555, 644]

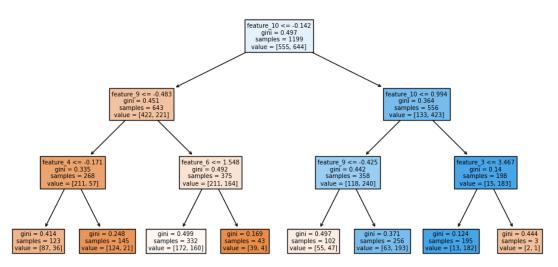
gini = 0.451 samples = 643 value = [422, 221] gini = 0.364 samples = 556 value = [133, 423]

### Decision Tree (Depth=2)

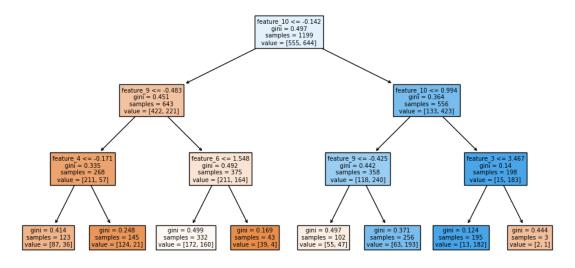
feature\_10 <= -0.142 gini = 0.497 samples = 1199 value = [555, 644]

gini = 0.451 samples = 643 value = [422, 221] gini = 0.364 samples = 556 value = [133, 423]

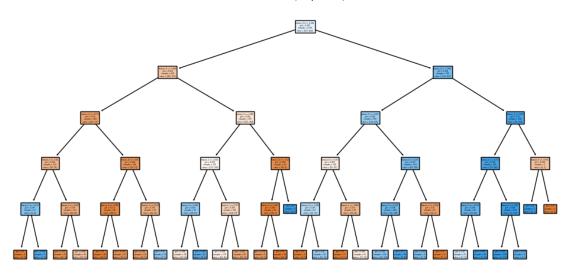
#### Decision Tree (Depth=3)



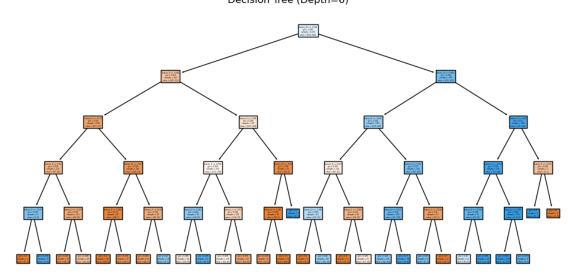
#### Decision Tree (Depth=4)

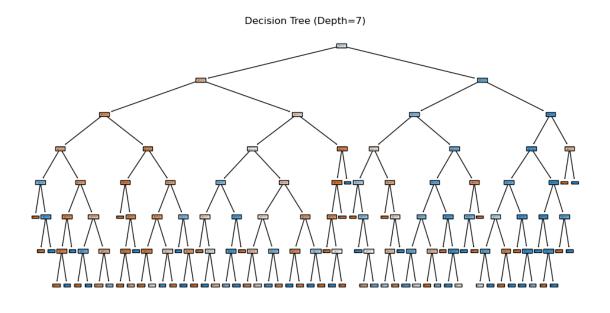


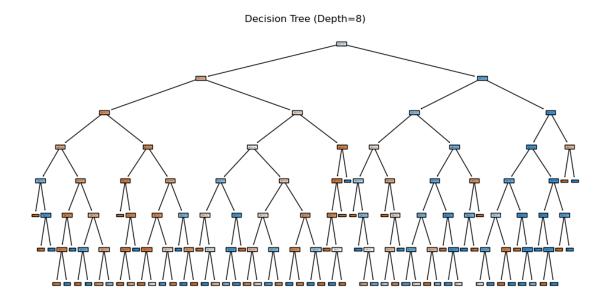
# Decision Tree (Depth=5)

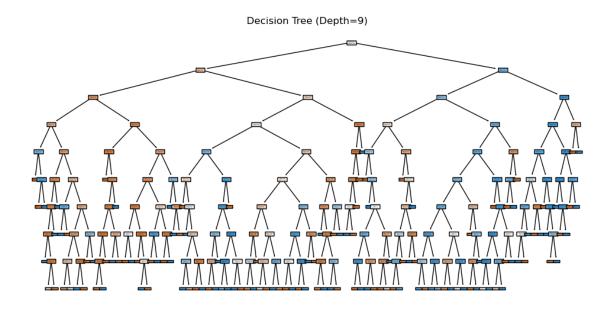


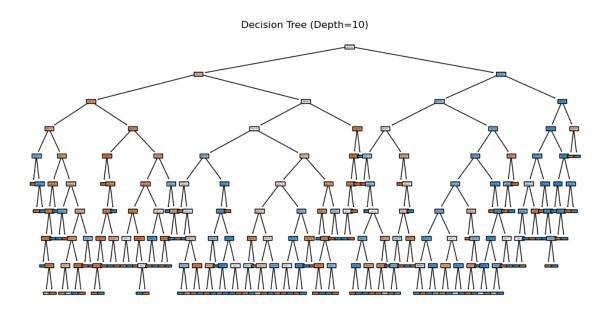
# Decision Tree (Depth=6)











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

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

**Dateset Descrption** 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**
```

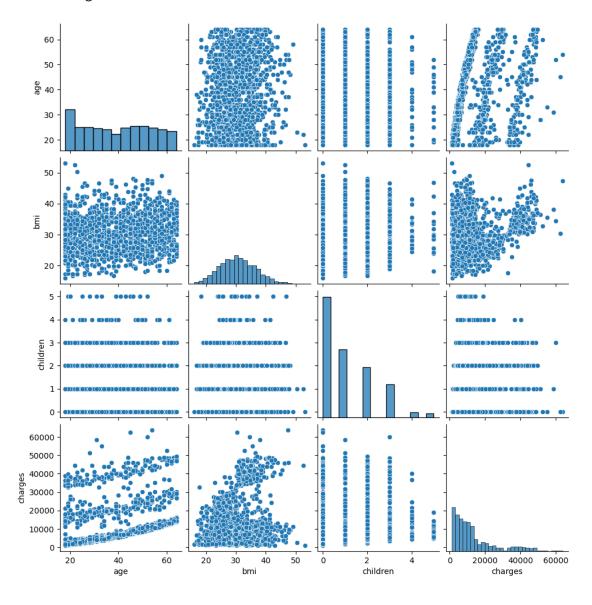
# []: data.describe()

```
[]:
                                   bmi
                                           children
                                                           charges
                     age
            1338.000000
                          1338.000000
                                        1338.000000
                                                       1338.000000
     count
     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
              64.000000
     max
                            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.

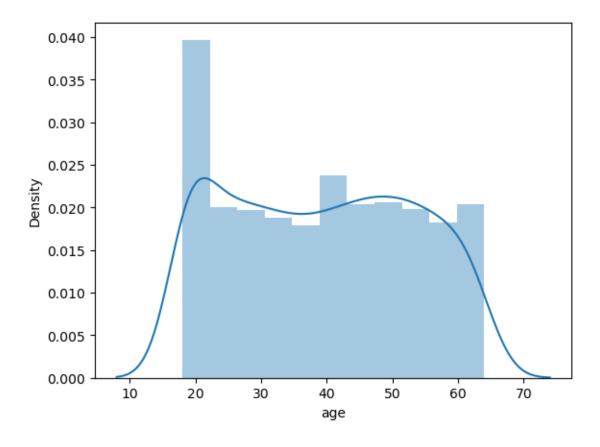
Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).

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):

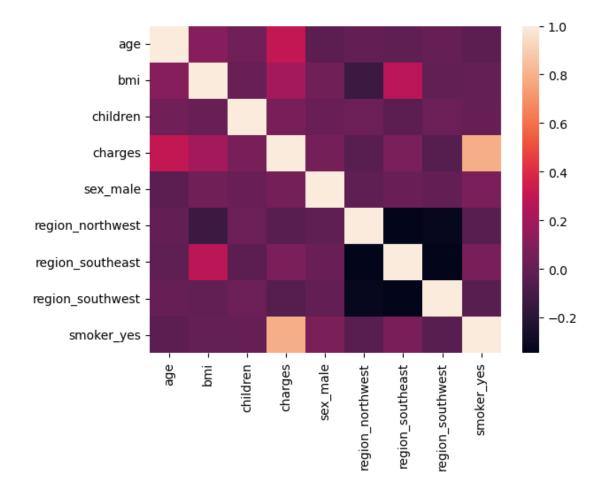
# []: <Axes: xlabel='age', ylabel='Density'>



```
[]: 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, u
arandom_state = 1)
```

```
[]: data.head()
[]:
                    children
                                   charges
                                           sex_male region_northwest \
       age
                bmi
        19
            27.900
                            0 16884.92400
                                               False
     0
                                                                 False
     1
        18 33.770
                            1
                               1725.55230
                                                True
                                                                 False
        28 33.000
                                4449.46200
                                                True
                                                                 False
     3
        33 22.705
                            0 21984.47061
                                                True
                                                                  True
        32 28.880
                                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
                   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
I
       |--- 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
I
           | |--- 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 \leq 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]
                                        20.00
                            |--- age >
                                |--- 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 \leq 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]
           28.26
|--- bmi >
    --- 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]
             |--- bmi > 30.63
                 |--- truncated branch of depth 4
                33.83
        - bmi >
         |--- bmi <= 39.15
             |---| bmi <= 38.22
                 |--- truncated branch of depth 5
             |--- bmi > 38.22
                 |--- truncated branch of depth 2
         |--- bmi > 39.15
             |--- region_southeast <= 0.50
                 |--- truncated branch of depth 2
             |--- region_southeast > 0.50
                 |--- truncated branch of depth 4
- age >
       18.50
 |--- bmi <= 33.20
     |--- bmi <= 33.05
         |--- region_southeast <= 0.50
             |--- region_southwest <= 0.50
                 |--- truncated branch of depth 7
             |--- region_southwest > 0.50
                 |--- truncated branch of depth 5
         |--- region_southeast > 0.50
             |--- sex_male <= 0.50
                 |--- truncated branch of depth 3
             |--- sex_male > 0.50
                 |--- value: [16586.50]
     |--- bmi > 33.05
         |--- value: [23082.96]
 |--- bmi > 33.20
     |--- sex_male <= 0.50
         |--- children <= 0.50
             |--- region_northwest <= 0.50
                 |--- truncated branch of depth 4
             |--- region_northwest > 0.50
                 |--- truncated branch of depth 2
         |--- children > 0.50
             |--- value: [2730.11]
        - sex_male > 0.50
         |--- age \leq 20.50
             |--- region_southwest <= 0.50
                 |--- value: [1391.53]
             |--- region_southwest > 0.50
                 |--- truncated branch of depth 3
         |--- age > 20.50
             |--- region_northwest <= 0.50
```

```
|--- truncated branch of depth 3
                     1
                     |--- region_northwest > 0.50
                     | |--- value: [1917.32]
- age >
        22.50
 |--- bmi <= 23.34
       -- bmi <= 22.91
         |--- age \leq 23.50
             |--- bmi <= 18.05
               |--- value: [2775.19]
             |--- bmi > 18.05
                 |--- value: [21595.38]
         |--- age > 23.50
             |--- sex_male <= 0.50
                 |--- age \leq 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
                     1
               -- children > 0.50
                 |--- bmi <= 29.31
                     |---| bmi <= 27.49
                     | |--- value: [3309.79]
                     |--- bmi > 27.49
                         |--- value: [2902.91]
                     1
                 |--- bmi > 29.31
```

```
|---| bmi <= 33.20
                       | |--- truncated branch of depth 3
                       |--- bmi > 33.20
                           |--- truncated branch of depth 2
                       40.76
           |--- bmi >
               |--- 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 \leq 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
               1
                 |--- 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
```

```
| | |--- value: [3906.13]
                           |--- age > 25.50
                           | |--- value: [3484.33]
                   |--- \text{ children} > 4.00
                       |--- value: [5080.10]
          -- region_northwest > 0.50
           |--- age <= 21.50
               |---| bmi <= 25.51
                   |--- bmi <= 22.18
                   | |--- value: [2803.70]
                   |--- bmi > 22.18
                       |--- value: [3077.10]
               |--- bmi > 25.51
                   |--- children <= 2.50
                       |--- age <= 20.00
                       | |--- sex_male <= 0.50
                         | |--- value: [24059.68]
                         |--- sex_male > 0.50
                         | |--- value: [22493.66]
                       |--- age > 20.00
                       | |--- value: [26018.95]
                   |--- children > 2.50
                   | |--- value: [18838.70]
           |--- age > 21.50
               |---| bmi <= 24.94
                   |--- bmi <= 22.23
                   | |--- value: [4296.27]
                   |--- bmi > 22.23
                      |--- value: [14426.07]
               |--- bmi > 24.94
                   |--- children <= 2.50
                       |--- age <= 24.50
                       | |--- value: [3537.70]
                       |--- age > 24.50
                       | |--- value: [4189.11]
                   |--- children > 2.50
                       |--- age <= 24.50
                         |--- bmi <= 32.58
                         | |--- value: [4618.08]
                           |--- bmi > 32.58
                          | |--- value: [4466.62]
                       |--- age > 24.50
                       | |--- value: [4877.98]
|--- age > 26.50
   |--- age <= 36.50
      |--- children <= 0.50
       | |--- bmi <= 33.74
       | | |--- age <= 30.50
```

```
|--- 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
              1
                 |--- 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 \leq 25.50
                        | |--- value: [4185.10]
                        |--- bmi > 25.50
                        |--- value: [4571.41]
                       33.50
            |--- age >
                |--- 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]
               33.74
       - bmi >
        |---| 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
```

```
|--- children <= 2.50
                |--- region_southwest <= 0.50
                    |--- sex_male <= 0.50
                       |--- truncated branch of depth 2
                    |--- sex male > 0.50
                        |--- value: [4428.89]
                |--- region_southwest > 0.50
                    |--- value: [3847.67]
               - children > 2.50
                |--- age <= 28.50
                    |--- value: [5615.37]
                |--- age > 28.50
                    |--- value: [5209.58]
        |--- bmi > 24.31
            |--- bmi <= 24.46
                |--- value: [23288.93]
              -- bmi > 24.46
                |---| bmi <= 34.07
                    |---| bmi \leq 27.24
                    | |--- truncated branch of depth 4
                    |--- bmi > 27.24
                        |--- truncated branch of depth 9
                |--- bmi > 34.07
                    |--- age <= 27.50
                        |--- truncated branch of depth 2
                    |--- age > 27.50
                        |--- value: [3277.16]
      -- region_southeast > 0.50
        |--- children <= 2.50
            |--- children <= 1.50
                |--- sex_male <= 0.50
                    |--- age <= 27.50
                        |--- value: [3561.89]
                    |--- age > 27.50
                        |--- truncated branch of depth 2
                |--- sex_male > 0.50
                    |--- value: [3471.41]
              -- children > 1.50
                |--- bmi <= 31.90
                    |--- value: [4340.44]
                |--- bmi > 31.90
                    |--- value: [4058.12]
        |--- children > 2.50
            |--- sex_male <= 0.50
               |--- value: [5138.26]
            |--- sex_male > 0.50
            |--- value: [4449.46]
|--- age >
           29.50
```

```
|--- bmi <= 23.89
    |--- bmi <= 22.28
        |--- age <= 35.50
           |--- children <= 2.00
                |---| bmi <= 22.04
                   |--- truncated branch of depth 3
                |--- bmi > 22.04
                    |--- value: [5354.07]
            |--- children > 2.00
                |--- value: [5693.43]
        |--- age > 35.50
            |--- value: [7228.22]
    |--- bmi > 22.28
        |--- age <= 31.00
            |--- value: [4719.52]
        |--- age > 31.00
            |--- region_southeast <= 0.50
               |--- value: [27375.90]
            |--- region_southeast > 0.50
               |--- value: [17626.24]
           23.89
  -- bmi >
    |--- bmi <= 38.05
        |--- age <= 32.50
            |--- children <= 2.50
                |--- children <= 1.50
                    |--- truncated branch of depth 7
                |--- children > 1.50
                    |--- truncated branch of depth 5
            |--- children > 2.50
                |--- bmi <= 30.65
                    |--- truncated branch of depth 2
                |--- bmi > 30.65
                    |--- truncated branch of depth 5
                1
           - age > 32.50
            |--- bmi <= 28.43
                |--- children <= 2.50
                 |--- truncated branch of depth 6
                |--- children > 2.50
                    |--- value: [6746.74]
            |--- bmi > 28.43
                |--- age <= 34.50
                | |--- truncated branch of depth 6
                |--- age > 34.50
                    |--- truncated branch of depth 8
    |--- bmi >
        |---| bmi <= 38.24
           |--- value: [24915.05]
        |--- bmi > 38.24
```

```
|--- bmi <= 38.87
                          |--- age <= 30.50
                              |--- value: [18963.17]
                          |--- age > 30.50
                              |--- truncated branch of depth 2
                        -- bmi > 38.87
                          |--- age \leq 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</pre>
                          |--- 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 \leq 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 \leq 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
                 |--- age <= 37.50
                 | |--- value: [7281.51]
                 |--- age > 37.50
                     |--- value: [7151.09]
                 1
               -- 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
                 1
             |--- bmi > 30.85
                 |--- region_southwest <= 0.50
                   |--- value: [7682.67]
                 |--- region_southwest > 0.50
                 |--- truncated branch of depth 2
         |--- age > 40.50
             |---| bmi <= 31.63
                 |--- value: [8410.05]
             |--- bmi > 31.63
                 |--- bmi <= 33.78
                     |--- value: [8538.29]
                 |--- bmi > 33.78
                     |--- value: [8522.00]
- 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]
                                    1
                                |--- children > 0.50
                                    |--- age <= 40.50
                                        |--- truncated branch of depth 3
                                    |--- age > 40.50
                                    1
                                       |--- truncated branch of depth 4
                        |--- region_northwest > 0.50
                            |---| bmi <= 40.99
                                |--- age \leq 39.50
                                    |--- value: [6373.56]
                                |--- age > 39.50
                                    |--- age <= 41.50
                                      |--- value: [7265.70]
                                    |--- age > 41.50
                                        |--- value: [7443.64]
                                    1
                            |--- bmi > 40.99
                            1
                                |--- value: [28476.73]
                    |--- age > 42.50
                        |--- value: [19144.58]
              -- children > 3.50
                |--- age \leq 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]
                            1
                    |--- 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
                        Ι
                            |--- 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 \leq 22.85
                     |--- value: [9193.84]
                 |--- bmi > 22.85
                 I
                     |--- value: [9301.89]
       -- children > 4.00
         |--- region_southeast <= 0.50
             |--- value: [10096.97]
         |--- region_southeast > 0.50
             |--- value: [9788.87]
        27.57
- bmi >
    - region_southwest <= 0.50</pre>
     |--- 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 \leq 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]
```

```
|--- age > 45.50
             |--- children <= 1.50
                 |--- bmi <= 33.58
                     |--- bmi <= 33.39
                         |--- value: [8334.46]
                     |--- bmi > 33.39
                         |--- value: [8334.59]
                 |--- bmi > 33.58
                     |--- value: [8823.99]
             |--- children > 1.50
                 |--- value: [9411.00]
         bmi > 36.06
         |--- bmi <= 36.72
             |--- age <= 44.50
                 |--- value: [12797.21]
             |--- age > 44.50
                 |--- value: [8527.53]
         |--- bmi > 36.72
             |--- bmi <= 39.90
                 |--- bmi <= 38.84
                     |--- region_southeast <= 0.50
                       |--- value: [8023.14]
                     |--- region_southeast > 0.50
                         |--- value: [8347.16]
                 |--- bmi > 38.84
                     |--- bmi <= 39.66
                         |--- value: [6948.70]
                     |--- bmi > 39.66
                         |--- value: [7448.40]
             |--- bmi > 39.90
                 |--- sex_male <= 0.50
                     |--- age <= 45.50
                         |--- value: [9704.67]
                     |--- age > 45.50
                         |--- value: [9432.93]
                   -- 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
            |--- age <= 47.50
                |--- region_northwest <= 0.50
                 |--- region_southwest <= 0.50
                    | |--- value: [8627.54]
```

```
| |--- region_southwest > 0.50
             | |--- value: [8539.67]
           |--- region_northwest > 0.50
           |--- value: [8428.07]
       |--- age > 47.50
           |--- value: [8269.04]
       - age > 48.50
       |---| bmi \leq 22.56
           |---| bmi \leq 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]
           1
    |--- 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 \leq 27.41
                |--- age <= 48.50
                    |--- value: [9447.25]
                |--- age > 48.50
                    |--- children <= 0.50
                       |--- value: [25656.58]
                    |--- children > 0.50
                        |--- value: [26140.36]
                    1
               - 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
                            |---| bmi <= 36.52
                                |--- bmi <= 33.00
                                    |--- value: [9377.90]
                                |--- bmi > 33.00
                                    |--- value: [9386.16]
                            |--- bmi > 36.52
                                |---| bmi \leq 40.92
                                    |--- value: [9048.03]
                                |--- bmi > 40.92
                                |--- value: [9058.73]
                   - children > 2.50
                    |--- age <= 49.50
                        |--- value: [10977.21]
                    |--- age > 49.50
                        |--- value: [10702.64]
|--- 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 \leq 52.50
                                | |--- truncated branch of depth 2
                                |--- age > 52.50
                                1
                                    |--- truncated branch of depth 5
                            |--- region_southwest > 0.50
```

```
|--- age <= 53.50
                       |--- truncated branch of depth 2
                    |--- age > 53.50
                        |--- value: [10704.47]
                    55.50
            age >
            |--- 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
                    1
                        |--- value: [9748.91]
           |--- age > 52.50
                |--- sex_male <= 0.50
                    |--- age <= 53.50
                    |--- truncated branch of depth 2
                   |--- age > 53.50
```

```
1
                 |--- truncated branch of depth 3
          |--- sex_male > 0.50
              |--- bmi <= 40.53
                  |--- truncated branch of depth 5
              |--- bmi > 40.53
                  |--- value: [9504.31]
              --- age >
             54.50
      |--- region_southwest <= 0.50
          |---| bmi <= 32.39
              |--- value: [11763.00]
          |--- bmi > 32.39
              |--- children <= 0.50
                 |--- truncated branch of depth 4
              |--- children > 0.50
                  |--- truncated branch of depth 2
     |--- region_southwest > 0.50
          |--- age <= 55.50
              |--- sex_male <= 0.50
                 |--- value: [10713.64]
              |--- sex_male > 0.50
               |--- value: [20630.28]
            -- age > 55.50
              |---| bmi <= 39.95
                  |--- value: [10601.41]
              |--- bmi > 39.95
                  |--- value: [10602.39]
-- age > 56.50
  |---| bmi <= 39.14
     |---| bmi <= 35.28
          |---| bmi <= 33.03
              |--- age <= 57.50
                 |--- value: [11842.62]
              |--- age > 57.50
              |--- truncated branch of depth 2
          |--- bmi > 33.03
              |--- region_northwest <= 0.50
                 |--- truncated branch of depth 2
              |--- region_northwest > 0.50
              | |--- truncated branch of depth 2
       -- bmi > 35.28
          |--- bmi <= 37.04
              |--- bmi <= 35.89
                  |--- value: [11362.75]
              |--- bmi > 35.89
                  |--- value: [11363.28]
          |--- bmi > 37.04
              |--- value: [11365.95]
 |--- bmi >
             39.14
```

```
|--- 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</pre>
     |--- 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
             Ι
                     |--- value: [12643.38]
     |--- bmi >
                 36.29
```

```
|---| bmi <= 38.22
            |--- bmi <= 37.89
                |--- children <= 2.50
               | |--- value: [26467.10]
                |--- children > 2.50
                  |--- value: [30063.58]
            |--- bmi > 37.89
                |--- value: [20463.00]
           - bmi > 38.22
            |--- children <= 2.50
               |--- value: [11396.90]
            |--- children > 2.50
               |--- age <= 53.50
                | |--- value: [12592.53]
                |--- age > 53.50
               | |--- value: [12485.80]
|--- region_southwest > 0.50
    |--- age <= 53.50
        |--- children <= 2.50
           |--- sex_male <= 0.50
                |--- age <= 52.50
                    |--- value: [10806.84]
                |--- age > 52.50
                    |--- bmi <= 31.30
                    | |--- value: [11150.78]
                    |--- bmi > 31.30
                   | |--- value: [11163.57]
            |--- sex_male > 0.50
               |--- value: [10325.21]
        |--- children > 2.50
            |--- bmi <= 28.35
               |--- value: [11741.73]
            |--- bmi > 28.35
                |--- sex_male <= 0.50
                    |--- value: [11411.68]
                |--- sex_male > 0.50
                    |--- bmi <= 32.60
                       |--- value: [11253.42]
                    |--- bmi > 32.60
                    1
                       |--- value: [11264.54]
            1
       - age > 53.50
        |--- bmi <= 37.05
            |--- bmi <= 33.45
               |--- value: [12105.32]
            |--- bmi > 33.45
               |--- value: [12363.55]
       |--- bmi > 37.05
           |--- value: [12646.21]
```

```
|--- age > 58.50
    |--- children <= 3.50
        |--- children <= 0.50
            |---| bmi <= 26.03
                --- bmi <= 25.65
                    |--- region_southeast <= 0.50
                        |--- age \leq 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 \leq 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 >
                    |--- age <= 59.50
                        |--- region_southeast <= 0.50
                        | |--- value: [21797.00]
```

```
|--- region_southeast > 0.50
               |--- value: [12244.53]
        |--- age > 59.50
           |--- age <= 62.50
                |--- bmi <= 35.96
                    |--- truncated branch of depth 3
                |--- bmi > 35.96
                    |--- truncated branch of depth 6
              -- age > 62.50
                |--- age <= 63.50
                    |--- truncated branch of depth 5
                |--- age > 63.50
                    |--- truncated branch of depth 4
children > 0.50
|--- bmi <= 34.23
   |--- age <= 61.00
        |--- children <= 2.50
           |--- age <= 59.50
                |--- region_southwest <= 0.50
                | |--- truncated branch of depth 3
                |--- region_southwest > 0.50
                    |--- value: [12333.83]
                -- age > 59.50
                |--- region_northwest <= 0.50
                    |--- value: [13224.69]
                |--- region_northwest > 0.50
                    |--- value: [13112.60]
          -- children > 2.50
            |--- region_northwest <= 0.50
                |--- region_southeast <= 0.50
                   |--- value: [14007.22]
                |--- region_southeast > 0.50
                    |--- value: [14001.13]
              -- region_northwest > 0.50
                |--- value: [14382.71]
    --- age >
               61.00
          -- children <= 1.50
            |--- age <= 63.50
                |--- bmi <= 29.50
                    |--- truncated branch of depth 2
                |--- bmi > 29.50
                    |--- value: [27000.98]
            |--- age > 63.50
                |--- value: [30166.62]
            children > 1.50
            |--- sex_male <= 0.50
                |--- age <= 63.00
               | |--- truncated branch of depth 2
```

```
|--- age > 63.00
                                        | |--- truncated branch of depth 2
                                    |--- sex_male > 0.50
                                        |--- region_southwest <= 0.50
                                            |--- value: [15161.53]
                                        |--- region_southwest > 0.50
                                           |--- value: [14988.43]
                           - bmi > 34.23
                            |--- age <= 60.00
                                |--- value: [36910.61]
                            |--- age > 60.00
                                |---| bmi <= 37.10
                                    |--- sex_male <= 0.50
                                        |--- value: [14474.67]
                                    |--- sex_male > 0.50
                                        |--- value: [27941.29]
                                |--- bmi > 37.10
                                    |---| bmi <= 39.07
                                        |--- children <= 2.50
                                          |--- value: [15230.32]
                                        |--- \text{ children} > 2.50
                                            |--- value: [16085.13]
                                    |--- bmi > 39.07
                                        |--- bmi <= 39.48
                                           |--- truncated branch of depth 2
                                        |--- bmi > 39.48
                                        | |--- value: [15170.07]
                |--- children > 3.50
                    |--- value: [36580.28]
|--- smoker_yes > 0.50
    |--- bmi <= 30.01
        |--- age <= 41.00
            |--- age <= 19.50
                |--- bmi <= 23.44
                    |--- bmi <= 19.43
                        |--- value: [12829.46]
                    |--- bmi > 19.43
                        |--- bmi <= 21.61
                            |--- value: [13747.87]
                        |--- bmi > 21.61
                            |--- region_southwest <= 0.50
                            | |--- value: [14283.46]
                            |--- region_southwest > 0.50
                                |--- value: [13844.51]
                |--- bmi > 23.44
                    |--- sex_male <= 0.50
                        |--- region_southwest <= 0.50
                        | |--- region_southeast <= 0.50
```

```
|---| bmi \leq 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]
                1
                |--- region_northwest > 0.50
                   |--- value: [16450.89]
                |--- bmi > 28.39
             |--- value: [17352.68]
- age >
        19.50
|--- bmi <= 28.07
    |--- age \leq 29.50
        |--- region_southeast <= 0.50
             |--- region_southwest <= 0.50
                 |---| bmi <= 25.46
                     |--- age \leq 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]
```

```
|--- bmi > 24.59
        |--- age <= 28.00
            |--- age \leq 26.50
                |--- age <= 23.00
                    |--- value: [17085.27]
                |--- age > 23.00
                    |--- value: [17043.34]
            |--- age > 26.50
                |--- value: [16577.78]
        |--- age > 28.00
           |--- value: [19107.78]
        29.50
age >
|--- bmi <= 18.03
    |--- value: [32734.19]
|--- bmi > 18.03
    |--- bmi <= 24.84
        |--- children <= 1.50
            |--- bmi <= 19.55
                |--- value: [15820.70]
            |--- bmi > 19.55
                |---| bmi <= 24.70
                | |--- truncated branch of depth 2
                |--- bmi > 24.70
                    |--- value: [17904.53]
          -- children > 1.50
            |--- age <= 34.50
                |--- bmi <= 21.38
                    |--- value: [16776.30]
                |--- bmi > 21.38
                    |--- value: [18765.88]
            |--- age > 34.50
                |--- region_southwest <= 0.50
                    |--- value: [19444.27]
                |--- region_southwest > 0.50
                    |--- truncated branch of depth 2
               24.84
    |--- bmi >
           - region southwest <= 0.50
            |--- children <= 1.50
                |--- bmi <= 27.93
                    |--- truncated branch of depth 3
                |--- bmi > 27.93
                    |--- value: [20773.63]
            |--- children > 1.50
                |--- age <= 37.00
                    |--- value: [20984.09]
                |--- age > 37.00
                    |--- value: [21659.93]
        |--- region_southwest > 0.50
```

```
|--- age <= 32.00
                       | |--- value: [19199.94]
                        |--- age > 32.00
                          |--- value: [19040.88]
               28.07
       - bmi >
        |--- 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</pre>
                    |--- 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</pre>
                |--- 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
            |--- region_northwest <= 0.50
              |--- value: [21771.34]
            |--- region_northwest > 0.50
               |--- value: [21880.82]
           |--- age > 44.50
        |--- children <= 0.50
            |---| bmi \leq 23.33
               |--- value: [35069.37]
            |--- bmi > 23.33
                |--- age <= 56.00
                  |--- value: [21223.68]
               |--- age > 56.00
                   |--- value: [26926.51]
          -- children > 0.50
            |--- age <= 48.00
                |--- children <= 1.50
                   |--- age <= 46.50
                   | |--- value: [21677.28]
                   |--- age > 46.50
                       |--- value: [21978.68]
                   |--- 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_northwest <= 0.50
                            | |--- value: [23306.55]
                            |--- region_northwest > 0.50
                            | |--- truncated branch of depth 3
                        |--- region_southeast > 0.50
                       |--- value: [24667.42]
                    |--- \text{ children} > 2.50
                       |--- value: [25382.30]
|--- bmi > 25.95
   |---| bmi \leq 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
                |--- 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
                        1
                            |--- 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 \leq 29.39
                             |--- value: [27218.44]
                         |--- bmi > 29.39
                             |--- value: [27533.91]
                     |--- age > 59.00
                         |---| bmi \leq 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]
        30.01
- bmi >
|--- age <= 42.00
    |--- age \leq 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</pre>
                             |--- region_southeast <= 0.50
                             |--- value: [34254.05]
                             |--- region_southeast > 0.50
```

```
| | |--- value: [34303.17]
             |--- region_southwest > 0.50
                 |--- value: [34166.27]
         |--- age > 25.50
              |--- region_southeast <= 0.50
             | |--- value: [34838.87]
             |--- region southeast > 0.50
                 |--- value: [34806.47]
             1
             31.70
      bmi >
     |--- 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
                     1
                         |--- 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 \leq 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_northwest <= 0.50
             |--- value: [36149.48]
             |--- region_northwest > 0.50
                 |--- value: [36219.41]
             |--- age > 19.50
             |--- region_southeast <= 0.50
             | |--- bmi <= 36.15
```

```
|--- value: [37465.34]
                      |--- bmi > 36.15
                          |--- region_southwest <= 0.50
                          | |--- value: [38511.63]
                          |--- region southwest > 0.50
                              |--- value: [38344.57]
                    -- region southeast > 0.50
                      |--- bmi <= 38.89
                          |--- children <= 1.50
                          | |--- truncated branch of depth 2
                          |--- children > 1.50
                              |--- value: [37484.45]
                          |--- bmi > 38.89
                          |--- value: [38126.25]
          |--- bmi > 41.14
              |--- children <= 0.50
                  |--- sex_male <= 0.50
                     |--- value: [38792.69]
                  |--- sex_male > 0.50
                      |--- bmi <= 43.51
                      | |--- value: [39611.76]
                      |--- bmi > 43.51
                         I--- value: [39722.75]
              |--- children > 0.50
                 |--- value: [40904.20]
      |--- bmi > 48.73
          |--- value: [44501.40]
-- age > 27.50
  |--- bmi <= 35.15
      |---| bmi <= 30.49
          |--- value: [43943.88]
      |--- bmi > 30.49
          |--- children <= 1.50
              |--- region_southwest <= 0.50</pre>
                  |--- bmi <= 33.92
                      |--- bmi <= 31.35
                          |--- value: [37270.15]
                      |--- bmi > 31.35
                          |--- sex_male <= 0.50
                              |--- value: [37701.88]
                          |--- sex_male > 0.50
                              |--- value: [37607.53]
                  |--- bmi > 33.92
                      |---| bmi <= 34.32
                          |--- value: [39047.29]
                      |--- bmi > 34.32
                          |--- value: [37742.58]
              |--- region_southwest > 0.50
```

```
|--- 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]
                     40.14
          |--- bmi >
              |--- bmi <= 44.75
                  |--- value: [43753.34]
              |--- bmi > 44.75
                 |--- value: [46113.51]
```

```
|--- region_northwest > 0.50
 1 1
           | |--- 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
                               1
                                   |--- value: [43254.42]
                           |--- bmi > 34.16
```

```
|--- age <= 52.50
                  |--- value: [44641.20]
                |--- age > 52.50
        |--- truncated branch of depth 2
                1
            36.75
   - bmi >
    |--- 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]
            32.62
|--- bmi >
    |--- bmi <= 33.30
        |--- value: [52590.83]
    |--- bmi > 33.30
        |---| bmi <= 37.33
            |--- region_southeast <= 0.50
                |--- sex_male <= 0.50
                1
                    |--- truncated branch of depth 2
                |--- sex_male > 0.50
```

```
| |--- truncated branch of depth 2
                                   |--- region_southeast > 0.50
                                       |--- age <= 62.00
                                           |--- value: [46599.11]
                                       1
                                       |--- age > 62.00
                                       |--- truncated branch of depth 2
                               |--- bmi > 37.33
                                   |--- region_southwest <= 0.50
                                       |--- children <= 0.50
                                       | |--- value: [48673.56]
                                       |--- children > 0.50
                                           |--- truncated branch of depth 2
                                   |--- region_southwest > 0.50
                                       |--- age <= 61.50
                                           |--- value: [48173.36]
                                       |--- age > 61.50
                                       | |--- value: [48824.45]
            |--- bmi > 46.81
               |--- value: [63770.43]
Decision Tree 4 (Max Depth: 3, Criterion: friedman_mse):
|--- smoker_yes <= 0.50
    |--- age <= 43.50
        |--- age \leq 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]
        1
   - smoker_yes > 0.50
    |--- bmi <= 30.01
        |--- age <= 41.00
        | |--- value: [18540.38]
        |--- age > 41.00
        | |--- value: [25245.72]
    |--- bmi > 30.01
I
        |--- age <= 42.00
        | |--- value: [38230.01]
        |--- age > 42.00
        | |--- value: [45690.05]
```

Decision Tree 5 (Max Depth: 5, Criterion: friedman\_mse):

|--- 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 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</pre>
                            |--- bmi <= 23.15
                            1
                                |--- 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]
           28.26
bmi >
|--- 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]
```

```
|--- bmi > 30.63
             | |--- truncated branch of depth 4
       -- bmi > 33.83
         |---| bmi <= 39.15
             |---| bmi <= 38.22
                 |--- truncated branch of depth 5
             |--- bmi > 38.22
                 |--- truncated branch of depth 2
           -- bmi > 39.15
             |--- region_southeast <= 0.50
                 |--- truncated branch of depth 2
             |--- region_southeast > 0.50
                |--- truncated branch of depth 4
- age >
        18.50
 |--- bmi <= 33.20
     |---| bmi <= 33.05
         |--- region_southeast <= 0.50
             |--- region_southwest <= 0.50
                 |--- truncated branch of depth 7
             |--- region_southwest > 0.50
                 |--- truncated branch of depth 5
         |--- region_southeast > 0.50
             |--- sex_male <= 0.50
                 |--- truncated branch of depth 3
             |--- sex_male > 0.50
                 |--- value: [16586.50]
             1
     |--- bmi > 33.05
         |--- value: [23082.96]
 |--- bmi > 33.20
     |--- sex_male <= 0.50
         |--- children <= 0.50
             |--- region_northwest <= 0.50
                 |--- truncated branch of depth 4
             |--- region_northwest > 0.50
                 |--- truncated branch of depth 2
         |--- children > 0.50
             |--- value: [2730.11]
       -- sex_male > 0.50
         |--- age <= 20.50
             |--- region_southwest <= 0.50
               |--- value: [1391.53]
             |--- region_southwest > 0.50
                 |--- truncated branch of depth 3
         |--- age > 20.50
             |--- region_northwest <= 0.50
                 |--- 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 \leq 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 \leq 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</pre>
      |--- 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</pre>
                          |--- region_southwest <= 0.50
                              |--- truncated branch of depth 3
                          |--- region_southwest > 0.50
                          | |--- value: [2913.57]
```

```
|--- 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
                |--- children <= 3.50
                    |--- value: [4661.29]
                |--- children > 3.50
                    |--- value: [4504.66]
    |--- region_southwest > 0.50
        |--- children <= 4.00
            |--- sex_male <= 0.50
                |--- value: [4391.65]
            |--- sex_male > 0.50
                |--- bmi <= 25.25
                    |--- value: [3484.33]
                |--- bmi > 25.25
                   |--- value: [3906.13]
```

```
| | |--- children > 4.00
                   | |--- value: [5080.10]
               |--- region_northwest > 0.50
           |--- age <= 21.50
               |---| bmi \leq 25.51
                   |--- bmi <= 22.18
                   | |--- value: [2803.70]
                   |--- bmi > 22.18
                       |--- value: [3077.10]
                --- bmi > 25.51
                   |--- children <= 2.50
                       |--- age <= 20.00
                         |--- sex_male <= 0.50
                       | |--- value: [24059.68]
                           |--- sex_male > 0.50
                         | |--- value: [22493.66]
                       |--- age > 20.00
                          |--- value: [26018.95]
                       |--- children > 2.50
                       |--- value: [18838.70]
           |--- age > 21.50
               |---| bmi <= 24.94
                   |--- bmi <= 22.23
                   | |--- value: [4296.27]
                   |--- bmi > 22.23
                       |--- value: [14426.07]
               |--- bmi > 24.94
                   |--- children <= 2.50
                       |--- age <= 24.50
                         |--- value: [3537.70]
                       |--- age > 24.50
                       | |--- value: [4189.11]
                   |--- children > 2.50
                       |--- sex_male <= 0.50
                           |--- age <= 23.50
                          | |--- value: [4466.62]
                           |--- age > 23.50
                           | |--- value: [4618.08]
                       |--- sex_male > 0.50
                       | |--- value: [4877.98]
|--- age > 26.50
    |--- age <= 36.50
       |--- children <= 0.50
           |---| bmi <= 33.74
               |--- age <= 30.50
                   |--- 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]
             1
  --- 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
             1
     |--- age > 27.50
         |--- age <= 28.50
             |--- value: [3062.51]
         |--- age > 28.50
             |--- value: [2866.09]
     30.50
-- age >
 |--- 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]
             1
             |--- bmi > 25.50
```

```
| | |--- value: [4571.41]
                     33.50
          |--- age >
              |--- 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 \leq 29.50
     |--- region_southeast <= 0.50
         |---| bmi <= 24.31
             |--- children <= 2.50
                 |--- region_southwest <= 0.50
             1
                 | |--- region_northwest <= 0.50
```

```
|--- value: [4428.89]
                    |--- region_northwest > 0.50
                    | |--- truncated branch of depth 2
                |--- region_southwest > 0.50
                    |--- value: [3847.67]
              -- children > 2.50
                |--- region_southwest <= 0.50
                  |--- value: [5209.58]
                |--- region_southwest > 0.50
                    |--- value: [5615.37]
        |--- bmi > 24.31
            |--- bmi <= 24.46
                |--- value: [23288.93]
            |--- bmi > 24.46
                |---| bmi <= 34.07
                    |---| bmi <= 27.24
                    | |--- truncated branch of depth 4
                    |--- bmi > 27.24
                        |--- truncated branch of depth 9
                |--- bmi > 34.07
                    |--- age \leq 27.50
                        |--- truncated branch of depth 2
                    |--- age > 27.50
                        |--- value: [3277.16]
    |--- region_southeast > 0.50
         --- children <= 2.50
            |--- children <= 1.50
                |--- sex_male <= 0.50
                    |--- age \leq 27.50
                       |--- value: [3561.89]
                    |--- age > 27.50
                        |--- truncated branch of depth 2
                |--- sex_male > 0.50
                    |--- value: [3471.41]
              -- children > 1.50
                |--- bmi <= 31.90
                  |--- value: [4340.44]
                |--- bmi > 31.90
                    |--- value: [4058.12]
        |--- children > 2.50
            |--- age <= 28.50
                |--- value: [4449.46]
            |--- age > 28.50
                |--- value: [5138.26]
|--- age >
    l--- bmi <= 23.89
        |--- bmi <= 22.28
          |--- age <= 35.50
```

```
|--- children <= 2.00
                |--- bmi <= 22.04
                   |--- truncated branch of depth 3
                |--- bmi > 22.04
                    |--- value: [5354.07]
                1
            |--- children > 2.00
                |--- value: [5693.43]
        |--- age > 35.50
           |--- value: [7228.22]
   |--- bmi > 22.28
       |--- age <= 31.00
           |--- value: [4719.52]
       |--- age > 31.00
            |--- region_southeast <= 0.50
               |--- value: [27375.90]
           |--- region_southeast > 0.50
                |--- value: [17626.24]
|--- bmi >
           23.89
    |--- bmi <= 38.05
       |--- age <= 32.50
            |--- children <= 2.50
                |--- children <= 1.50
                | |--- truncated branch of depth 7
                |--- children > 1.50
                |--- truncated branch of depth 5
            |--- children > 2.50
                |--- bmi <= 30.65
                   |--- truncated branch of depth 2
                |--- bmi > 30.65
                    |--- truncated branch of depth 5
         -- age > 32.50
            |---| bmi \leq 28.43
                |--- children <= 2.50
                | |--- truncated branch of depth 6
                |--- children > 2.50
                    |--- value: [6746.74]
                -- bmi > 28.43
                |--- age <= 34.50
                  |--- truncated branch of depth 6
                |--- age > 34.50
                    |--- truncated branch of depth 8
                1
               38.05
   |--- bmi >
       |--- bmi <= 38.24
           |--- value: [24915.05]
          -- bmi > 38.24
           |--- bmi <= 38.87
               |--- age <= 30.50
               | |--- value: [18963.17]
```

```
|--- 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 \leq 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]
           35.68
|--- bmi >
       - 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 \leq 40.50
```

```
| |--- truncated branch of depth 3
                                |--- age > 40.50
                                    |--- truncated branch of depth 4
                    |--- region_northwest > 0.50
                        |---| bmi <= 40.99
                            |--- age \leq 39.50
                                |--- value: [6373.56]
                            |--- age > 39.50
                                |--- children <= 1.50
                                | |--- value: [7443.64]
                                |--- children > 1.50
                                |--- value: [7265.70]
                        |--- bmi > 40.99
                            |--- value: [28476.73]
                        1
                |--- age > 42.50
                    |--- value: [19144.58]
         --- children > 3.50
            |--- age <= 39.50
                |--- region_southwest <= 0.50</pre>
                    |--- region_northwest <= 0.50</pre>
                        |--- bmi <= 29.10
                        | |--- value: [8582.30]
                        |--- bmi > 29.10
                        | |--- value: [8596.83]
                    |--- region_northwest > 0.50
                        |--- value: [8965.80]
                |--- region_southwest > 0.50
                    |--- value: [7512.27]
            |--- age > 39.50
                |--- bmi <= 30.09
                    |--- region_southeast <= 0.50
                    | |--- value: [15828.82]
                    |--- region_southeast > 0.50
                    1
                       |--- 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]
                    |--- \text{ children} > 0.50
```

```
|--- age <= 45.00
            |--- region_northwest <= 0.50</pre>
                |--- 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]
    |--- \text{ children} > 4.00
        |--- region_southeast <= 0.50
           |--- value: [10096.97]
        |--- region_southeast > 0.50
            |--- value: [9788.87]
        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 \leq 29.07
                    |--- value: [28340.19]
                |--- bmi > 29.07
```

```
| | |--- value: [8413.46]
         |--- region_southeast > 0.50
             |---| bmi <= 31.24
                 |--- age <= 44.50
                     |--- value: [7731.43]
                 |--- age > 44.50
                     |--- age <= 45.50
                     | |--- truncated branch of depth 2
                     |--- age > 45.50
                         |--- value: [8232.64]
                     1
             |--- 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]
         31.90
-- bmi >
 |--- bmi <= 36.06
     |--- age <= 45.50
         |--- region_northwest <= 0.50
             |---| bmi \leq 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]
     |--- age > 45.50
         |--- bmi <= 32.82
            |--- value: [9411.00]
```

```
|--- bmi > 32.82
                  |---| bmi <= 33.58
                      |---| bmi <= 33.39
                         |--- value: [8334.46]
                      |--- bmi > 33.39
                          |--- value: [8334.59]
                  |--- bmi > 33.58
                      |--- value: [8823.99]
                  36.06
          bmi >
          |---| bmi \leq 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</pre>
                      |--- sex_male <= 0.50
                          |--- value: [8539.67]
                      |--- sex_male > 0.50
```

```
| | |--- value: [8627.54]
           |--- region_northwest > 0.50
               |--- value: [8428.07]
           |--- age > 48.50
        |--- bmi <= 22.56
           |---| bmi <= 22.47
               |--- age <= 50.00
               | |--- value: [9182.17]
                |--- age > 50.00
                | |--- value: [9361.33]
            |--- 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
           |--- region_southwest <= 0.50
           | |--- value: [30284.64]
           |--- region_southwest > 0.50
           1
               |--- value: [26236.58]
   |--- bmi > 25.38
        |--- bmi <= 27.09
           |--- sex_male <= 0.50
               |--- children <= 1.50
               | |--- value: [10106.13]
                |--- children > 1.50
                    |--- value: [9715.84]
               - sex_male > 0.50
                |--- children <= 0.50
                    |--- region_northwest <= 0.50
                    | |--- value: [8782.47]
                    |--- region_northwest > 0.50
                    | |--- value: [8827.21]
                |--- children > 0.50
                    |--- bmi <= 25.65
                       |--- value: [9225.26]
                    |--- bmi > 25.65
                       |--- value: [9282.48]
                   27.09
        |--- bmi >
           |---| bmi \leq 27.41
               |--- age <= 48.50
               | |--- value: [9447.25]
```

```
|--- age > 48.50
                     |--- bmi <= 27.23
                         |--- value: [26140.36]
                     |--- bmi > 27.23
                         |--- value: [25656.58]
                         27.41
                - bmi >
                 |--- 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
                     1
                         |--- 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]
        51.50
- age >
 |--- 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
                             1
                                 |--- truncated branch of depth 2
                             |--- age > 53.50
```

```
|--- value: [10704.47]
                    55.50
        --- age >
            |--- 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</pre>
                    |--- age <= 57.50
                        |--- truncated branch of depth 3
                    |--- age > 57.50
                        |--- truncated branch of depth 3
                  -- region_southwest > 0.50
                    |---| bmi \leq 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]
                    1
                    |--- region_southeast > 0.50
                        |--- value: [9140.95]
                |--- bmi > 37.05
                    |--- region_southeast <= 0.50
                        |--- value: [9634.54]
                    |--- region_southeast > 0.50
                    1
                        |--- value: [9748.91]
               - age > 52.50
                |--- sex_male <= 0.50
                    |--- bmi <= 32.97
                        |--- truncated branch of depth 3
                    |--- bmi > 32.97
                        |--- truncated branch of depth 2
                |--- sex_male > 0.50
                    |--- region_southeast <= 0.50
```

```
|--- truncated branch of depth 5
            |--- region_southeast > 0.50
                |--- value: [9504.31]
|--- age > 54.50
     |--- region southwest <= 0.50
         |---| bmi <= 32.39
            |--- value: [11763.00]
         |--- bmi > 32.39
            |--- children <= 0.50
                |--- truncated branch of depth 4
            |--- children > 0.50
                |--- truncated branch of depth 2
      -- region_southwest > 0.50
         |--- age <= 55.50
            |--- sex_male <= 0.50
               |--- value: [10713.64]
            |--- sex_male > 0.50
                |--- value: [20630.28]
         |--- age > 55.50
            |--- bmi <= 39.95
                |--- value: [10601.41]
            |--- bmi > 39.95
                |--- value: [10602.39]
- age >
       56.50
 |---| bmi <= 39.14
    |--- bmi <= 35.28
        |--- bmi <= 33.03
            |--- region_northwest <= 0.50
                |--- truncated branch of depth 2
            |--- region_northwest > 0.50
               |--- value: [11842.62]
         |--- bmi > 33.03
            |--- region_northwest <= 0.50
            | |--- truncated branch of depth 2
            |--- region_northwest > 0.50
                |--- truncated branch of depth 2
            1
       - bmi > 35.28
         |---| bmi <= 37.04
            |--- bmi <= 35.89
                |--- value: [11362.75]
            |--- bmi > 35.89
                |--- value: [11363.28]
         |--- bmi > 37.04
            |--- value: [11365.95]
|--- bmi > 39.14
    |--- 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</pre>
           |--- 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]
               36.29
     -- bmi >
       |--- bmi <= 38.22
           |--- bmi <= 37.89
           |--- children <= 2.50
```

```
| | |--- value: [26467.10]
                       |--- children > 2.50
                       | |--- value: [30063.58]
                   |--- bmi > 37.89
                       |--- value: [20463.00]
               |--- bmi > 38.22
                   |--- children <= 2.50
                       |--- value: [11396.90]
                   |--- children > 2.50
                       |--- age <= 53.50
                       | |--- value: [12592.53]
                       |--- age > 53.50
                          |--- value: [12485.80]
                       |--- region_southwest > 0.50
            |--- age <= 53.50
               |--- children <= 2.50
                   |--- sex_male <= 0.50
                       |--- age <= 52.50
                           |--- value: [10806.84]
                       |--- age > 52.50
                           |--- bmi <= 31.30
                           | |--- value: [11150.78]
                           |--- bmi > 31.30
                           | |--- value: [11163.57]
                   |--- sex_male > 0.50
                       |--- value: [10325.21]
                   1
               |--- children > 2.50
                   |--- bmi <= 28.35
                       |--- value: [11741.73]
                   |--- bmi > 28.35
                       |--- sex_male <= 0.50
                       | |--- value: [11411.68]
                       |--- sex_male > 0.50
                          |--- bmi <= 32.60
                           | |--- value: [11253.42]
                           |--- bmi > 32.60
                   1
                             |--- value: [11264.54]
                           |--- age > 53.50
               |---| bmi <= 37.05
                   |--- bmi <= 33.45
                   | |--- value: [12105.32]
                   |--- bmi > 33.45
                   1
                     |--- value: [12363.55]
               |--- bmi > 37.05
                   |--- value: [12646.21]
|--- 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
                |--- region_southeast <= 0.50
                    |--- truncated branch of depth 2
                |--- region_southeast > 0.50
                    |--- value: [11743.30]
          -- 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
                1
   |--- bmi > 31.40
       |--- age <= 59.50
           |--- region_southeast <= 0.50
           | |--- value: [21797.00]
           |--- region_southeast > 0.50
               |--- value: [12244.53]
       |--- age > 59.50
```

```
|--- age <= 62.50
               |--- bmi <= 35.96
                   |--- truncated branch of depth 3
               |--- bmi > 35.96
                   |--- truncated branch of depth 6
              -- age > 62.50
               |--- age \leq 63.50
                   |--- truncated branch of depth 5
               |--- age > 63.50
                   |--- truncated branch of depth 4
children > 0.50
--- bmi <= 34.23
   |--- age <= 61.00
       |--- children <= 2.50
           |--- age <= 59.50
               |--- region_southwest <= 0.50</pre>
                 |--- truncated branch of depth 3
               |--- region_southwest > 0.50
                   |--- value: [12333.83]
             -- age > 59.50
               |---| bmi <= 26.51
                   |--- value: [13112.60]
               |--- bmi > 26.51
                   |--- value: [13224.69]
         -- children > 2.50
           |---| bmi <= 27.21
               |--- value: [14382.71]
           |--- bmi > 27.21
               |--- region_southeast <= 0.50
                   |--- value: [14007.22]
               |--- region_southeast > 0.50
               |--- value: [14001.13]
    --- age >
               61.00
         -- children <= 1.50
           |--- age <= 63.50
               |---| bmi <= 29.50
                   |--- truncated branch of depth 2
               |--- bmi > 29.50
                   |--- value: [27000.98]
           |--- age > 63.50
               |--- value: [30166.62]
          - children > 1.50
           |--- sex_male <= 0.50
               |--- age <= 63.00
                   |--- truncated branch of depth 2
               |--- age > 63.00
                   |--- truncated branch of depth 2
           |--- sex_male > 0.50
```

```
|--- region_southwest <= 0.50
                                        | |--- value: [15161.53]
                                        |--- region_southwest > 0.50
                                | |--- value: [14988.43]
                                   34.23
                           - bmi >
                            |--- age <= 60.00
                                |--- value: [36910.61]
                            |--- age > 60.00
                                |--- bmi <= 37.10
                                    |--- sex_male <= 0.50
                                    | |--- value: [14474.67]
                                    |--- sex_male > 0.50
                                        |--- value: [27941.29]
                                |--- bmi > 37.10
                                    |---| bmi <= 39.07
                                        |--- children <= 2.50
                                        | |--- value: [15230.32]
                                        |--- children > 2.50
                                            |--- value: [16085.13]
                                    |--- bmi > 39.07
                                        |---| bmi <= 39.48
                                            |--- truncated branch of depth 2
                                        |--- bmi > 39.48
                                        | |--- value: [15170.07]
                |--- children > 3.50
                    |--- value: [36580.28]
|--- smoker_yes > 0.50
    |---| bmi <= 30.01
        |--- age <= 41.00
           |--- age <= 19.50
                |---| bmi <= 23.44
                    |--- bmi <= 19.43
                        |--- value: [12829.46]
                    |--- bmi > 19.43
                        |--- sex male <= 0.50
                            |--- region_southwest <= 0.50
                               |--- value: [14283.46]
                            |--- region_southwest > 0.50
                            | |--- value: [13844.51]
                        |--- sex_male > 0.50
                            |--- value: [13747.87]
                |--- bmi > 23.44
                    |--- sex_male <= 0.50
                        |--- region_southwest <= 0.50</pre>
                            |--- region_southeast <= 0.50
                                |--- bmi <= 28.59
                                    |--- value: [17468.98]
                                1
                                |--- 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 \leq 28.07
     |--- age <= 29.50
          |--- region_southeast <= 0.50
              |--- region_southwest <= 0.50
                  |---| bmi <= 25.46
                      |--- age <= 26.50
                          |--- bmi <= 19.52
                          | |--- value: [14455.64]
                          |--- bmi > 19.52
                              |--- truncated branch of depth 2
                      |--- 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]
                  |--- \text{ children} > 1.50
                     |--- value: [17663.14]
              |--- bmi > 24.59
                  |--- age <= 28.00
                  |--- bmi <= 25.80
```

```
|--- value: [16577.78]
            |--- bmi > 25.80
                |--- age <= 23.00
                   |--- value: [17085.27]
                |--- age > 23.00
                    |--- value: [17043.34]
                |--- age > 28.00
           |--- value: [19107.78]
       age >
       29.50
|--- bmi <= 18.03
   |--- value: [32734.19]
|--- bmi > 18.03
   |--- bmi <= 24.84
       |--- children <= 1.50
            |--- bmi <= 19.55
               |--- value: [15820.70]
            |--- bmi > 19.55
                |--- bmi <= 24.70
                   |--- truncated branch of depth 2
                |--- bmi > 24.70
                    |--- value: [17904.53]
          - children > 1.50
            |--- age <= 34.50
                |--- bmi <= 21.38
                | |--- value: [16776.30]
                |--- bmi > 21.38
                   |--- value: [18765.88]
            |--- age > 34.50
                |--- age <= 39.50
                   |--- truncated branch of depth 2
                |--- age > 39.50
                  |--- value: [19444.27]
    --- bmi >
               24.84
           - region_southwest <= 0.50
            |--- children <= 1.50
                |---| bmi \leq 27.93
                   |--- truncated branch of depth 3
                |--- bmi > 27.93
                    |--- value: [20773.63]
            |--- children > 1.50
                |--- age <= 37.00
                    |--- value: [20984.09]
                |--- age > 37.00
                    |--- value: [21659.93]
         -- region_southwest > 0.50
            |--- age <= 32.00
               |--- value: [19199.94]
           |--- age > 32.00
```

```
| | | | |--- value: [19040.88]
                28.07
     --- bmi >
         |--- 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]
                  1
              |--- 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]
         25.95
-- bmi >
  |---| 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]
        56.50
- age >
  --- children <= 2.00
     |--- age <= 59.00
         |--- bmi <= 29.39
         1
             |--- 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
                    -- children > 2.00
                      |--- age <= 60.00
                          |--- value: [30184.94]
                      |--- age > 60.00
                        |--- value: [30942.19]
         30.01
-- bmi >
 |--- 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]
            31.70
    - bmi >
     |--- 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 \leq 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
```

```
|--- value: [38344.57]
                            |--- age > 21.50
                                |--- value: [38511.63]
                    |--- region_southeast > 0.50
                        |--- bmi <= 38.89
                            |--- children <= 1.50
                            | |--- truncated branch of depth 2
                            |--- \text{ children} > 1.50
                                |--- value: [37484.45]
                            |--- bmi > 38.89
                            |--- value: [38126.25]
            |--- bmi > 41.14
                |--- children <= 0.50
                    |--- sex_male <= 0.50
                       |--- value: [38792.69]
                    |--- sex_male > 0.50
                        |--- bmi <= 43.51
                        | |--- value: [39611.76]
                        |--- bmi > 43.51
                           |--- value: [39722.75]
                        1
                |--- children > 0.50
                    |--- value: [40904.20]
        |--- bmi > 48.73
            |--- value: [44501.40]
|--- age > 27.50
    |--- bmi <= 35.15
        |---| bmi <= 30.49
            |--- value: [43943.88]
        |--- bmi > 30.49
            |--- children <= 1.50
                |--- region_southwest <= 0.50</pre>
                    |--- bmi <= 33.92
                        |--- age <= 35.50
                            |--- age <= 33.00
                            | |--- value: [37607.53]
                            |--- age > 33.00
                            | |--- value: [37701.88]
                        |--- age > 35.50
                            |--- value: [37270.15]
                      -- bmi > 33.92
                        |--- bmi <= 34.32
                            |--- value: [39047.29]
                        |--- bmi > 34.32
                            |--- value: [37742.58]
                |--- region_southwest > 0.50
                    |--- 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
                        |--- region southwest <= 0.50
                            |--- value: [39983.43]
                        |--- region_southwest > 0.50
                            |--- value: [38415.47]
                    |--- age > 36.50
                        |---| bmi <= 31.78
                            |--- value: [39597.41]
                        |--- bmi > 31.78
                            |--- sex_male <= 0.50
                                |--- region_northwest <= 0.50
                                | |--- value: [39836.52]
                                |--- region_northwest > 0.50
                                |--- value: [40003.33]
                            |--- 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]
                                1
                                |--- children > 1.00
                                    |--- truncated branch of depth 2
                            |--- age > 33.00
                                |--- children <= 2.00
                                    |--- truncated branch of depth 4
                                |--- children > 2.00
                                1
                                    |--- 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]
       56.50
age >
|--- 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]
           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
                    |--- truncated branch of depth 2
           |--- region_southeast > 0.50
               |--- age <= 62.00
```

```
|--- 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
I
                                         |--- age > 59.50
                                             |--- value: [48673.56]
                        46.81
            |--- bmi >
                |--- value: [63770.43]
```

## []: result\_table

```
[]:
        Max Depth
                       Criterion
                                           MSE
                                                         MAE R-squared
              3.0
                                                               0.860782
     0
                   squared_error
                                  2.078248e+07
                                                 2690.276900
     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
                                                 2690.276900
                                  2.078248e+07
                                                               0.860782
     4
              5.0
                    friedman_mse 2.119546e+07
                                                2491.107164
                                                               0.858016
     5
              {\tt NaN}
                    friedman_mse 3.974123e+07
                                                2905.321888
                                                               0.733782
```

## []: \*\*Conclusion\*\*