In [1]:
```python
import pandas as pd
import numpy as np
```

In [2]:
```python
# Load the dataset
df = pd.read_csv('climate_change_impact_on_agriculture_2024.csv')
```

In [3]:
```python
df.head()
```

Out[3]:

	Year	Country	Region	Crop_Type	Average_Temperature_C	Total_Precipitation_mm	CO2_Emissi
0	2001	India	West Bengal	Corn	1.55	447.06	
1	2024	China	North	Corn	3.23	2913.57	
2	2001	France	Ile-de-France	Wheat	21.11	1301.74	
3	2001	Canada	Prairies	Coffee	27.85	1154.36	
4	1998	India	Tamil Nadu	Sugarcane	2.19	1627.48	

In [4]:
```python
df.shape
```

Out[4]:
```
(10000, 15)
```

In [5]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 15 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   Year                         10000 non-null  int64
 1   Country                      10000 non-null  object
 2   Region                       10000 non-null  object
 3   Crop_Type                    10000 non-null  object
 4   Average_Temperature_C        10000 non-null  float64
 5   Total_Precipitation_mm       10000 non-null  float64
 6   CO2_Emissions_MT             10000 non-null  float64
 7   Crop_Yield_MT_per_HA         10000 non-null  float64
 8   Extreme_Weather_Events       10000 non-null  int64
 9   Irrigation_Access_%          10000 non-null  float64
 10  Pesticide_Use_KG_per_HA      10000 non-null  float64
 11  Fertilizer_Use_KG_per_HA     10000 non-null  float64
 12  Soil_Health_Index            10000 non-null  float64
 13  Adaptation_Strategies        10000 non-null  object
 14  Economic_Impact_Million_USD  10000 non-null  float64
dtypes: float64(9), int64(2), object(4)
memory usage: 1.1+ MB
```

In [6]:
```python
# Check for missing values
print("Missing Values:")
print(df.isnull().sum())
```

```
Missing Values:
Year                           0
Country                        0
Region                         0
```

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```
Crop_Type                       0
Average_Temperature_C           0
Total_Precipitation_mm          0
CO2_Emissions_MT                0
Crop_Yield_MT_per_HA            0
Extreme_Weather_Events          0
Irrigation_Access_%             0
Pesticide_Use_KG_per_HA         0
Fertilizer_Use_KG_per_HA        0
Soil_Health_Index               0
Adaptation_Strategies           0
Economic_Impact_Million_USD     0
dtype: int64
```

In [7]:
```
df.describe()
```

Out[7]:

	Year	Average_Temperature_C	Total_Precipitation_mm	CO2_Emissions_MT	Crop_Yie
count	10000.000000	10000.000000	10000.000000	10000.000000	
mean	2007.088700	15.241299	1611.663834	15.246608	
std	10.084245	11.466955	805.016815	8.589423	
min	1990.000000	-4.990000	200.150000	0.500000	
25%	1999.000000	5.430000	925.697500	7.760000	
50%	2007.000000	15.175000	1611.160000	15.200000	
75%	2016.000000	25.340000	2306.997500	22.820000	
max	2024.000000	35.000000	2999.670000	30.000000	

In [11]:
```
df.sort_values(by="Soil_Health_Index", ascending=False).head()
```

Out[11]:

	Year	Country	Region	Crop_Type	Average_Temperature_C	Total_Precipitation_mm	CO2_
7372	2015	France	Provence-Alpes-Cote d'Azur	Wheat	21.65	960.78	
7033	1992	China	Central	Barley	25.53	1902.94	
3473	2015	Argentina	Patagonia	Soybeans	5.92	923.08	
9141	2008	Russia	Volga	Barley	20.09	421.42	
9028	2008	China	East	Coffee	32.88	642.15	

In [12]:
```
# Handle missing values (imputation or dropping)
# For this example, we'll use mean imputation for numerical columns and mode f
numerical_columns = df.select_dtypes(include=[np.number]).columns
categorical_columns = df.select_dtypes(include=[object]).columns

# Impute missing values in numerical columns with the mean
for col in numerical_columns:
    df[col].fillna(df[col].mean(), inplace=True)
# Impute missing values in categorical columns with the mode
for col in categorical_columns:
```

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```
    df[col].fillna(df[col].mode()[0], inplace=True)
```

In [13]:
```
# Check for duplicates
print("Duplicates:", df.duplicated().sum())
```

```
Duplicates: 0
```

In [14]:
```
# Drop duplicates if any
df.drop_duplicates(inplace=True)
```

In [15]:
```
# Descriptive statistics
print("Descriptive Statistics:")
print(df.describe())
```

```
Descriptive Statistics:
               Year  Average_Temperature_C  Total_Precipitation_mm  \
count  10000.000000           10000.000000            10000.000000
mean    2007.088700              15.241299             1611.663834
std       10.084245              11.466955              805.016815
min     1990.000000              -4.990000              200.150000
25%     1999.000000               5.430000              925.697500
50%     2007.000000              15.175000             1611.160000
75%     2016.000000              25.340000             2306.997500
max     2024.000000              35.000000             2999.670000

       CO2_Emissions_MT  Crop_Yield_MT_per_HA  Extreme_Weather_Events  \
count      10000.000000          10000.000000            10000.000000
mean          15.246608              2.240017                4.980900
std            8.589423              0.998342                3.165808
min            0.500000              0.450000                0.000000
25%            7.760000              1.449000                2.000000
50%           15.200000              2.170000                5.000000
75%           22.820000              2.930000                8.000000
max           30.000000              5.000000               10.000000

       Irrigation_Access_%  Pesticide_Use_KG_per_HA  Fertilizer_Use_KG_per_HA
\
count         10000.000000             10000.000000              10000.000000
mean             55.248332                24.955735                 49.973708
std              25.988305                14.490962                 28.711027
min              10.010000                 0.000000                  0.010000
25%              32.677500                12.527500                 25.390000
50%              55.175000                24.930000                 49.635000
75%              77.582500                37.470000                 74.825000
max              99.990000                49.990000                 99.990000

       Soil_Health_Index  Economic_Impact_Million_USD
count       10000.000000                 10000.000000
mean           64.901278                   674.269658
std            20.195882                   414.591431
min            30.000000                    47.840000
25%            47.235000                   350.545000
50%            64.650000                   583.920000
75%            82.472500                   917.505000
max           100.000000                  2346.470000
```

In [16]:
```
# Calculate correlation for numeric columns only
df.corr(numeric_only=True)
```

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Out[16]:

	Year	Average_Temperature_C	Total_Precipitation_mm	CO2_Emi
Year	1.000000	-0.004583	0.006551	
Average_Temperature_C	-0.004583	1.000000	0.007213	
Total_Precipitation_mm	0.006551	0.007213	1.000000	
CO2_Emissions_MT	-0.005461	-0.003052	-0.008681	
Crop_Yield_MT_per_HA	0.010734	0.263781	0.029728	
Extreme_Weather_Events	-0.002726	-0.016808	0.004360	
Irrigation_Access_%	0.000938	-0.013268	-0.007580	
Pesticide_Use_KG_per_HA	-0.004332	0.005764	0.011198	
Fertilizer_Use_KG_per_HA	0.013132	-0.014725	-0.026356	
Soil_Health_Index	-0.006294	-0.010841	-0.021621	
Economic_Impact_Million_USD	0.012419	0.195827	0.020966	

In [17]:

```
# Choose a column to check for outliers
column = 'Crop_Yield_MT_per_HA'
```

In [18]:

```
#Z-Score Method
from scipy.stats import zscore

df['z_score'] = zscore(df[column])
outliers_z = df[np.abs(df['z_score']) > 3]
print(f"Outliers based on Z-Score:\\n{outliers_z}")
```

```
Outliers based on Z-Score:\nEmpty DataFrame
Columns: [Year, Country, Region, Crop_Type, Average_Temperature_C, Total_Preci
pitation_mm, CO2_Emissions_MT, Crop_Yield_MT_per_HA, Extreme_Weather_Events, I
rrigation_Access_%, Pesticide_Use_KG_per_HA, Fertilizer_Use_KG_per_HA, Soil_He
alth_Index, Adaptation_Strategies, Economic_Impact_Million_USD, z_score]
Index: []
```

In [19]:

```
# 2. IQR Method
Q1 = df[column].quantile(0.25)
Q3 = df[column].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR

outliers_iqr = df[(df[column] < lower_bound) | (df[column] > upper_bound)]
print(f"Outliers based on IQR:\\n{outliers_iqr}")
```

```
Outliers based on IQR:\nEmpty DataFrame
Columns: [Year, Country, Region, Crop_Type, Average_Temperature_C, Total_Preci
pitation_mm, CO2_Emissions_MT, Crop_Yield_MT_per_HA, Extreme_Weather_Events, I
rrigation_Access_%, Pesticide_Use_KG_per_HA, Fertilizer_Use_KG_per_HA, Soil_He
alth_Index, Adaptation_Strategies, Economic_Impact_Million_USD, z_score]
Index: []
```

In [20]:

```
import matplotlib.pyplot as plt
import seaborn as sns
# 3. Visualization - Boxplot
plt.figure(figsize=(10, 5))
sns.boxplot(df[column])
```

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```
plt.title(f"Boxplot of {column}")
plt.show()
```

In [21]:

```
# Choose a column to check for outliers
column = 'Average_Temperature_C'
#Z-Score Method
from scipy.stats import zscore

df['z_score'] = zscore(df[column])
outliers_z = df[np.abs(df['z_score']) > 3]
print(f"Outliers based on Z-Score:\\n{outliers_z}")
# 2. IQR Method
Q1 = df[column].quantile(0.25)
Q3 = df[column].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR

outliers_iqr = df[(df[column] < lower_bound) | (df[column] > upper_bound)]
print(f"Outliers based on IQR:\\n{outliers_iqr}")
import matplotlib.pyplot as plt
import seaborn as sns
# 3. Visualization - Boxplot
plt.figure(figsize=(10, 5))
sns.boxplot(df[column])
plt.title(f"Boxplot of {column}")
plt.show()
```

```
Outliers based on Z-Score:\nEmpty DataFrame
Columns: [Year, Country, Region, Crop_Type, Average_Temperature_C, Total_Preci
pitation_mm, CO2_Emissions_MT, Crop_Yield_MT_per_HA, Extreme_Weather_Events, I
rrigation_Access_%, Pesticide_Use_KG_per_HA, Fertilizer_Use_KG_per_HA, Soil_He
alth_Index, Adaptation_Strategies, Economic_Impact_Million_USD, z_score]
Index: []
Outliers based on IQR:\nEmpty DataFrame
Columns: [Year, Country, Region, Crop_Type, Average_Temperature_C, Total_Preci
pitation_mm, CO2_Emissions_MT, Crop_Yield_MT_per_HA, Extreme_Weather_Events, I
rrigation_Access_%, Pesticide_Use_KG_per_HA, Fertilizer_Use_KG_per_HA, Soil_He
alth_Index, Adaptation_Strategies, Economic_Impact_Million_USD, z_score]
Index: []
```

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In [ ]:

In [22]:
```
# Correlation matrix
import seaborn as sns
import matplotlib.pyplot as plt
plt.figure(figsize=(12, 8))
sns.heatmap(df.corr(numeric_only=True), annot=True, cmap='coolwarm')
plt.title('Correlation Matrix')
plt.show()
```

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In [23]:
```
# Distribution of numerical features
df[numerical_columns].hist(bins=15, figsize=(15, 10))
plt.suptitle("Distribution of Numerical Features")
plt.show()
```

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In [24]:
```
# Count plots for categorical variables
for col in categorical_columns:
    plt.figure(figsize=(10, 6))
    sns.countplot(data=df, x=col)
    plt.title(f'Count Plot for {col}')
    plt.xticks(rotation=45)
    plt.show()
```

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In [25]:
```
# Box plots for outlier detection in numerical columns
plt.figure(figsize=(15, 10))
df[numerical_columns].boxplot()
plt.title("Boxplot of Numerical Features")
```

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```
plt.xticks(rotation=45)
plt.show()
```

In [28]:

```
# Pair plot to see pairwise relationships
sns.pairplot(df[numerical_columns])
plt.title("Pairwise Relationships")
plt.show()
```

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In [23]:

```
import matplotlib.pyplot as plt
import seaborn as sns
# Select only numeric columns for correlation analysis
numeric_df = df.select_dtypes(include=[np.number])
correlation_matrix = numeric_df.corr()

# Plot the correlation heatmap
plt.figure(figsize=(12, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', linewidths=0.5)
plt.title('Correlation Heatmap')
plt.show()
```

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In [24]:

```
# Plotting Average Temperature over the Years
plt.figure(figsize=(14, 6))
sns.lineplot(data=df, x='Year', y='Average_Temperature_C', hue='Region')
plt.title('Average Temperature Over the Years by Region')
plt.show()
```

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

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In [31]:
```
# Plotting Crop Yield over the Years
plt.figure(figsize=(14, 6))
sns.lineplot(data=df, x='Year', y='Crop_Yield_MT_per_HA', hue='Region')
plt.title('Crop Yield Over the Years by Region')
plt.show()
```

In [32]:
```
#Count plot for Country, Crop_Type and Adaptation_Strategies
cols = ['Country','Crop_Type','Adaptation_Strategies']
```

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```
for col in cols:
    sns.countplot(y=col,data=df)
    plt.show()
```

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In [33]:
```
#Distribution of numerical columns
for col in df:
    if df[col].dtype != 'O':
        sns.histplot(df[col],kde=True)
        plt.show()
```

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In [34]:
```
#Crop type distribution in each country
crossstab = pd.crosstab(df['Country'], df['Crop_Type'])
for country in crossstab.index:
    plt.figure(figsize=(6, 6))
    country_data = crossstab.loc[country]

    plt.pie(country_data, labels=country_data.index, autopct='%1.1f%%', starta
    plt.title(f'Crop Type Distribution in {country}',fontweight="bold")
    plt.show()
```

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In [35]:
```
#Average Temperature distribution for each crop type
sns.boxplot(x='Crop_Type',y='Average_Temperature_C',data=df)
plt.xticks(rotation=45)
plt.show()
```

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In [36]:
```
#Soil Health Index for each crop type
sns.boxplot(x='Crop_Type',y='Soil_Health_Index',data=df)
plt.xticks(rotation=45)
plt.show()
```

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In [37]:
```
#CO2 Emissions for each Country
sns.boxplot(x='Country',y='CO2_Emissions_MT',data=df)
plt.xticks(rotation=45)
plt.show()
```

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In [38]:
```
#Average Economic Impact by Adaptation Strategy
sns.barplot(x='Adaptation_Strategies', y='Economic_Impact_Million_USD', data=d
plt.xticks(rotation=45)
plt.show()
```

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In [28]:
```
#Adaptation Strategies vs. Crop Types (Summed Economic Impact)
pivot_table = df.pivot_table(index='Adaptation_Strategies',
                             columns='Crop_Type',
                             values='Economic_Impact_Million_USD',
                             aggfunc='mean')
pivot_table
```

Out[28]:

Crop_Type Adaptation_Strategies	Barley	Coffee	Corn	Cotton	Fruits	Rice	Sc
Crop Rotation	684.720936	768.995746	680.317097	649.594040	734.814569	698.800464	662
Drought-resistant Crops	682.005243	667.372882	697.058039	654.078455	713.030000	690.908660	694
No Adaptation	675.337771	674.580955	649.697422	646.988578	679.191168	652.787964	697
Organic Farming	705.037158	633.793942	654.411437	684.067604	625.317231	636.457310	629
Water Management	677.048241	677.363990	651.029208	619.309192	677.095058	689.214179	629

In [25]:
```
#Adaptation Strategies vs. Crop Types (Summed Economic Impact)
pivot_table = df.pivot_table(index='Adaptation_Strategies',
                             columns='Crop_Type',
                             values='Economic_Impact_Million_USD',
                             aggfunc='mean')
```

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```
plt.figure(figsize=(10, 6))
sns.heatmap(pivot_table, annot=True, cmap='Blues', fmt='.2f')
plt.title('Economic Impact by Adaptation Strategies and Crop Types')
plt.show()
```

In [40]:

```
#Adaption strategies distribution in each country
crossstab_ad = pd.crosstab(df['Country'], df['Adaptation_Strategies'])
for country in crossstab_ad.index:
    plt.figure(figsize=(6, 6))
    country_data = crossstab_ad.loc[country]

    plt.pie(country_data, labels=country_data.index, autopct='%1.1f%%', starta
    plt.title(f'Adaption Strategies Distribution in {country}',fontweight="bol
    plt.show()
```

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In [14]:
```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error, r2_score
```

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```
from sklearn.preprocessing import StandardScaler
import matplotlib.pyplot as pltimport
```

In [16]:
```
df["Crop_Type"].unique()
```

Out[16]:
```
array(['Corn', 'Wheat', 'Coffee', 'Sugarcane', 'Fruits', 'Rice', 'Barley',
       'Vegetables', 'Soybeans', 'Cotton'], dtype=object)
```

In [17]:
```
Corn_data = df[df['Crop_Type'] == 'Corn']
```

In [18]:
```
annual_avg_yield = Corn_data.groupby('Adaptation_Strategies')['Crop_Yield_MT_p


sns.scatterplot(x='Crop_Yield_MT_per_HA', y='Adaptation_Strategies', data=annu


plt.title('Average Crop Yield per Hectare by Adaptation_Strategies')
plt.xlabel('Adaptation_Strategies')
plt.ylabel('Average Crop Yield (MT/HA)')


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

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[18], line 4
      1 annual_avg_yield = Corn_data.groupby('Adaptation_Strategies')['Crop_Yi
eld_MT_per_HA'].mean().reset_index()
----> 4 sns.scatterplot(x='Crop_Yield_MT_per_HA', y='Adaptation_Strategies', d
ata=annual_avg_yield)
      7 plt.title('Average Crop Yield per Hectare by Adaptation_Strategies')
      8 plt.xlabel('Adaptation_Strategies')

NameError: name 'sns' is not defined
```

In [19]:
```
# Visualize a Histogram of Average Temperature
sns.histplot(df['Average_Temperature_C'], kde=True)
plt.title('Distribution of Average Temperature')
plt.xlabel('Average Temperature (°C)')
plt.show()
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[19], line 2
      1 # Visualize a Histogram of Average Temperature
----> 2 sns.histplot(df['Average_Temperature_C'], kde=True)
      3 plt.title('Distribution of Average Temperature')
      4 plt.xlabel('Average Temperature (°C)')

NameError: name 'sns' is not defined
```

In [20]:
```
# View the index number and label for each column
for x, y in enumerate(df.columns):
    print(x, y)
```

```
0 Year
1 Country
2 Region
3 Crop_Type
4 Average_Temperature_C
```

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```
5 Total_Precipitation_mm
6 CO2_Emissions_MT
7 Crop_Yield_MT_per_HA
8 Extreme_Weather_Events
9 Irrigation_Access_%
10 Pesticide_Use_KG_per_HA
11 Fertilizer_Use_KG_per_HA
12 Soil_Health_Index
13 Adaptation_Strategies
14 Economic_Impact_Million_USD
```

In [ ]:

In [ ]:

In [21]:
```
# Correct way to select multiple columns in pandas
X = df[['Average_Temperature_C', 'Total_Precipitation_mm', 'CO2_Emissions_MT',
y = df['Crop_Yield_MT_per_HA']
```

In [22]:
```
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size = 0.30,random_s
```

In [25]:
```
X_train.shape,X_test.shape
```

Out[25]:
```
((7000, 7), (3000, 7))
```

In [26]:
```
y_train.shape,y_test.shape
```

Out[26]:
```
((7000,), (3000,))
```

In [29]:
```
# Split data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, rando

# Initialize and train the regression model
from sklearn.preprocessing import StandardScaler # Import the StandardScaler c

# Reshape the data into a 2D array if it's a single column
X = x.reshape(-1, 1)
# Apply StandardScaler
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)

print(X_scaled)


model = RandomForestRegressor(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[29], line 8
      5 from sklearn.preprocessing import StandardScaler # Import the Standard
Scaler class from sklearn.preprocessing
      7 # Reshape the data into a 2D array if it's a single column
----> 8 X = x.reshape(-1, 1)
      9 # Apply StandardScaler
     10 scaler = StandardScaler()

AttributeError: 'int' object has no attribute 'reshape'
```

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In [35]:
```
# Make predictions
y_pred = model.predict(X_test)

# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

print(f"Mean Squared Error: {mse}")
print(f"R2 Score: {r2}")
```

```
Mean Squared Error: 0.7438114143221499
R2 Score: 0.2952807163245461
```

In [36]:
```
from sklearn.ensemble import RandomForestRegressor, GradientBoostingRegressor
from sklearn.metrics import mean_squared_error, r2_score
```

In [37]:
```
# Initialize and train the Random Forest model
rf_model = RandomForestRegressor(n_estimators=100, random_state=42)
rf_model.fit(X_train, y_train)
```

Out[37]:
```
▾ RandomForestRegressor
RandomForestRegressor(random_state=42)
```

In [38]:
```
# Initialize and train the Gradient Boosting model
gb_model = GradientBoostingRegressor(n_estimators=100, learning_rate=0.1, rand
gb_model.fit(X_train, y_train)
```

Out[38]:
```
▾ GradientBoostingRegressor
GradientBoostingRegressor(random_state=42)
```

In [39]:
```
# Combine predictions using weighted averaging
rf_pred = rf_model.predict(X_test)
gb_pred = gb_model.predict(X_test)
```

In [40]:
```
# Hybrid model: weighted average of predictions
hybrid_pred = 0.6 * rf_pred + 0.4 * gb_pred
```

In [41]:
```
# Evaluate the hybrid model
mse = mean_squared_error(y_test, hybrid_pred)
r2 = r2_score(y_test, hybrid_pred)
```

In [42]:
```
print(f"Hybrid Model Mean Squared Error: {mse}")
print(f"Hybrid Model R2 Score: {r2}")
```

```
Hybrid Model Mean Squared Error: 0.7246677119141384
Hybrid Model R2 Score: 0.31341829258124354
```

In [43]:
```
# Initialize and train the Linear Regression model
lr_model = LinearRegression()
lr_model.fit(X_train, y_train)

# Combine predictions using stacking
rf_pred = rf_model.predict(X_test)
lr_pred = lr_model.predict(X_test)
```

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```
# Hybrid model: stacking approach (feed predictions as features into a meta-mo
stacking_features = np.column_stack((rf_pred, lr_pred))
meta_model = LinearRegression()
meta_model.fit(stacking_features, y_test)

# Make final predictions using the meta-model
final_pred = meta_model.predict(stacking_features)

# Evaluate the hybrid model
mse = mean_squared_error(y_test, final_pred)
r2 = r2_score(y_test, final_pred)

print(f"Hybrid Model (Stacking) Mean Squared Error: {mse}")
print(f"Hybrid Model (Stacking) R2 Score: {r2}")
```

```
Hybrid Model (Stacking) Mean Squared Error: 0.7422506397975319
Hybrid Model (Stacking) R2 Score: 0.29675946199016634
```

In [54]:

```
from sklearn.pipeline import Pipeline
# Split data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, rando

# Create pipelines for models with scaling
rf_pipeline = Pipeline([
    ('scaler', StandardScaler()),  # StandardScaler for Random Forest
    ('rf', RandomForestRegressor(n_estimators=100, random_state=42))
])

gb_pipeline = Pipeline([
    ('scaler', MinMaxScaler()),  # MinMaxScaler for Gradient Boosting
    ('gb', GradientBoostingRegressor(n_estimators=100, learning_rate=0.1, rand
])

# Train the pipelines
rf_pipeline.fit(X_train, y_train)
gb_pipeline.fit(X_train, y_train)

# Combine predictions using weighted averaging
rf_pred = rf_pipeline.predict(X_test)
gb_pred = gb_pipeline.predict(X_test)

# Hybrid model: weighted average of predictions
hybrid_pred = 0.5 * rf_pred + 0.5 * gb_pred

# Evaluate the hybrid model
mse = mean_squared_error(y_test, hybrid_pred)
r2 = r2_score(y_test, hybrid_pred)

print(f"Hybrid Model Mean Squared Error: {mse}")
print(f"Hybrid Model R2 Score: {r2}")
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[54], line 12
      5 # Create pipelines for models with scaling
      6 rf_pipeline = Pipeline([
      7     ('scaler', StandardScaler()),  # StandardScaler for Random Forest
      8     ('rf', RandomForestRegressor(n_estimators=100, random_state=42))
      9 ])
     11 gb_pipeline = Pipeline([
---> 12     ('scaler', MinMaxScaler()),  # MinMaxScaler for Gradient Boosting
     13     ('gb', GradientBoostingRegressor(n_estimators=100, learning_rate=
```

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```
0.1, random_state=42))
     14 ])
     16 # Train the pipelines
     17 rf_pipeline.fit(X_train, y_train)

NameError: name 'MinMaxScaler' is not defined
```

In [44]:

```python
# Import necessary libraries
from sklearn.preprocessing import StandardScaler, MinMaxScaler
from sklearn.ensemble import RandomForestRegressor, GradientBoostingRegressor
from sklearn.model_selection import train_test_split
from sklearn.pipeline import Pipeline
from sklearn.metrics import r2_score, mean_squared_error

# Sample data (replace with your actual data)
X = df['Average_Temperature_C', 'Total_Precipitation_mm', 'CO2_Emissions_MT',
y = df['Crop_Yield_MT_per_HA']

# Train/Test split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, rando

# Create pipelines for models with scaling

# Random Forest with StandardScaler
rf_pipeline = Pipeline([
    ('scaler', StandardScaler()),  # StandardScaler for Random Forest
    ('rf', RandomForestRegressor(n_estimators=100, random_state=42))
])

# Gradient Boosting with MinMaxScaler
gb_pipeline = Pipeline([
    ('scaler', MinMaxScaler()),  # MinMaxScaler for Gradient Boosting
    ('gb', GradientBoostingRegressor(n_estimators=100, learning_rate=0.1, rand
])

# Train the pipelines
rf_pipeline.fit(X_train, y_train)
gb_pipeline.fit(X_train, y_train)

# Make predictions
rf_predictions = rf_pipeline.predict(X_test)
gb_predictions = gb_pipeline.predict(X_test)

# Evaluate the models
rf_r2 = r2_score(y_test, rf_predictions)
rf_mse = mean_squared_error(y_test, rf_predictions)

gb_r2 = r2_score(y_test, gb_predictions)
gb_mse = mean_squared_error(y_test, gb_predictions)

print(f"Random Forest R² Score: {rf_r2:.2f}")
print(f"Random Forest Mean Squared Error: {rf_mse:.2f}")

print(f"Gradient Boosting R² Score: {gb_r2:.2f}")
print(f"Gradient Boosting Mean Squared Error: {gb_mse:.2f}")
```

```
Random Forest R² Score: 0.30
Random Forest Mean Squared Error: 0.74
Gradient Boosting R² Score: 0.32
Gradient Boosting Mean Squared Error: 0.72
```

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In [45]:
```
from sklearn.neural_network import MLPRegressor
from sklearn.metrics import r2_score, mean_squared_error

# Initialize MLPRegressor with more complexity (more layers and neurons)
mlp_model_complex = MLPRegressor(hidden_layer_sizes=(100, 100, 100), max_iter=

# Train the model
mlp_model_complex.fit(X_train, y_train)

# Make predictions
mlp_predictions_complex = mlp_model_complex.predict(X_test)

# Evaluate the model
mlp_r2_complex = r2_score(y_test, mlp_predictions_complex)
mlp_mse_complex = mean_squared_error(y_test, mlp_predictions_complex)

print(f"Neural Network R² Score (More Layers/Neurons): {mlp_r2_complex:.2f}")
print(f"Neural Network Mean Squared Error: {mlp_mse_complex:.2f}")
```

```
Neural Network R² Score (More Layers/Neurons): -0.11
Neural Network Mean Squared Error: 1.17
```

In [46]:
```
import xgboost as xgb
from sklearn.metrics import r2_score, mean_squared_error
from sklearn.model_selection import train_test_split

# Train/Test split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, rando

# Initialize XGBoost regressor
xg_model = xgb.XGBRegressor(n_estimators=100, learning_rate=0.1, max_depth=6,

# Train the model
xg_model.fit(X_train, y_train)

# Make predictions
xg_predictions = xg_model.predict(X_test)

# Evaluate the model
xg_r2 = r2_score(y_test, xg_predictions)
xg_mse = mean_squared_error(y_test, xg_predictions)

print(f"XGBoost R² Score: {xg_r2:.2f}")
print(f"XGBoost Mean Squared Error: {xg_mse:.2f}")
```

```
XGBoost R² Score: 0.29
XGBoost Mean Squared Error: 0.75
```

In [47]:
```
import lightgbm as lgb
from sklearn.metrics import r2_score, mean_squared_error
from sklearn.model_selection import train_test_split

# Train/Test split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, rando

# Initialize LightGBM regressor
lgb_model = lgb.LGBMRegressor(n_estimators=100, learning_rate=0.05, max_depth=

# Train the model
lgb_model.fit(X_train, y_train)

# Make predictions
```

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```
lgb_predictions = lgb_model.predict(X_test)

# Evaluate the model
lgb_r2 = r2_score(y_test, lgb_predictions)
lgb_mse = mean_squared_error(y_test, lgb_predictions)

print(f"LightGBM R² Score: {lgb_r2:.2f}")
print(f"LightGBM Mean Squared Error: {lgb_mse:.2f}")
```

```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000354 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 8000, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232193
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
LightGBM R² Score: 0.32
LightGBM Mean Squared Error: 0.72
```

In [48]:

```
from sklearn.model_selection import GridSearchCV

# Define parameter grid for XGBoost
param_grid_xgboost = {
    'n_estimators': [50, 100, 200],
    'learning_rate': [0.01, 0.05, 0.1],
    'max_depth': [4, 6, 8],
    'subsample': [0.8, 0.9, 1.0],
}

# Perform GridSearchCV for XGBoost
grid_search_xgboost = GridSearchCV(estimator=xgb.XGBRegressor(), param_grid=pa
grid_search_xgboost.fit(X_train, y_train)

# Get best model
best_xg_model = grid_search_xgboost.best_estimator_
```

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```
# Evaluate best model
best_xg_predictions = best_xg_model.predict(X_test)
best_xg_r2 = r2_score(y_test, best_xg_predictions)
best_xg_mse = mean_squared_error(y_test, best_xg_predictions)

print(f"Best XGBoost R² Score: {best_xg_r2:.2f}")
print(f"Best XGBoost Mean Squared Error: {best_xg_mse:.2f}")
```

```
Best XGBoost R² Score: 0.32
Best XGBoost Mean Squared Error: 0.72
```

In [49]:

```
# Define parameter grid for LightGBM
param_grid_lgbm = {
    'n_estimators': [50, 100, 200],
    'learning_rate': [0.01, 0.05, 0.1],
    'max_depth': [4, 6, 8],
    'subsample': [0.8, 0.9, 1.0],
}

# Perform GridSearchCV for LightGBM
grid_search_lgbm = GridSearchCV(estimator=lgb.LGBMRegressor(), param_grid=para
grid_search_lgbm.fit(X_train, y_train)

# Get best model
best_lgbm_model = grid_search_lgbm.best_estimator_

# Evaluate best model
best_lgbm_predictions = best_lgbm_model.predict(X_test)
best_lgbm_r2 = r2_score(y_test, best_lgbm_predictions)
best_lgbm_mse = mean_squared_error(y_test, best_lgbm_predictions)

print(f"Best LightGBM R² Score: {best_lgbm_r2:.2f}")
print(f"Best LightGBM Mean Squared Error: {best_lgbm_mse:.2f}")
```

```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000448 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000279 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000340 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000291 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000357 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000315 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000301 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
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```
ing was 0.000331 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000365 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000290 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000313 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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ing was 0.000373 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000390 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000322 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
[LightGBM] [Info] Start training from score 2.229045
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000333 seconds.
```

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```
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000587 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000297 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000322 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
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You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000366 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
[LightGBM] [Info] Start training from score 2.231105
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000322 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000325 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000318 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000320 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000297 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000290 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000270 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000286 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000300 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000253 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
```

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```
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000295 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000254 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000272 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
```

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```
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000262 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000279 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000333 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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```
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000313 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000240 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000418 seconds.
```

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```
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000280 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000282 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000426 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000273 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000281 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000252 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
```

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```
ing was 0.000267 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000299 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000409 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000264 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000272 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000291 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000291 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000261 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000268 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
```

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```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000289 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000270 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000256 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000259 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000271 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000256 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000277 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000344 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000269 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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```
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000267 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000277 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000273 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of test
ing was 0.000188 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000343 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000380 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000289 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000271 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000282 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of test
ing was 0.000289 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000276 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000666 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000276 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000252 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000290 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000287 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000413 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000248 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000265 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000274 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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```
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000190 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000185 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000423 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000234 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000251 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000244 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000219 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000257 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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```
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000207 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000211 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000196 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000238 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000359 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000222 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000191 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000194 seconds.
```

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```
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000191 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000184 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000172 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000287 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000206 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
```

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```
ing was 0.000225 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000182 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000245 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000184 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000218 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000235 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000229 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000263 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
```

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```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000227 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000197 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000193 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000224 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000211 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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```
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000197 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000244 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000188 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
```

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```
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000208 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000210 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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You can set `force_col_wise=true` to remove the overhead.
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You can set `force_col_wise=true` to remove the overhead.
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You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000228 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000197 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
```

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```
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000217 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000187 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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You can set `force_col_wise=true` to remove the overhead.
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ing was 0.000196 seconds.
You can set `force_col_wise=true` to remove the overhead.
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You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000184 seconds.
You can set `force_col_wise=true` to remove the overhead.
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Explore our developer-friendly HTML to PDF API Printed using PDFCrowd HTML to PDF

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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000284 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
```

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```
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000195 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
```

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```
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000210 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000207 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000187 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000207 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000193 seconds.
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```
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000208 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
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ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000191 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000192 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000206 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000178 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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```
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000241 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000186 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000197 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
```

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```
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000214 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000220 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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```
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
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You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000226 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000217 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000184 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000206 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000210 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000224 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000185 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000207 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000207 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000210 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
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```
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000311 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000262 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000194 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
```

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```
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000327 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000208 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000241 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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ing was 0.000235 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000224 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000187 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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```
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000207 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000179 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000185 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000206 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000250 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000178 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000220 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000211 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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```
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000416 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000225 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000208 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000224 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000222 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000192 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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```
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000216 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000213 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000220 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000211 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000197 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000186 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000219 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000235 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000175 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000210 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
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ing was 0.000208 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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ing was 0.000212 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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ing was 0.000229 seconds.
You can set `force_col_wise=true` to remove the overhead.
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ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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features: 7
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ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
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ing was 0.000291 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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ing was 0.000214 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000199 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000249 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
```

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```
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000207 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000330 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000214 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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ing was 0.000196 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
[LightGBM] [Info] Start training from score 2.232297
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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You can set `force_col_wise=true` to remove the overhead.
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features: 7
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features: 7
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You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000223 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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```
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000195 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000200 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000176 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
```

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```
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000539 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000225 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000232 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000184 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000401 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000204 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000222 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000206 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
```

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```
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000216 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000217 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000198 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
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```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000203 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
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ing was 0.000223 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000251 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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ing was 0.000315 seconds.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000185 seconds.
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features: 7
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You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000202 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
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You can set `force_col_wise=true` to remove the overhead.
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features: 7
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ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
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You can set `force_col_wise=true` to remove the overhead.
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You can set `force_col_wise=true` to remove the overhead.
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features: 7
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You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000219 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000223 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000182 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
```

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```
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000312 seconds.
```

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```
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000210 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000227 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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ing was 0.000251 seconds.
You can set `force_col_wise=true` to remove the overhead.
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ing was 0.000300 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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You can set `force_col_wise=true` to remove the overhead.
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features: 7
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You can set `force_col_wise=true` to remove the overhead.
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ing was 0.000225 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
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You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000189 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000197 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000321 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000228 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000244 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000205 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000269 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000187 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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```
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000216 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000220 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000608 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000238 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000251 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000228 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000210 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000222 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000231 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000442 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
```

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```
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000196 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000228 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000209 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000223 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
```

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```
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000220 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000352 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000201 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000292 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000402 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000221 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000218 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000212 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.235440
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000327 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.233080
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000240 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232297
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000215 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000232 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.231105
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000314 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000220 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
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features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000213 seconds.
You can set `force_col_wise=true` to remove the overhead.
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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
[LightGBM] [Info] Start training from score 2.229045
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000311 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000214 seconds.
You can set `force_col_wise=true` to remove the overhead.
```

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[LightGBM] [Info] Number of data points in the train set: 6400, number of used
features: 7
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You can set `force_col_wise=true` to remove the overhead.
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features: 7
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ing was 0.000260 seconds.
You can set `force_col_wise=true` to remove the overhead.
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features: 7
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Auto-choosing col-wise multi-threading, the overhead of test
ing was 0.000236 seconds.
You can set `force_col_wise=true` to remove the overhead.
[LightGBM] [Info] Total Bins 1785
[LightGBM] [Info] Number of data points in the train set: 8000, number of used
features: 7
[LightGBM] [Info] Start training from score 2.232193
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

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```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
Best LightGBM R² Score: 0.32
Best LightGBM Mean Squared Error: 0.72
```

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