```
import pandas as pd
from bidi.algorithm import get_display
import arabic_reshaper
import matplotlib.pyplot as plt
import warnings
import numpy as np
import seaborn as sb
import sklearn
warnings.filterwarnings('ignore')
```

```
data = pd.read_csv('DATA1.csv')
```

```
data
```

	shmare_parvande	Gender	Age	admission	Release_date	ت تشخیص متاستاز مغزی	ت تشخیص متاستاز بیضه	گروه خونی	شخیص
0	01--20--59	مرد	3	82/10/2	86/2/25	NaN	82/10/17	B-	ALL
1	00--98--82	مرد	11	82/8/13	85/12/25	NaN	NaN	O+	ALL
2	00--96--44	مرد	5	82/8/8	85/10/2	NaN	NaN	O+	ALL
3	00--02--01	زن	10	81/12/12	91/12/8	90/8/25	NaN	B+	ALL
4	00--34--99	زن	11	82/5/18	85/6/21	NaN	NaN	O+	A''
...	...	...	...	...	...	...	...	...	...
254	13--43--28	زن	1	89/11/17	89/11/18	NaN	NaN	O+	AML
255	18--15--93	مرد	3	92/5/29	92/8/18	92/7/5	NaN	O+	AML
256	16--13--49	مرد	10	91/5/10	93/3/25	NaN	NaN	B+	AML
257	15--85--49	مرد	2	91/3/16	91/4/11	91/3/16	NaN	A+	AML
258	15--75--41	مرد	8	91/2/26	92/6/4	NaN	NaN	A+	AML

259 rows × 39 columns

اطلاعات آماری statics analysis ⌄

```
data.describe()
```

	Age	HGB3	HCT3	MCV3	MCH3	MCHC3	WBC1	
count	259.000000	25.000000	25.000000	25.000000	25.000000	25.000000	257.000000	257.0
mean	6.196911	10.340000	31.952000	84.380000	27.276000	32.368000	32.305837	3.1
std	3.990763	2.246108	6.477083	6.535671	2.277477	1.933632	61.495570	1.0
min	1.000000	6.100000	18.900000	72.000000	22.400000	27.900000	0.700000	0.6
25%	3.000000	8.600000	27.200000	78.500000	26.200000	31.200000	3.400000	3.1
50%	5.000000	10.000000	30.900000	85.200000	27.200000	32.400000	8.000000	3.1
75%	9.500000	12.200000	37.200000	88.100000	28.600000	33.500000	24.700000	3.9
max	15.000000	15.100000	42.600000	96.800000	31.300000	36.200000	420.000000	6.0

8 rows × 21 columns

⌄ Data Cleaning

اصلاح ستون های مد نظر و جایگزینی مقادیر آن با مقادیر انکد شده

```python
datacopy = data.copy()
```

```python
datacopy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 259 entries, 0 to 258
Data columns (total 39 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   shmare_parvande     259 non-null    object
 1   Gender              259 non-null    object
 2   Age                 259 non-null    int64
 3   admission           259 non-null    object
 4   Release_date        259 non-null    object
 5   ت تشخیص متاستاز مغزی   31 non-null      object
 6   ت تشخیص متاستاز بیضه   24 non-null      object
 7   گروه خونی            259 non-null     object
 8   تشخیص               259 non-null      object
 9   مورفولوژی            62 non-null      object
 10  اسپلنومگالی          254 non-null    object
 11  هپاتومگالی           254 non-null    object
 12  نوع درمان            255 non-null    object
 13  نتیجه ی درمان         60 non-null      object
 14  توضیحات             61 non-null      object
 15  WBC3                25 non-null     object
 16  RBC3                25 non-null     object
 17  HGB3                25 non-null     float64
 18  HCT3                25 non-null     float64
 19  MCV3                25 non-null     float64
 20  MCH3                25 non-null     float64
 21  MCHC3               25 non-null     float64
 22  PLT3                25 non-null     object
 23  WBC1                257 non-null    float64
 24  RBC1                257 non-null    float64
 25  HGB1                257 non-null    float64
 26  HCT1                257 non-null    float64
 27  MCV1                257 non-null    float64
 28  MCH1                257 non-null    float64
 29  MCHC1               257 non-null    float64
 30  PLT1                257 non-null    float64
 31  WBC2                31 non-null     float64
 32  RBC2                31 non-null     float64
 33  HGB2                31 non-null     float64
 34  HCT2                31 non-null     float64
 35  MCV1.1              31 non-null     float64
 36  MCH2                31 non-null     float64
 37  MCHC2               31 non-null     float64
 38  PLT2                31 non-null     object
dtypes: float64(20), int64(1), object(18)
memory usage: 79.0+ KB
```

```python
datacopy['ت تشخیص متاستاز مغزی'] = datacopy['ت تشخیص متاستاز مغزی'].notna().astype(int)
```

```python
datacopy['ت تشخیص متاستاز بیضه'] = datacopy['ت تشخیص متاستاز بیضه'].notna().astype(int)
```

```python
datacopy['نتیجه ی درمان'] = datacopy['نتیجه ی درمان'].notna().astype(int)
```

```python
datacopy['اسپلنومگالی'] = datacopy['اسپلنومگالی'].notna().astype(int)
```

```python
datacopy['هپاتومگالی'] = datacopy['هپاتومگالی'].notna().astype(int)
```

```python
datacopy.replace({'Gender':{'مرد':1,'زن':0}},inplace=True)
```

```python
datacopy['Age'] = datacopy['Age'].astype(int)
```

```python
datacopy['WBC1'] = datacopy['WBC1'].astype(float)
```

⌄ OneHot coding Data and remove columns

```python
blood_group = pd.get_dummies(datacopy['گروه خونی']).astype(int)
```

```python
datacopy.replace({'تشخیص':{"ALL":1,"AML":0}},inplace=True)
```

```python
datacopy = pd.concat([datacopy,blood_group],axis=1)
```

```python
datacopy = datacopy.drop('گروه خونی',axis=1)
```

⌄ Make Clean custom Dataset for analyse

⌄ data before make custom dataset

```python
datacopy.info()
```

```
⊡⋗  <class 'pandas.core.frame.DataFrame'>
    RangeIndex: 259 entries, 0 to 258
    Data columns (total 46 columns):
     #   Column              Non-Null Count  Dtype
    ---  ------              --------------  -----
     0   shmare_parvande     259 non-null    object
     1   Gender              259 non-null    int64
     2   Age                 259 non-null    int32
     3   admission           259 non-null    object
     4   Release_date        259 non-null    object
     5   ت تشخیص متاستاز مغزی 259  non-null    int32
     6   ت تشخیص متاستاز بیضه 259  non-null    int32
     7   تشخیص            259  non-null    int64
     8   مورفولوژی         62          non-null    object
     9   اسپلنومگالی       259          non-null    int32
     10  هپاتومگالی        259          non-null    int32
     11  نوع درمان         255          non-null    object
     12  نتیجه ی درمان     259          non-null    int32
     13  توضیحات           61          non-null    object
     14  WBC3                25 non-null     object
     15  RBC3                25 non-null     object
     16  HGB3                25 non-null     float64
     17  HCT3                25 non-null     float64
     18  MCV3                25 non-null     float64
     19  MCH3                25 non-null     float64
     20  MCHC3               25 non-null     float64
     21  PLT3                25 non-null     object
     22  WBC1                257 non-null    float64
     23  RBC1                257 non-null    float64
     24  HGB1                257 non-null    float64
     25  HCT1                257 non-null    float64
     26  MCV1                257 non-null    float64
     27  MCH1                257 non-null    float64
     28  MCHC1               257 non-null    float64
     29  PLT1                257 non-null    float64
     30  WBC2                31 non-null     float64
     31  RBC2                31 non-null     float64
     32  HGB2                31 non-null     float64
     33  HCT2                31 non-null     float64
     34  MCV1.1              31 non-null     float64
     35  MCH2                31 non-null     float64
     36  MCHC2               31 non-null     float64
     37  PLT2                31 non-null     object
     38  A+                  259 non-null    int32
     39  A-                  259 non-null    int32
     40  AB+                 259 non-null    int32
     41  AB-                 259 non-null    int32
     42  B+                  259 non-null    int32
     43  B-                  259 non-null    int32
     44  O+                  259 non-null    int32
     45  O-                  259 non-null    int32
    dtypes: float64(20), int32(14), int64(2), object(10)
    memory usage: 79.0+ KB
```

⌄ ستون های اضافی جهت تحلیل درست الگوریتم ها حذف شده اند (در زیر)

```python
dataclean = datacopy.drop(['shmare_parvande','admission','Release_date','مورفولوژی','نوع درمان','توضیحات','WBC3','RBC3','HGB3','HCT3','MCV3','MCH
```

```python
dataclean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 259 entries, 0 to 258
Data columns (total 23 columns):
 #   Column                        Non-Null Count  Dtype
---  ------                        --------------  -----
 0   Gender                        259 non-null    int64
 1   Age                           259 non-null    int32
 2   ت تشخیص متاستاز مغزی          259 non-null    int32
 3   ت تشخیص متاستاز بیضه          259 non-null    int32
 4   تشخیص                         259 non-null    int64
 5   اسپلنومگالی                   259 non-null    int32
 6   هپاتومگالی                    259 non-null    int32
 7   نتیجه ی درمان                 259 non-null    int32
 8   WBC1                          257 non-null    float64
 9   RBC1                          257 non-null    float64
 10  HGB1                          257 non-null    float64
 11  HCT1                          257 non-null    float64
 12  MCH1                          257 non-null    float64
 13  MCHC1                         257 non-null    float64
 14  PLT1                          257 non-null    float64
 15  A+                            259 non-null    int32
 16  A-                            259 non-null    int32
 17  AB+                           259 non-null    int32
 18  AB-                           259 non-null    int32
 19  B+                            259 non-null    int32
 20  B-                            259 non-null    int32
 21  O+                            259 non-null    int32
 22  O-                            259 non-null    int32
dtypes: float64(7), int32(14), int64(2)
memory usage: 32.5 KB
```

مقادیر خالی یا میسینگ را در دیتاهای بالا پیدا میکنیم:

```
dataclean.isna().sum()
```

```
Gender                    0
Age                       0
ت تشخیص متاستاز مغزی      0
ت تشخیص متاستاز بیضه      0
تشخیص                     0
اسپلنومگالی               0
هپاتومگالی                0
نتیجه ی درمان             0
WBC1                      2
RBC1                      2
HGB1                      2
HCT1                      2
MCH1                      2
MCHC1                     2
PLT1                      2
A+                        0
A-                        0
AB+                       0
AB-                       0
B+                        0
B-                        0
O+                        0
O-                        0
dtype: int64
```

```
dataclean.dropna(axis=1,inplace=True)
```

```
dataclean.isna().sum()
```

```
Gender                    0
Age                       0
ت تشخیص متاستاز مغزی      0
ت تشخیص متاستاز بیضه      0
تشخیص                     0
اسپلنومگالی               0
هپاتومگالی                0
نتیجه ی درمان             0
A+                        0
A-                        0
AB+                       0
AB-                       0
B+                        0
B-                        0
O+                        0
```

```
    O-                        0
    dtype: int64
```

```python
column_to_move = 'نتیجه ی درمان'
df_next = dataclean[[col for col in dataclean.columns if col != column_to_move] + [column_to_move]]
```
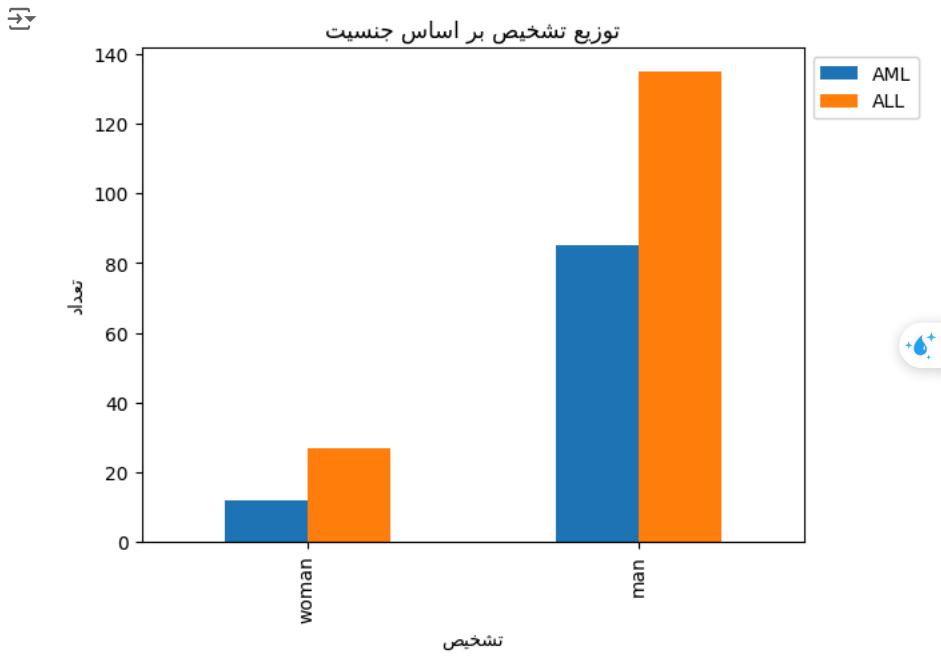
```python
X = df_next.iloc[:,:-1]
y = df_next.iloc[:,-1]
```

∨ Data visualization

```python
table = pd.crosstab(df_next['تشخیص'], df_next['Gender'])
table.columns = table.columns.map({1: 'man', 0: 'woman'})
table.index = table.index.map({1: 'man', 0: 'woman'})
print(table)
```

```
Gender  woman  man
تشخیص
woman     12   27
man       85  135
```

```python
table.plot(kind='bar')
plt.title(get_display(arabic_reshaper.reshape('توزیع تشخیص بر اساس جنسیت')))
plt.xlabel(get_display(arabic_reshaper.reshape('تشخیص')))
plt.ylabel(get_display(arabic_reshaper.reshape('تعداد')))
plt.legend(['AML', 'ALL'], bbox_to_anchor=(1, 1))
plt.show()
```
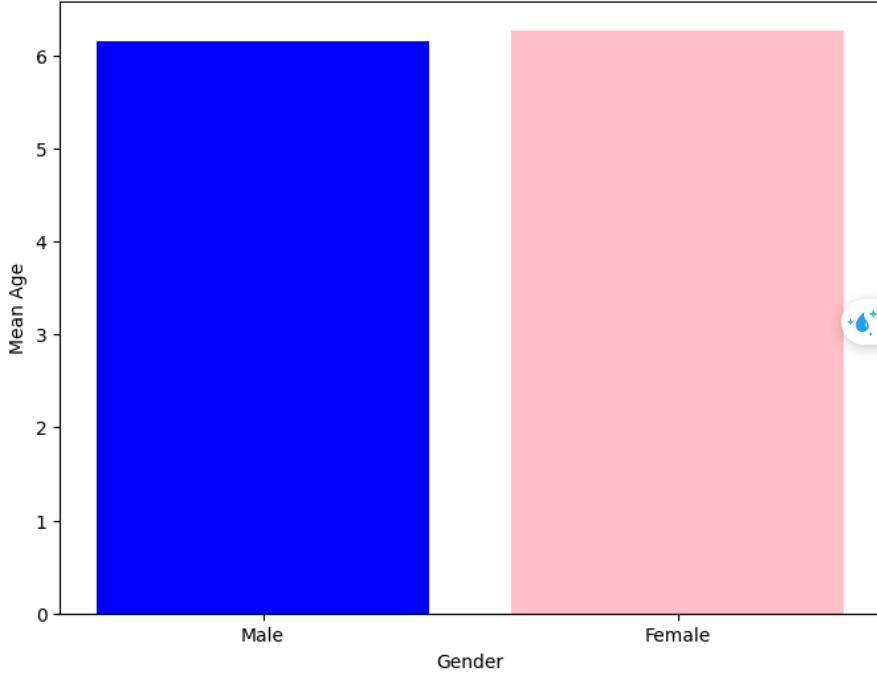


```python
mean_age_male = df_next[df_next['Gender'] == 1]['Age'].mean()
mean_age_female = df_next[df_next['Gender'] == 0]['Age'].mean()
print(f"میانگین سن در جنس مرد: {mean_age_male:.2f} | | | میانگین سن در جنس زن: {mean_age_female:.2f}")

mean_ages = pd.DataFrame({
    'Gender': ['Male', 'Female'],
    'Mean Age': [mean_age_male, mean_age_female]
})

plt.figure(figsize=(8, 6))
plt.bar(mean_ages['Gender'], mean_ages['Mean Age'], color=['blue', 'pink'])
plt.xlabel('Gender')
plt.ylabel('Mean Age')
plt.title('Mean Age of Deceased by Gender')
plt.show()
```

میانگین سن در جنس مرد: 6.15 | | | میانگین سن در جنس زن: 6.27

Mean Age of Deceased by Gender
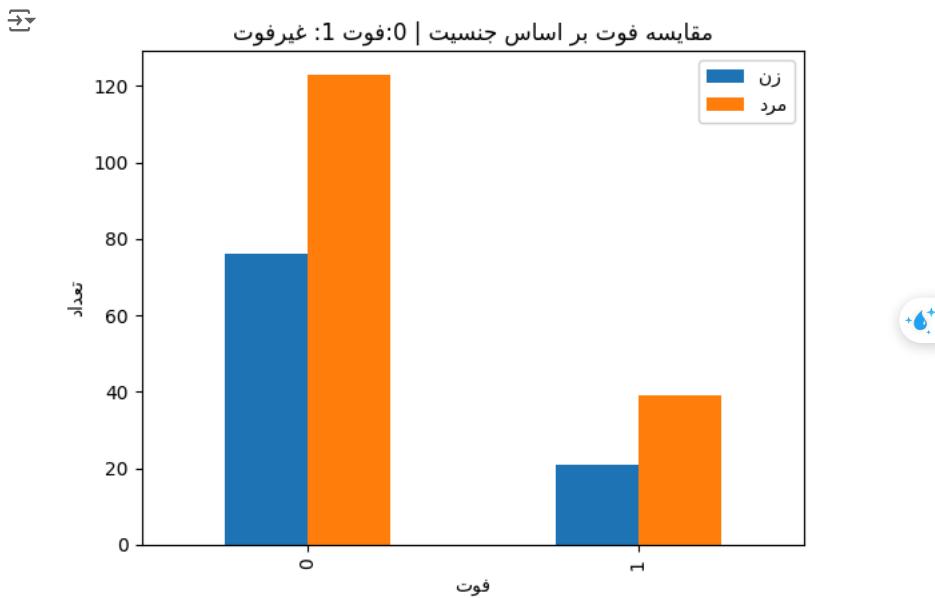

```
import pandas as pd
import matplotlib.pyplot as plt
import arabic_reshaper
from bidi.algorithm import get_display

table = pd.crosstab(df_next['نتیجه ی درمان'], df_next['Gender'])
ax = table.plot(kind='bar')

plt.title(get_display(arabic_reshaper.reshape('مقایسه فوت بر اساس جنسیت | فوت:0 | 1: غیرفوت')))
plt.xlabel(get_display(arabic_reshaper.reshape('فوت')))
plt.ylabel(get_display(arabic_reshaper.reshape('تعداد')))

plt.legend([get_display(arabic_reshaper.reshape("زن")), get_display(arabic_reshaper.reshape("مرد"))], loc='upper right', bbox_to_anchor=(1, 1
plt.show()
```
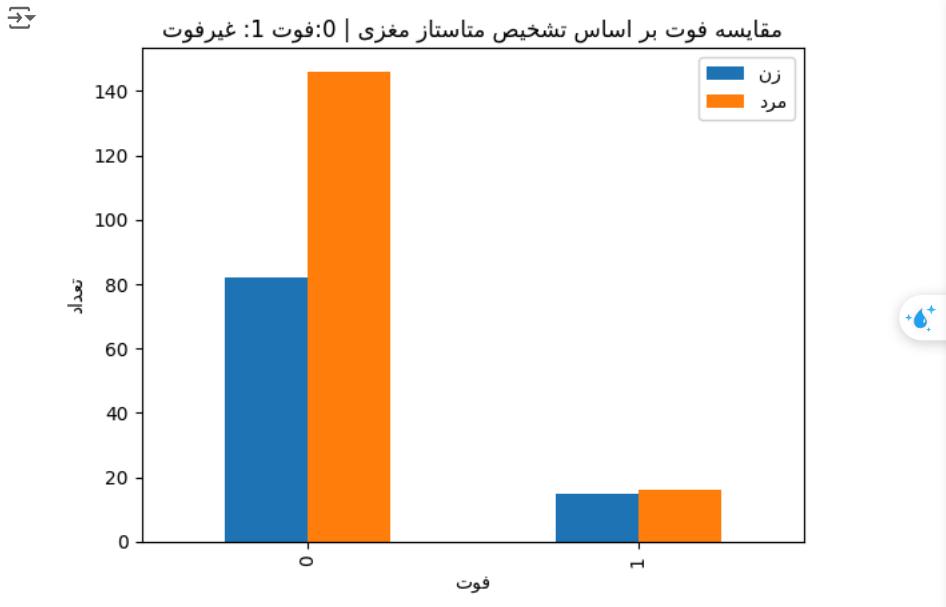
```python
import pandas as pd
import matplotlib.pyplot as plt
import arabic_reshaper
from bidi.algorithm import get_display

table = pd.crosstab(df_next['ت تشخیص متاستاز مغزی'], df_next['Gender'])
ax = table.plot(kind='bar')

plt.title(get_display(arabic_reshaper.reshape('مقایسه فوت بر اساس تشخیص متاستاز مغزی | 0:فوت 1: غیرفوت')))
plt.xlabel(get_display(arabic_reshaper.reshape('فوت')))
plt.ylabel(get_display(arabic_reshaper.reshape('تعداد')))
plt.legend([get_display(arabic_reshaper.reshape("زن")), get_display(arabic_reshaper.reshape("مرد"))], loc='upper right', bbox_to_anchor=(1, 1

plt.show()
```
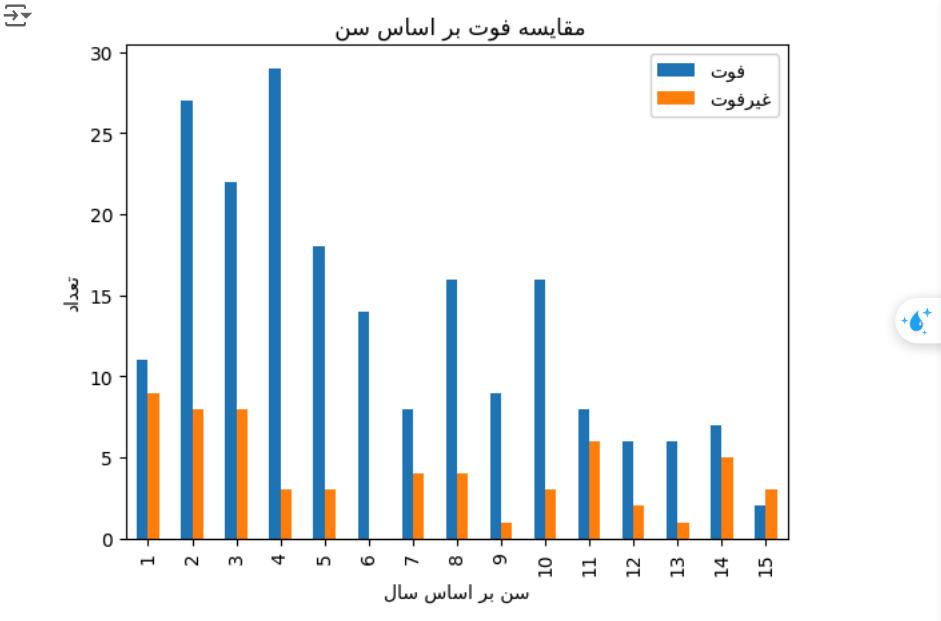


```python
import pandas as pd
import matplotlib.pyplot as plt
import arabic_reshaper
from bidi.algorithm import get_display

table = pd.crosstab(df_next['Age'], df_next['نتیجه ی درمان'])
ax = table.plot(kind='bar')

plt.title(get_display(arabic_reshaper.reshape(' مقایسه فوت بر اساس سن')))
plt.xlabel(get_display(arabic_reshaper.reshape('سن بر اساس سال')))
plt.ylabel(get_display(arabic_reshaper.reshape('تعداد')))
plt.legend([get_display(arabic_reshaper.reshape("فوت")), get_display(arabic_reshaper.reshape("غیرفوت"))], loc='upper right', bbox_to_anchor=(

plt.show()
```

train test split

تقسیم دیتا به بخش های تست و آموزش ⌄

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(X,y,test_size=0.15,random_state=0)
```

StandardScaler

استاندارد کردن داده ها ⌄

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
```

DecisionTreeClassifier

```
from sklearn.tree import DecisionTreeClassifier

tree = DecisionTreeClassifier(criterion = 'entropy', random_state = 0)
tree.fit(x_train,y_train)
```

```
▾              DecisionTreeClassifier              ⓘ ⍰
   DecisionTreeClassifier(criterion='entropy', random_state=0)
```

پیش بینی مدل برای ارزیابی مدل ⌄

```
y_pred_DecidionTree = tree.predict(x_test)
```

```
from sklearn.metrics import classification_report,accuracy_score
print(classification_report(y_test,y_pred_DecidionTree))
print(f" دقت مدل : {accuracy_score(y_test,y_pred_DecidionTree):.3f}")
```
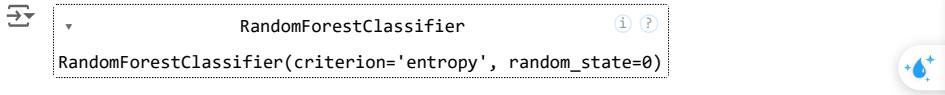
```
              precision    recall  f1-score   support
```

```
           0       0.87      0.79      0.83        33
           1       0.22      0.33      0.27         6

    accuracy                           0.72        39
   macro avg       0.54      0.56      0.55        39
weighted avg       0.77      0.72      0.74        39
```

دقت مدل : 0.718

RandomForest

```
from sklearn.ensemble import RandomForestClassifier
rfc = RandomForestClassifier(criterion = 'entropy', random_state = 0)
rfc.fit(x_train, y_train)
```

```
▼          RandomForestClassifier              ⓘ ⓘ
RandomForestClassifier(criterion='entropy', random_state=0)
```

```
y_pred_RandomForest = rfc.predict(x_test)
```

```
from sklearn.metrics import classification_report,accuracy_score
print(classification_report(y_test,y_pred_RandomForest))
print(f"دقت مدل : {accuracy_score(y_test,y_pred_RandomForest):.3f}")
```

```
               precision    recall  f1-score   support

           0       0.88      0.88      0.88        33
           1       0.33      0.33      0.33         6

    accuracy                           0.79        39
   macro avg       0.61      0.61      0.61        39
weighted avg       0.79      0.79      0.79        39
```

دقت مدل : 0.795

CatBoost

```
from catboost import CatBoostClassifier, Pool
```

```
catboost = CatBoostClassifier(
    iterations=1000,
    learning_rate=0.1,
    depth=6,
    loss_function='Logloss',
    verbose=True
)
```

```
catboost.fit(x_train, y_train, eval_set=(x_test, y_test), plot=True)
```

```
MetricVisualizer(layout=Layout(align_self='stretch', height='500px'))
0:      learn: 0.6548641        test: 0.6602610 best: 0.6602610 (0)    total: 90.5ms
1:      learn: 0.6217336        test: 0.6230476 best: 0.6230476 (1)    total: 93.7ms
2:      learn: 0.5955285        test: 0.5946456 best: 0.5946456 (2)    total: 94.8ms
3:      learn: 0.5694043        test: 0.5765228 best: 0.5765228 (3)    total: 95.8ms
4:      learn: 0.5515773        test: 0.5584403 best: 0.5584403 (4)    total: 96.5ms
5:      learn: 0.5405268        test: 0.5418623 best: 0.5418623 (5)    total: 97.3ms
6:      learn: 0.5325781        test: 0.5293643 best: 0.5293643 (6)    total: 97.8ms
7:      learn: 0.5117859        test: 0.5197385 best: 0.5197385 (7)    total: 98.7ms
8:      learn: 0.5024902        test: 0.5120977 best: 0.5120977 (8)    total: 99.7ms
9:      learn: 0.4961151        test: 0.5071833 best: 0.5071833 (9)    total: 100ms
10:     learn: 0.4913865        test: 0.5018959 best: 0.5018959 (10)   total: 102ms
11:     learn: 0.4805759        test: 0.4879896 best: 0.4879896 (11)   total: 103ms
12:     learn: 0.4736226        test: 0.4829830 best: 0.4829830 (12)   total: 103ms
13:     learn: 0.4641688        test: 0.4762716 best: 0.4762716 (13)   total: 104ms
14:     learn: 0.4589882        test: 0.4756416 best: 0.4756416 (14)   total: 105ms
15:     learn: 0.4558051        test: 0.4686498 best: 0.4686498 (15)   total: 106ms
16:     learn: 0.4522151        test: 0.4689824 best: 0.4686498 (15)   total: 106ms
17:     learn: 0.4504513        test: 0.4666439 best: 0.4666439 (17)   total: 107ms
18:     learn: 0.4446686        test: 0.4584595 best: 0.4584595 (18)   total: 108ms
19:     learn: 0.4430059        test: 0.4591197 best: 0.4584595 (18)   total: 108ms
20:     learn: 0.4411866        test: 0.4613307 best: 0.4584595 (18)   total: 109ms
21:     learn: 0.4385162        test: 0.4605820 best: 0.4584595 (18)   total: 110ms
22:     learn: 0.4361209        test: 0.4634812 best: 0.4584595 (18)   total: 111ms
23:     learn: 0.4342723        test: 0.4625763 best: 0.4584595 (18)   total: 111ms
24:     learn: 0.4324325        test: 0.4643541 best: 0.4584595 (18)   total: 112ms
25:     learn: 0.4291703        test: 0.4640568 best: 0.4584595 (18)   total: 113ms
26:     learn: 0.4238193        test: 0.4604371 best: 0.4584595 (18)   total: 113ms
27:     learn: 0.4216553        test: 0.4590227 best: 0.4584595 (18)   total: 114ms
28:     learn: 0.4192415        test: 0.4643532 best: 0.4584595 (18)   total: 115ms
29:     learn: 0.4152649        test: 0.4669313 best: 0.4584595 (18)   total: 116ms
30:     learn: 0.4083208        test: 0.4744918 best: 0.4584595 (18)   total: 117ms
31:     learn: 0.4021323        test: 0.4808616 best: 0.4584595 (18)   total: 117ms
32:     learn: 0.3982628        test: 0.4869003 best: 0.4584595 (18)   total: 118ms
33:     learn: 0.3948497        test: 0.4899007 best: 0.4584595 (18)   total: 119ms
34:     learn: 0.3917081        test: 0.5006145 best: 0.4584595 (18)   total: 119ms
35:     learn: 0.3909051        test: 0.4997386 best: 0.4584595 (18)   total: 120ms
36:     learn: 0.3875216        test: 0.5038106 best: 0.4584595 (18)   total: 121ms
37:     learn: 0.3871628        test: 0.5041378 best: 0.4584595 (18)   total: 121ms
38:     learn: 0.3826456        test: 0.5086468 best: 0.4584595 (18)   total: 122ms
39:     learn: 0.3810988        test: 0.5083942 best: 0.4584595 (18)   total: 124ms
40:     learn: 0.3784570        test: 0.5087525 best: 0.4584595 (18)   total: 124ms
41:     learn: 0.3732703        test: 0.5044526 best: 0.4584595 (18)   total: 125ms
42:     learn: 0.3721829        test: 0.5074323 best: 0.4584595 (18)   total: 126ms
43:     learn: 0.3702780        test: 0.5084447 best: 0.4584595 (18)   total: 127ms
44:     learn: 0.3692806        test: 0.5128039 best: 0.4584595 (18)   total: 128ms
45:     learn: 0.3657341        test: 0.5179693 best: 0.4584595 (18)   total: 128ms
46:     learn: 0.3638149        test: 0.5197238 best: 0.4584595 (18)   total: 129ms
47:     learn: 0.3638028        test: 0.5193727 best: 0.4584595 (18)   total: 130ms
48:     learn: 0.3618018        test: 0.5200698 best: 0.4584595 (18)   total: 130ms
49:     learn: 0.3580018        test: 0.5252203 best: 0.4584595 (18)   total: 131ms
50:     learn: 0.3539206        test: 0.5267834 best: 0.4584595 (18)   total: 131ms
51:     learn: 0.3528473        test: 0.5295538 best: 0.4584595 (18)   total: 132ms
52:     learn: 0.3495936        test: 0.5335966 best: 0.4584595 (18)   total: 133ms
53:     learn: 0.3481825        test: 0.5306010 best: 0.4584595 (18)   total: 133ms
54:     learn: 0.3463192        test: 0.5257757 best: 0.4584595 (18)   total: 134ms
55:     learn: 0.3432074        test: 0.5192966 best: 0.4584595 (18)   total: 135ms
56:     learn: 0.3412842        test: 0.5209115 best: 0.4584595 (18)   total: 135ms
57:     learn: 0.3376443        test: 0.5224858 best: 0.4584595 (18)   total: 136ms
58:     learn: 0.3353513        test: 0.5229769 best: 0.4584595 (18)   total: 136ms
59:     learn: 0.3330932        test: 0.5230709 best: 0.4584595 (18)   total: 137ms
60:     learn: 0.3323958        test: 0.5252106 best: 0.4584595 (18)   total: 137ms
61:     learn: 0.3309383        test: 0.5258551 best: 0.4584595 (18)   total: 138ms
62:     learn: 0.3279467        test: 0.5257322 best: 0.4584595 (18)   total: 139ms
63:     learn: 0.3260585        test: 0.5226104 best: 0.4584595 (18)   total: 139ms
64:     learn: 0.3255968        test: 0.5252084 best: 0.4584595 (18)   total: 140ms
65:     learn: 0.3248635        test: 0.5268090 best: 0.4584595 (18)   total: 142ms
66:     learn: 0.3220448        test: 0.5296684 best: 0.4584595 (18)   total: 143ms
67:     learn: 0.3194290        test: 0.5305190 best: 0.4584595 (18)   total: 144ms
68:     learn: 0.3166737        test: 0.5296495 best: 0.4584595 (18)   total: 144ms
69:     learn: 0.3144764        test: 0.5341222 best: 0.4584595 (18)   total: 145ms
70:     learn: 0.3123430        test: 0.5356103 best: 0.4584595 (18)   total: 146ms
71:     learn: 0.3110503        test: 0.5369276 best: 0.4584595 (18)   total: 146ms
72:     learn: 0.3085040        test: 0.5377151 best: 0.4584595 (18)   total: 147ms
73:     learn: 0.3063000        test: 0.5406928 best: 0.4584595 (18)   total: 147ms
74:     learn: 0.3041181        test: 0.5375803 best: 0.4584595 (18)   total: 148ms
75:     learn: 0.3029190        test: 0.5397695 best: 0.4584595 (18)   total: 149ms
76:     learn: 0.3004866        test: 0.5393736 best: 0.4584595 (18)   total: 149ms
77:     learn: 0.3000026        test: 0.5392777 best: 0.4584595 (18)   total: 150ms
78:     learn: 0.2976472        test: 0.5420773 best: 0.4584595 (18)   total: 150ms
79:     learn: 0.2957607        test: 0.5448360 best: 0.4584595 (18)   total: 151ms
80:     learn: 0.2932872        test: 0.5426101 best: 0.4584595 (18)   total: 151ms
81:     learn: 0.2909404        test: 0.5451739 best: 0.4584595 (18)   total: 152ms
82:     learn: 0.2889847        test: 0.5448834 best: 0.4584595 (18)   total: 153ms
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83:     learn: 0.2875615     test: 0.5470818 best: 0.4584595 (18)      total: 154ms
84:     learn: 0.2853888     test: 0.5464069 best: 0.4584595 (18)      total: 154ms
85:     learn: 0.2832260     test: 0.5448679 best: 0.4584595 (18)      total: 155ms
86:     learn: 0.2816669     test: 0.5440158 best: 0.4584595 (18)      total: 155ms
87:     learn: 0.2802435     test: 0.5465492 best: 0.4584595 (18)      total: 156ms
88:     learn: 0.2786168     test: 0.5473411 best: 0.4584595 (18)      total: 156ms
89:     learn: 0.2773081     test: 0.5533380 best: 0.4584595 (18)      total: 157ms
90:     learn: 0.2768798     test: 0.5555266 best: 0.4584595 (18)      total: 158ms
91:     learn: 0.2752602     test: 0.5561674 best: 0.4584595 (18)      total: 158ms
92:     learn: 0.2738636     test: 0.5554415 best: 0.4584595 (18)      total: 159ms
93:     learn: 0.2723513     test: 0.5546778 best: 0.4584595 (18)      total: 160ms
94:     learn: 0.2708487     test: 0.5530986 best: 0.4584595 (18)      total: 160ms
95:     learn: 0.2697259     test: 0.5550579 best: 0.4584595 (18)      total: 161ms
96:     learn: 0.2684057     test: 0.5532291 best: 0.4584595 (18)      total: 162ms
97:     learn: 0.2676084     test: 0.5548715 best: 0.4584595 (18)      total: 162ms
98:     learn: 0.2661601     test: 0.5568112 best: 0.4584595 (18)      total: 163ms
99:     learn: 0.2648960     test: 0.5587102 best: 0.4584595 (18)      total: 163ms
100:    learn: 0.2637222     test: 0.5576556 best: 0.4584595 (18)      total: 164ms
101:    learn: 0.2629671     test: 0.5588876 best: 0.4584595 (18)      total: 165ms
102:    learn: 0.2624931     test: 0.5583147 best: 0.4584595 (18)      total: 165ms
103:    learn: 0.2615553     test: 0.5594103 best: 0.4584595 (18)      total: 166ms
104:    learn: 0.2605184     test: 0.5599917 best: 0.4584595 (18)      total: 166ms
105:    learn: 0.2596174     test: 0.5627950 best: 0.4584595 (18)      total: 167ms
106:    learn: 0.2589260     test: 0.5609015 best: 0.4584595 (18)      total: 168ms
107:    learn: 0.2580256     test: 0.5631879 best: 0.4584595 (18)      total: 168ms
108:    learn: 0.2572232     test: 0.5657973 best: 0.4584595 (18)      total: 169ms
109:    learn: 0.2560075     test: 0.5661400 best: 0.4584595 (18)      total: 169ms
110:    learn: 0.2551010     test: 0.5667226 best: 0.4584595 (18)      total: 170ms
111:    learn: 0.2540177     test: 0.5678793 best: 0.4584595 (18)      total: 171ms
112:    learn: 0.2534259     test: 0.5701986 best: 0.4584595 (18)      total: 171ms
113:    learn: 0.2523307     test: 0.5683125 best: 0.4584595 (18)      total: 172ms
114:    learn: 0.2519120     test: 0.5695131 best: 0.4584595 (18)      total: 173ms
115:    learn: 0.2508268     test: 0.5732846 best: 0.4584595 (18)      total: 173ms
116:    learn: 0.2506802     test: 0.5731894 best: 0.4584595 (18)      total: 174ms
117:    learn: 0.2498490     test: 0.5787309 best: 0.4584595 (18)      total: 174ms
118:    learn: 0.2489180     test: 0.5788987 best: 0.4584595 (18)      total: 175ms
119:    learn: 0.2479163     test: 0.5800870 best: 0.4584595 (18)      total: 176ms
120:    learn: 0.2477010     test: 0.5778625 best: 0.4584595 (18)      total: 176ms
121:    learn: 0.2471763     test: 0.5796605 best: 0.4584595 (18)      total: 177ms
122:    learn: 0.2468222     test: 0.5802087 best: 0.4584595 (18)      total: 178ms
123:    learn: 0.2460966     test: 0.5818978 best: 0.4584595 (18)      total: 178ms
124:    learn: 0.2453270     test: 0.5821812 best: 0.4584595 (18)      total: 179ms
125:    learn: 0.2448905     test: 0.5843213 best: 0.4584595 (18)      total: 179ms
126:    learn: 0.2442338     test: 0.5843068 best: 0.4584595 (18)      total: 180ms
127:    learn: 0.2429607     test: 0.5829374 best: 0.4584595 (18)      total: 180ms
128:    learn: 0.2422185     test: 0.5840407 best: 0.4584595 (18)      total: 181ms
129:    learn: 0.2410615     test: 0.5828005 best: 0.4584595 (18)      total: 182ms
130:    learn: 0.2404421     test: 0.5833260 best: 0.4584595 (18)      total: 182ms
131:    learn: 0.2398286     test: 0.5865073 best: 0.4584595 (18)      total: 183ms
132:    learn: 0.2388668     test: 0.5872084 best: 0.4584595 (18)      total: 184ms
133:    learn: 0.2386826     test: 0.5891901 best: 0.4584595 (18)      total: 185ms
134:    learn: 0.2384044     test: 0.5871729 best: 0.4584595 (18)      total: 186ms
135:    learn: 0.2378167     test: 0.5878518 best: 0.4584595 (18)      total: 187ms
136:    learn: 0.2371671     test: 0.5891889 best: 0.4584595 (18)      total: 187ms
137:    learn: 0.2365986     test: 0.5914332 best: 0.4584595 (18)      total: 189ms
138:    learn: 0.2359918     test: 0.5923671 best: 0.4584595 (18)      total: 190ms
139:    learn: 0.2358562     test: 0.5927454 best: 0.4584595 (18)      total: 191ms
140:    learn: 0.2350679     test: 0.5946616 best: 0.4584595 (18)      total: 192ms
141:    learn: 0.2345755     test: 0.5933537 best: 0.4584595 (18)      total: 193ms
142:    learn: 0.2340097     test: 0.5961116 best: 0.4584595 (18)      total: 194ms
143:    learn: 0.2335024     test: 0.5954812 best: 0.4584595 (18)      total: 195ms
144:    learn: 0.2333179     test: 0.5971271 best: 0.4584595 (18)      total: 196ms
145:    learn: 0.2326140     test: 0.5976769 best: 0.4584595 (18)      total: 196ms
146:    learn: 0.2319243     test: 0.6014266 best: 0.4584595 (18)      total: 197ms
147:    learn: 0.2314409     test: 0.6041397 best: 0.4584595 (18)      total: 197ms
148:    learn: 0.2305701     test: 0.6060273 best: 0.4584595 (18)      total: 198ms
149:    learn: 0.2303851     test: 0.6058520 best: 0.4584595 (18)      total: 199ms
150:    learn: 0.2302814     test: 0.6055914 best: 0.4584595 (18)      total: 199ms
151:    learn: 0.2299322     test: 0.6062162 best: 0.4584595 (18)      total: 200ms
152:    learn: 0.2295859     test: 0.6059564 best: 0.4584595 (18)      total: 201ms
153:    learn: 0.2291304     test: 0.6056760 best: 0.4584595 (18)      total: 201ms
154:    learn: 0.2284821     test: 0.6073591 best: 0.4584595 (18)      total: 202ms
155:    learn: 0.2280976     test: 0.6074991 best: 0.4584595 (18)      total: 202ms
156:    learn: 0.2276589     test: 0.6079209 best: 0.4584595 (18)      total: 203ms
157:    learn: 0.2274023     test: 0.6098721 best: 0.4584595 (18)      total: 204ms
158:    learn: 0.2268345     test: 0.6102979 best: 0.4584595 (18)      total: 204ms
159:    learn: 0.2261372     test: 0.6110391 best: 0.4584595 (18)      total: 205ms
160:    learn: 0.2257753     test: 0.6114431 best: 0.4584595 (18)      total: 205ms
161:    learn: 0.2255896     test: 0.6116513 best: 0.4584595 (18)      total: 206ms
162:    learn: 0.2249382     test: 0.6124503 best: 0.4584595 (18)      total: 206ms
163:    learn: 0.2245643     test: 0.6119643 best: 0.4584595 (18)      total: 207ms
164:    learn: 0.2242060     test: 0.6127162 best: 0.4584595 (18)      total: 208ms
165:    learn: 0.2236283     test: 0.6135484 best: 0.4584595 (18)      total: 208ms
166:    learn: 0.2232987     test: 0.6133455 best: 0.4584595 (18)      total: 209ms
167:    learn: 0.2227676     test: 0.6158249 best: 0.4584595 (18)      total: 209ms
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168:    learn: 0.2223709     test: 0.6166680 best: 0.4584595 (18)     total: 210ms
169:    learn: 0.2220077     test: 0.6178468 best: 0.4584595 (18)     total: 211ms
170:    learn: 0.2218354     test: 0.6180017 best: 0.4584595 (18)     total: 212ms
171:    learn: 0.2214686     test: 0.6187786 best: 0.4584595 (18)     total: 212ms
172:    learn: 0.2211414     test: 0.6201484 best: 0.4584595 (18)     total: 213ms
173:    learn: 0.2209415     test: 0.6199147 best: 0.4584595 (18)     total: 213ms
174:    learn: 0.2208334     test: 0.6195656 best: 0.4584595 (18)     total: 214ms
175:    learn: 0.2202749     test: 0.6188770 best: 0.4584595 (18)     total: 214ms
176:    learn: 0.2199997     test: 0.6208761 best: 0.4584595 (18)     total: 215ms
177:    learn: 0.2196721     test: 0.6232887 best: 0.4584595 (18)     total: 216ms
178:    learn: 0.2193595     test: 0.6228074 best: 0.4584595 (18)     total: 216ms
179:    learn: 0.2189354     test: 0.6233274 best: 0.4584595 (18)     total: 217ms
180:    learn: 0.2186551     test: 0.6246106 best: 0.4584595 (18)     total: 217ms
181:    learn: 0.2182733     test: 0.6251752 best: 0.4584595 (18)     total: 218ms
182:    learn: 0.2180800     test: 0.6265296 best: 0.4584595 (18)     total: 218ms
183:    learn: 0.2178948     test: 0.6257717 best: 0.4584595 (18)     total: 219ms
184:    learn: 0.2176323     test: 0.6271124 best: 0.4584595 (18)     total: 220ms
185:    learn: 0.2172865     test: 0.6272018 best: 0.4584595 (18)     total: 221ms
186:    learn: 0.2169568     test: 0.6286656 best: 0.4584595 (18)     total: 222ms
187:    learn: 0.2166482     test: 0.6285824 best: 0.4584595 (18)     total: 222ms
188:    learn: 0.2163914     test: 0.6290112 best: 0.4584595 (18)     total: 223ms
189:    learn: 0.2160669     test: 0.6306967 best: 0.4584595 (18)     total: 224ms
190:    learn: 0.2157025     test: 0.6321421 best: 0.4584595 (18)     total: 224ms
191:    learn: 0.2154375     test: 0.6318742 best: 0.4584595 (18)     total: 225ms
192:    learn: 0.2150640     test: 0.6322932 best: 0.4584595 (18)     total: 225ms
193:    learn: 0.2147377     test: 0.6337765 best: 0.4584595 (18)     total: 226ms
194:    learn: 0.2146896     test: 0.6336886 best: 0.4584595 (18)     total: 227ms
195:    learn: 0.2146314     test: 0.6340966 best: 0.4584595 (18)     total: 227ms
196:    learn: 0.2143994     test: 0.6346879 best: 0.4584595 (18)     total: 228ms
197:    learn: 0.2141674     test: 0.6353726 best: 0.4584595 (18)     total: 228ms
198:    learn: 0.2138939     test: 0.6369678 best: 0.4584595 (18)     total: 229ms
199:    learn: 0.2137503     test: 0.6372791 best: 0.4584595 (18)     total: 230ms
200:    learn: 0.2134437     test: 0.6374621 best: 0.4584595 (18)     total: 230ms
201:    learn: 0.2130933     test: 0.6372671 best: 0.4584595 (18)     total: 231ms
202:    learn: 0.2128844     test: 0.6385018 best: 0.4584595 (18)     total: 231ms
203:    learn: 0.2126720     test: 0.6397945 best: 0.4584595 (18)     total: 232ms
204:    learn: 0.2123843     test: 0.6406451 best: 0.4584595 (18)     total: 232ms
205:    learn: 0.2122459     test: 0.6411686 best: 0.4584595 (18)     total: 233ms
206:    learn: 0.2119107     test: 0.6414341 best: 0.4584595 (18)     total: 234ms
207:    learn: 0.2117142     test: 0.6427099 best: 0.4584595 (18)     total: 234ms
208:    learn: 0.2114437     test: 0.6441991 best: 0.4584595 (18)     total: 235ms
209:    learn: 0.2112538     test: 0.6457330 best: 0.4584595 (18)     total: 236ms
210:    learn: 0.2110192     test: 0.6471850 best: 0.4584595 (18)     total: 236ms
211:    learn: 0.2108665     test: 0.6492526 best: 0.4584595 (18)     total: 237ms
212:    learn: 0.2106712     test: 0.6501768 best: 0.4584595 (18)     total: 237ms
213:    learn: 0.2105778     test: 0.6514270 best: 0.4584595 (18)     total: 238ms
214:    learn: 0.2104531     test: 0.6520967 best: 0.4584595 (18)     total: 239ms
215:    learn: 0.2102643     test: 0.6522545 best: 0.4584595 (18)     total: 240ms
216:    learn: 0.2101541     test: 0.6524258 best: 0.4584595 (18)     total: 240ms
217:    learn: 0.2100860     test: 0.6532840 best: 0.4584595 (18)     total: 241ms
218:    learn: 0.2099067     test: 0.6539634 best: 0.4584595 (18)     total: 242ms
219:    learn: 0.2096569     test: 0.6544893 best: 0.4584595 (18)     total: 243ms
220:    learn: 0.2096226     test: 0.6545556 best: 0.4584595 (18)     total: 243ms
221:    learn: 0.2095112     test: 0.6551662 best: 0.4584595 (18)     total: 244ms
222:    learn: 0.2092756     test: 0.6541143 best: 0.4584595 (18)     total: 245ms
223:    learn: 0.2090559     test: 0.6555424 best: 0.4584595 (18)     total: 245ms
224:    learn: 0.2089005     test: 0.6569859 best: 0.4584595 (18)     total: 246ms
225:    learn: 0.2087496     test: 0.6575167 best: 0.4584595 (18)     total: 247ms
226:    learn: 0.2085037     test: 0.6590567 best: 0.4584595 (18)     total: 247ms
227:    learn: 0.2083490     test: 0.6595140 best: 0.4584595 (18)     total: 248ms
228:    learn: 0.2082193     test: 0.6601767 best: 0.4584595 (18)     total: 249ms
229:    learn: 0.2081425     test: 0.6599557 best: 0.4584595 (18)     total: 249ms
230:    learn: 0.2080972     test: 0.6600111 best: 0.4584595 (18)     total: 250ms
231:    learn: 0.2080071     test: 0.6604216 best: 0.4584595 (18)     total: 251ms
232:    learn: 0.2076951     test: 0.6604484 best: 0.4584595 (18)     total: 251ms
233:    learn: 0.2075396     test: 0.6610500 best: 0.4584595 (18)     total: 252ms
234:    learn: 0.2074698     test: 0.6609605 best: 0.4584595 (18)     total: 253ms
235:    learn: 0.2074043     test: 0.6620678 best: 0.4584595 (18)     total: 254ms
236:    learn: 0.2072856     test: 0.6636078 best: 0.4584595 (18)     total: 254ms
237:    learn: 0.2072166     test: 0.6648712 best: 0.4584595 (18)     total: 255ms
238:    learn: 0.2071087     test: 0.6666561 best: 0.4584595 (18)     total: 256ms
239:    learn: 0.2069476     test: 0.6675835 best: 0.4584595 (18)     total: 256ms
240:    learn: 0.2069210     test: 0.6677607 best: 0.4584595 (18)     total: 257ms
241:    learn: 0.2067780     test: 0.6682877 best: 0.4584595 (18)     total: 258ms
242:    learn: 0.2066041     test: 0.6688840 best: 0.4584595 (18)     total: 258ms
243:    learn: 0.2063796     test: 0.6690193 best: 0.4584595 (18)     total: 259ms
244:    learn: 0.2060923     test: 0.6690455 best: 0.4584595 (18)     total: 260ms
245:    learn: 0.2060546     test: 0.6690540 best: 0.4584595 (18)     total: 261ms
246:    learn: 0.2059093     test: 0.6700560 best: 0.4584595 (18)     total: 261ms
247:    learn: 0.2058476     test: 0.6699762 best: 0.4584595 (18)     total: 262ms
248:    learn: 0.2056988     test: 0.6703027 best: 0.4584595 (18)     total: 263ms
249:    learn: 0.2054965     test: 0.6703555 best: 0.4584595 (18)     total: 264ms
250:    learn: 0.2054603     test: 0.6703022 best: 0.4584595 (18)     total: 264ms
251:    learn: 0.2052855     test: 0.6705488 best: 0.4584595 (18)     total: 265ms
252:    learn: 0.2050578     test: 0.6708757 best: 0.4584595 (18)     total: 266ms
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253:    learn: 0.2049321    test: 0.6708049 best: 0.4584595 (18)    total: 266ms
254:    learn: 0.2048209    test: 0.6720476 best: 0.4584595 (18)    total: 267ms
255:    learn: 0.2047233    test: 0.6716765 best: 0.4584595 (18)    total: 267ms
256:    learn: 0.2046051    test: 0.6716146 best: 0.4584595 (18)    total: 268ms
257:    learn: 0.2045235    test: 0.6720235 best: 0.4584595 (18)    total: 269ms
258:    learn: 0.2044745    test: 0.6729892 best: 0.4584595 (18)    total: 269ms
259:    learn: 0.2044066    test: 0.6729415 best: 0.4584595 (18)    total: 270ms
260:    learn: 0.2041384    test: 0.6737934 best: 0.4584595 (18)    total: 270ms
261:    learn: 0.2039181    test: 0.6748321 best: 0.4584595 (18)    total: 271ms
262:    learn: 0.2038050    test: 0.6742081 best: 0.4584595 (18)    total: 271ms
263:    learn: 0.2036793    test: 0.6748670 best: 0.4584595 (18)    total: 272ms
264:    learn: 0.2035953    test: 0.6759946 best: 0.4584595 (18)    total: 273ms
265:    learn: 0.2035001    test: 0.6774125 best: 0.4584595 (18)    total: 273ms
266:    learn: 0.2034644    test: 0.6764401 best: 0.4584595 (18)    total: 275ms
267:    learn: 0.2033032    test: 0.6771843 best: 0.4584595 (18)    total: 275ms
268:    learn: 0.2031386    test: 0.6785180 best: 0.4584595 (18)    total: 276ms
269:    learn: 0.2029908    test: 0.6793720 best: 0.4584595 (18)    total: 277ms
270:    learn: 0.2029305    test: 0.6789951 best: 0.4584595 (18)    total: 278ms
271:    learn: 0.2028521    test: 0.6790185 best: 0.4584595 (18)    total: 278ms
272:    learn: 0.2027706    test: 0.6803794 best: 0.4584595 (18)    total: 279ms
273:    learn: 0.2026538    test: 0.6808757 best: 0.4584595 (18)    total: 280ms
274:    learn: 0.2025622    test: 0.6815213 best: 0.4584595 (18)    total: 281ms
275:    learn: 0.2025433    test: 0.6814566 best: 0.4584595 (18)    total: 282ms
276:    learn: 0.2024669    test: 0.6819982 best: 0.4584595 (18)    total: 283ms
277:    learn: 0.2023038    test: 0.6824257 best: 0.4584595 (18)    total: 283ms
278:    learn: 0.2021203    test: 0.6841772 best: 0.4584595 (18)    total: 284ms
279:    learn: 0.2019347    test: 0.6841366 best: 0.4584595 (18)    total: 285ms
280:    learn: 0.2018792    test: 0.6842797 best: 0.4584595 (18)    total: 286ms
281:    learn: 0.2018014    test: 0.6841786 best: 0.4584595 (18)    total: 288ms
282:    learn: 0.2016429    test: 0.6855184 best: 0.4584595 (18)    total: 289ms
283:    learn: 0.2016279    test: 0.6855941 best: 0.4584595 (18)    total: 290ms
284:    learn: 0.2014790    test: 0.6865081 best: 0.4584595 (18)    total: 290ms
285:    learn: 0.2013234    test: 0.6853867 best: 0.4584595 (18)    total: 291ms
286:    learn: 0.2012551    test: 0.6852783 best: 0.4584595 (18)    total: 292ms
287:    learn: 0.2011616    test: 0.6848630 best: 0.4584595 (18)    total: 292ms
288:    learn: 0.2010245    test: 0.6858340 best: 0.4584595 (18)    total: 293ms
289:    learn: 0.2008879    test: 0.6871505 best: 0.4584595 (18)    total: 294ms
290:    learn: 0.2007903    test: 0.6879356 best: 0.4584595 (18)    total: 294ms
291:    learn: 0.2006367    test: 0.6895619 best: 0.4584595 (18)    total: 295ms
292:    learn: 0.2005835    test: 0.6895060 best: 0.4584595 (18)    total: 296ms
293:    learn: 0.2005561    test: 0.6893937 best: 0.4584595 (18)    total: 296ms
294:    learn: 0.2005295    test: 0.6900627 best: 0.4584595 (18)    total: 297ms
295:    learn: 0.2004317    test: 0.6909658 best: 0.4584595 (18)    total: 298ms
296:    learn: 0.2003455    test: 0.6919095 best: 0.4584595 (18)    total: 298ms
297:    learn: 0.2002021    test: 0.6935107 best: 0.4584595 (18)    total: 299ms
298:    learn: 0.2001050    test: 0.6940205 best: 0.4584595 (18)    total: 300ms
299:    learn: 0.1999763    test: 0.6939478 best: 0.4584595 (18)    total: 301ms
300:    learn: 0.1998467    test: 0.6955087 best: 0.4584595 (18)    total: 301ms
301:    learn: 0.1996402    test: 0.6957617 best: 0.4584595 (18)    total: 302ms
302:    learn: 0.1996046    test: 0.6965032 best: 0.4584595 (18)    total: 303ms
303:    learn: 0.1995392    test: 0.6970220 best: 0.4584595 (18)    total: 303ms
304:    learn: 0.1994902    test: 0.6969198 best: 0.4584595 (18)    total: 304ms
305:    learn: 0.1994277    test: 0.6976217 best: 0.4584595 (18)    total: 305ms
306:    learn: 0.1993145    test: 0.6978980 best: 0.4584595 (18)    total: 305ms
307:    learn: 0.1992332    test: 0.6977740 best: 0.4584595 (18)    total: 306ms
308:    learn: 0.1991061    test: 0.6977067 best: 0.4584595 (18)    total: 307ms
309:    learn: 0.1989910    test: 0.6985242 best: 0.4584595 (18)    total: 307ms
310:    learn: 0.1988717    test: 0.7001147 best: 0.4584595 (18)    total: 308ms
311:    learn: 0.1988151    test: 0.7003164 best: 0.4584595 (18)    total: 309ms
312:    learn: 0.1987276    test: 0.7002283 best: 0.4584595 (18)    total: 309ms
313:    learn: 0.1985839    test: 0.7004925 best: 0.4584595 (18)    total: 310ms
314:    learn: 0.1985257    test: 0.7013868 best: 0.4584595 (18)    total: 310ms
315:    learn: 0.1984283    test: 0.7026867 best: 0.4584595 (18)    total: 311ms
316:    learn: 0.1983544    test: 0.7040226 best: 0.4584595 (18)    total: 312ms
317:    learn: 0.1982882    test: 0.7051414 best: 0.4584595 (18)    total: 312ms
318:    learn: 0.1981910    test: 0.7052095 best: 0.4584595 (18)    total: 313ms
319:    learn: 0.1981399    test: 0.7060122 best: 0.4584595 (18)    total: 314ms
320:    learn: 0.1980109    test: 0.7064371 best: 0.4584595 (18)    total: 314ms
321:    learn: 0.1978503    test: 0.7068762 best: 0.4584595 (18)    total: 315ms
322:    learn: 0.1978149    test: 0.7070737 best: 0.4584595 (18)    total: 316ms
323:    learn: 0.1977649    test: 0.7077255 best: 0.4584595 (18)    total: 316ms
324:    learn: 0.1976948    test: 0.7076505 best: 0.4584595 (18)    total: 317ms
325:    learn: 0.1976281    test: 0.7085585 best: 0.4584595 (18)    total: 318ms
326:    learn: 0.1975792    test: 0.7089618 best: 0.4584595 (18)    total: 319ms
327:    learn: 0.1975045    test: 0.7100038 best: 0.4584595 (18)    total: 320ms
328:    learn: 0.1974005    test: 0.7104380 best: 0.4584595 (18)    total: 320ms
329:    learn: 0.1973003    test: 0.7112621 best: 0.4584595 (18)    total: 321ms
330:    learn: 0.1972641    test: 0.7111683 best: 0.4584595 (18)    total: 321ms
331:    learn: 0.1971831    test: 0.7127391 best: 0.4584595 (18)    total: 322ms
332:    learn: 0.1971371    test: 0.7135925 best: 0.4584595 (18)    total: 322ms
333:    learn: 0.1969947    test: 0.7140282 best: 0.4584595 (18)    total: 323ms
334:    learn: 0.1968912    test: 0.7139418 best: 0.4584595 (18)    total: 324ms
335:    learn: 0.1968783    test: 0.7137419 best: 0.4584595 (18)    total: 324ms
336:    learn: 0.1968187    test: 0.7140166 best: 0.4584595 (18)    total: 325ms
337:    learn: 0.1967358    test: 0.7143232 best: 0.4584595 (18)    total: 326ms
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337:    learn: 0.1967998    test: 0.7145232 best: 0.4584595 (18)    total: 326ms
338:    learn: 0.1966573    test: 0.7145375 best: 0.4584595 (18)    total: 326ms
339:    learn: 0.1966251    test: 0.7145343 best: 0.4584595 (18)    total: 327ms
340:    learn: 0.1965218    test: 0.7161772 best: 0.4584595 (18)    total: 327ms
341:    learn: 0.1963972    test: 0.7166154 best: 0.4584595 (18)    total: 328ms
342:    learn: 0.1963262    test: 0.7174821 best: 0.4584595 (18)    total: 328ms
343:    learn: 0.1962459    test: 0.7179290 best: 0.4584595 (18)    total: 329ms
344:    learn: 0.1962133    test: 0.7179148 best: 0.4584595 (18)    total: 330ms
345:    learn: 0.1961219    test: 0.7182335 best: 0.4584595 (18)    total: 330ms
346:    learn: 0.1960501    test: 0.7192861 best: 0.4584595 (18)    total: 331ms
347:    learn: 0.1959882    test: 0.7200611 best: 0.4584595 (18)    total: 331ms
348:    learn: 0.1959102    test: 0.7211230 best: 0.4584595 (18)    total: 332ms
349:    learn: 0.1958453    test: 0.7213400 best: 0.4584595 (18)    total: 334ms
350:    learn: 0.1957544    test: 0.7222451 best: 0.4584595 (18)    total: 335ms
351:    learn: 0.1956634    test: 0.7224820 best: 0.4584595 (18)    total: 335ms
352:    learn: 0.1956329    test: 0.7225051 best: 0.4584595 (18)    total: 336ms
353:    learn: 0.1955630    test: 0.7231238 best: 0.4584595 (18)    total: 336ms
354:    learn: 0.1955004    test: 0.7235631 best: 0.4584595 (18)    total: 337ms
355:    learn: 0.1954856    test: 0.7231949 best: 0.4584595 (18)    total: 338ms
356:    learn: 0.1954725    test: 0.7232447 best: 0.4584595 (18)    total: 338ms
357:    learn: 0.1953576    test: 0.7238983 best: 0.4584595 (18)    total: 339ms
358:    learn: 0.1952912    test: 0.7260243 best: 0.4584595 (18)    total: 339ms
359:    learn: 0.1952175    test: 0.7271009 best: 0.4584595 (18)    total: 340ms
360:    learn: 0.1951744    test: 0.7273840 best: 0.4584595 (18)    total: 340ms
361:    learn: 0.1951079    test: 0.7278339 best: 0.4584595 (18)    total: 341ms
362:    learn: 0.1950714    test: 0.7280770 best: 0.4584595 (18)    total: 342ms
363:    learn: 0.1950259    test: 0.7285306 best: 0.4584595 (18)    total: 342ms
364:    learn: 0.1949926    test: 0.7288110 best: 0.4584595 (18)    total: 343ms
365:    learn: 0.1949721    test: 0.7288647 best: 0.4584595 (18)    total: 343ms
366:    learn: 0.1948946    test: 0.7300217 best: 0.4584595 (18)    total: 344ms
367:    learn: 0.1948388    test: 0.7311467 best: 0.4584595 (18)    total: 345ms
368:    learn: 0.1948271    test: 0.7308704 best: 0.4584595 (18)    total: 345ms
369:    learn: 0.1947929    test: 0.7318301 best: 0.4584595 (18)    total: 346ms
370:    learn: 0.1946859    test: 0.7323984 best: 0.4584595 (18)    total: 346ms
371:    learn: 0.1946321    test: 0.7335449 best: 0.4584595 (18)    total: 347ms
372:    learn: 0.1945265    test: 0.7336949 best: 0.4584595 (18)    total: 347ms
373:    learn: 0.1944594    test: 0.7336967 best: 0.4584595 (18)    total: 348ms
374:    learn: 0.1944088    test: 0.7349184 best: 0.4584595 (18)    total: 349ms
375:    learn: 0.1943645    test: 0.7353959 best: 0.4584595 (18)    total: 349ms
376:    learn: 0.1943009    test: 0.7364230 best: 0.4584595 (18)    total: 350ms
377:    learn: 0.1942610    test: 0.7365876 best: 0.4584595 (18)    total: 351ms
378:    learn: 0.1942124    test: 0.7371324 best: 0.4584595 (18)    total: 352ms
379:    learn: 0.1941519    test: 0.7379192 best: 0.4584595 (18)    total: 352ms
380:    learn: 0.1940995    test: 0.7389941 best: 0.4584595 (18)    total: 353ms
381:    learn: 0.1940442    test: 0.7394430 best: 0.4584595 (18)    total: 353ms
382:    learn: 0.1939929    test: 0.7409221 best: 0.4584595 (18)    total: 354ms
383:    learn: 0.1939310    test: 0.7412049 best: 0.4584595 (18)    total: 355ms
384:    learn: 0.1938308    test: 0.7416708 best: 0.4584595 (18)    total: 355ms
385:    learn: 0.1937683    test: 0.7418567 best: 0.4584595 (18)    total: 356ms
386:    learn: 0.1937072    test: 0.7421059 best: 0.4584595 (18)    total: 357ms
387:    learn: 0.1936190    test: 0.7420127 best: 0.4584595 (18)    total: 357ms
388:    learn: 0.1935639    test: 0.7421511 best: 0.4584595 (18)    total: 358ms
389:    learn: 0.1935292    test: 0.7423757 best: 0.4584595 (18)    total: 358ms
390:    learn: 0.1934547    test: 0.7432126 best: 0.4584595 (18)    total: 359ms
391:    learn: 0.1934377    test: 0.7437182 best: 0.4584595 (18)    total: 359ms
392:    learn: 0.1934164    test: 0.7437833 best: 0.4584595 (18)    total: 360ms
393:    learn: 0.1934011    test: 0.7443617 best: 0.4584595 (18)    total: 361ms
394:    learn: 0.1933689    test: 0.7446271 best: 0.4584595 (18)    total: 361ms
395:    learn: 0.1933209    test: 0.7455875 best: 0.4584595 (18)    total: 362ms
396:    learn: 0.1932649    test: 0.7451788 best: 0.4584595 (18)    total: 362ms
397:    learn: 0.1932149    test: 0.7457885 best: 0.4584595 (18)    total: 363ms
398:    learn: 0.1931600    test: 0.7466441 best: 0.4584595 (18)    total: 364ms
399:    learn: 0.1931216    test: 0.7475582 best: 0.4584595 (18)    total: 364ms
400:    learn: 0.1930706    test: 0.7480858 best: 0.4584595 (18)    total: 365ms
401:    learn: 0.1930452    test: 0.7482926 best: 0.4584595 (18)    total: 365ms
402:    learn: 0.1929964    test: 0.7483319 best: 0.4584595 (18)    total: 366ms
403:    learn: 0.1929841    test: 0.7482685 best: 0.4584595 (18)    total: 367ms
404:    learn: 0.1929247    test: 0.7488074 best: 0.4584595 (18)    total: 367ms
405:    learn: 0.1928509    test: 0.7488159 best: 0.4584595 (18)    total: 368ms
406:    learn: 0.1928085    test: 0.7492855 best: 0.4584595 (18)    total: 369ms
407:    learn: 0.1927828    test: 0.7495127 best: 0.4584595 (18)    total: 369ms
408:    learn: 0.1927443    test: 0.7500308 best: 0.4584595 (18)    total: 370ms
409:    learn: 0.1926674    test: 0.7517500 best: 0.4584595 (18)    total: 371ms
410:    learn: 0.1926096    test: 0.7519753 best: 0.4584595 (18)    total: 372ms
411:    learn: 0.1925413    test: 0.7528809 best: 0.4584595 (18)    total: 372ms
412:    learn: 0.1924614    test: 0.7530341 best: 0.4584595 (18)    total: 373ms
413:    learn: 0.1923688    test: 0.7539041 best: 0.4584595 (18)    total: 373ms
414:    learn: 0.1923067    test: 0.7541883 best: 0.4584595 (18)    total: 374ms
415:    learn: 0.1922103    test: 0.7550141 best: 0.4584595 (18)    total: 375ms
416:    learn: 0.1921317    test: 0.7548780 best: 0.4584595 (18)    total: 375ms
417:    learn: 0.1920821    test: 0.7553640 best: 0.4584595 (18)    total: 376ms
418:    learn: 0.1920132    test: 0.7564786 best: 0.4584595 (18)    total: 376ms
419:    learn: 0.1919692    test: 0.7566396 best: 0.4584595 (18)    total: 377ms
420:    learn: 0.1919017    test: 0.7573273 best: 0.4584595 (18)    total: 378ms
421:    learn: 0.1918771    test: 0.7581823 best: 0.4584595 (18)    total: 378ms
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422:     learn: 0.1918105      test: 0.7579646 best: 0.4584595 (18)     total: 379ms
423:     learn: 0.1917407      test: 0.7587377 best: 0.4584595 (18)     total: 379ms
424:     learn: 0.1916953      test: 0.7596930 best: 0.4584595 (18)     total: 380ms
425:     learn: 0.1916853      test: 0.7596846 best: 0.4584595 (18)     total: 380ms
426:     learn: 0.1916177      test: 0.7599032 best: 0.4584595 (18)     total: 382ms
427:     learn: 0.1915747      test: 0.7608354 best: 0.4584595 (18)     total: 382ms
428:     learn: 0.1915557      test: 0.7612847 best: 0.4584595 (18)     total: 383ms
429:     learn: 0.1915300      test: 0.7612611 best: 0.4584595 (18)     total: 384ms
430:     learn: 0.1915021      test: 0.7614245 best: 0.4584595 (18)     total: 385ms
431:     learn: 0.1914733      test: 0.7613921 best: 0.4584595 (18)     total: 385ms
432:     learn: 0.1913920      test: 0.7619466 best: 0.4584595 (18)     total: 386ms
433:     learn: 0.1913641      test: 0.7621494 best: 0.4584595 (18)     total: 387ms
434:     learn: 0.1913484      test: 0.7628657 best: 0.4584595 (18)     total: 388ms
435:     learn: 0.1912748      test: 0.7632091 best: 0.4584595 (18)     total: 390ms
436:     learn: 0.1912159      test: 0.7634780 best: 0.4584595 (18)     total: 391ms
437:     learn: 0.1911855      test: 0.7644494 best: 0.4584595 (18)     total: 391ms
438:     learn: 0.1911322      test: 0.7645363 best: 0.4584595 (18)     total: 392ms
439:     learn: 0.1910825      test: 0.7654372 best: 0.4584595 (18)     total: 393ms
440:     learn: 0.1910629      test: 0.7653709 best: 0.4584595 (18)     total: 394ms
441:     learn: 0.1910301      test: 0.7656814 best: 0.4584595 (18)     total: 395ms
442:     learn: 0.1909825      test: 0.7666677 best: 0.4584595 (18)     total: 396ms
443:     learn: 0.1909488      test: 0.7676036 best: 0.4584595 (18)     total: 396ms
444:     learn: 0.1909367      test: 0.7682916 best: 0.4584595 (18)     total: 397ms
445:     learn: 0.1909057      test: 0.7681415 best: 0.4584595 (18)     total: 397ms
446:     learn: 0.1908763      test: 0.7680010 best: 0.4584595 (18)     total: 398ms
447:     learn: 0.1907987      test: 0.7685909 best: 0.4584595 (18)     total: 399ms
448:     learn: 0.1907510      test: 0.7693607 best: 0.4584595 (18)     total: 399ms
449:     learn: 0.1907130      test: 0.7692631 best: 0.4584595 (18)     total: 400ms
450:     learn: 0.1906850      test: 0.7702893 best: 0.4584595 (18)     total: 401ms
451:     learn: 0.1906360      test: 0.7707092 best: 0.4584595 (18)     total: 401ms
452:     learn: 0.1905598      test: 0.7709304 best: 0.4584595 (18)     total: 402ms
453:     learn: 0.1905095      test: 0.7714844 best: 0.4584595 (18)     total: 402ms
454:     learn: 0.1904723      test: 0.7710395 best: 0.4584595 (18)     total: 403ms
455:     learn: 0.1904040      test: 0.7714672 best: 0.4584595 (18)     total: 403ms
456:     learn: 0.1903901      test: 0.7720182 best: 0.4584595 (18)     total: 404ms
457:     learn: 0.1903617      test: 0.7732220 best: 0.4584595 (18)     total: 405ms
458:     learn: 0.1903085      test: 0.7734829 best: 0.4584595 (18)     total: 405ms
459:     learn: 0.1902544      test: 0.7744996 best: 0.4584595 (18)     total: 406ms
460:     learn: 0.1902262      test: 0.7749544 best: 0.4584595 (18)     total: 407ms
461:     learn: 0.1901752      test: 0.7750446 best: 0.4584595 (18)     total: 407ms
462:     learn: 0.1901517      test: 0.7750643 best: 0.4584595 (18)     total: 408ms
463:     learn: 0.1900880      test: 0.7759195 best: 0.4584595 (18)     total: 408ms
464:     learn: 0.1900630      test: 0.7769055 best: 0.4584595 (18)     total: 409ms
465:     learn: 0.1900317      test: 0.7773781 best: 0.4584595 (18)     total: 409ms
466:     learn: 0.1900109      test: 0.7776103 best: 0.4584595 (18)     total: 410ms
467:     learn: 0.1900017      test: 0.7775551 best: 0.4584595 (18)     total: 411ms
468:     learn: 0.1899679      test: 0.7774825 best: 0.4584595 (18)     total: 411ms
469:     learn: 0.1899493      test: 0.7777498 best: 0.4584595 (18)     total: 412ms
470:     learn: 0.1899273      test: 0.7786921 best: 0.4584595 (18)     total: 412ms
471:     learn: 0.1899111      test: 0.7785529 best: 0.4584595 (18)     total: 414ms
472:     learn: 0.1898749      test: 0.7787383 best: 0.4584595 (18)     total: 414ms
473:     learn: 0.1898391      test: 0.7794937 best: 0.4584595 (18)     total: 415ms
474:     learn: 0.1898220      test: 0.7797902 best: 0.4584595 (18)     total: 415ms
475:     learn: 0.1898149      test: 0.7797590 best: 0.4584595 (18)     total: 416ms
476:     learn: 0.1897937      test: 0.7802359 best: 0.4584595 (18)     total: 417ms
477:     learn: 0.1897631      test: 0.7804881 best: 0.4584595 (18)     total: 417ms
478:     learn: 0.1897312      test: 0.7806855 best: 0.4584595 (18)     total: 418ms
479:     learn: 0.1897014      test: 0.7816464 best: 0.4584595 (18)     total: 418ms
480:     learn: 0.1896893      test: 0.7820542 best: 0.4584595 (18)     total: 419ms
481:     learn: 0.1896647      test: 0.7825161 best: 0.4584595 (18)     total: 420ms
482:     learn: 0.1896183      test: 0.7836992 best: 0.4584595 (18)     total: 420m
483:     learn: 0.1895845      test: 0.7838198 best: 0.4584595 (18)     total: 421m
484:     learn: 0.1895704      test: 0.7836568 best: 0.4584595 (18)     total: 421ms
485:     learn: 0.1895529      test: 0.7836315 best: 0.4584595 (18)     total: 422ms
486:     learn: 0.1895420      test: 0.7834669 best: 0.4584595 (18)     total: 423ms
487:     learn: 0.1895245      test: 0.7835164 best: 0.4584595 (18)     total: 423ms
488:     learn: 0.1894723      test: 0.7836459 best: 0.4584595 (18)     total: 424ms
489:     learn: 0.1894247      test: 0.7847366 best: 0.4584595 (18)     total: 425ms
490:     learn: 0.1893923      test: 0.7853791 best: 0.4584595 (18)     total: 425ms
491:     learn: 0.1893877      test: 0.7855165 best: 0.4584595 (18)     total: 426ms
492:     learn: 0.1893669      test: 0.7857571 best: 0.4584595 (18)     total: 426ms
493:     learn: 0.1893573      test: 0.7849729 best: 0.4584595 (18)     total: 427ms
494:     learn: 0.1893205      test: 0.7858566 best: 0.4584595 (18)     total: 428ms
495:     learn: 0.1892893      test: 0.7862259 best: 0.4584595 (18)     total: 428ms
496:     learn: 0.1892436      test: 0.7861398 best: 0.4584595 (18)     total: 429ms
497:     learn: 0.1892212      test: 0.7866619 best: 0.4584595 (18)     total: 429ms
498:     learn: 0.1891773      test: 0.7870166 best: 0.4584595 (18)     total: 430ms
499:     learn: 0.1891591      test: 0.7871960 best: 0.4584595 (18)     total: 431ms
500:     learn: 0.1891429      test: 0.7877651 best: 0.4584595 (18)     total: 432ms
501:     learn: 0.1891053      test: 0.7880972 best: 0.4584595 (18)     total: 432ms
502:     learn: 0.1890851      test: 0.7882486 best: 0.4584595 (18)     total: 433ms
503:     learn: 0.1890497      test: 0.7885271 best: 0.4584595 (18)     total: 433ms
504:     learn: 0.1890460      test: 0.7885422 best: 0.4584595 (18)     total: 434ms
505:     learn: 0.1890055      test: 0.7885336 best: 0.4584595 (18)     total: 435ms
506:     learn: 0.1889682      test: 0.7893260 best: 0.4584595 (18)     total: 435ms
```

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507:    learn: 0.1889654        test: 0.7891726 best: 0.4584595 (18)        total: 436ms
508:    learn: 0.1889535        test: 0.7890386 best: 0.4584595 (18)        total: 436ms
509:    learn: 0.1889109        test: 0.7889580 best: 0.4584595 (18)        total: 437ms
510:    learn: 0.1888689        test: 0.7899739 best: 0.4584595 (18)        total: 437ms
511:    learn: 0.1888578        test: 0.7901277 best: 0.4584595 (18)        total: 438ms
512:    learn: 0.1888529        test: 0.7900190 best: 0.4584595 (18)        total: 439ms
513:    learn: 0.1888465        test: 0.7900506 best: 0.4584595 (18)        total: 440ms
514:    learn: 0.1888093        test: 0.7905145 best: 0.4584595 (18)        total: 440ms
515:    learn: 0.1887265        test: 0.7901514 best: 0.4584595 (18)        total: 441ms
516:    learn: 0.1886892        test: 0.7906232 best: 0.4584595 (18)        total: 441ms
517:    learn: 0.1886279        test: 0.7913291 best: 0.4584595 (18)        total: 442ms
518:    learn: 0.1886019        test: 0.7917481 best: 0.4584595 (18)        total: 442ms
519:    learn: 0.1885740        test: 0.7916462 best: 0.4584595 (18)        total: 443ms
520:    learn: 0.1885687        test: 0.7916423 best: 0.4584595 (18)        total: 444ms
521:    learn: 0.1885503        test: 0.7916044 best: 0.4584595 (18)        total: 444ms
522:    learn: 0.1884990        test: 0.7922733 best: 0.4584595 (18)        total: 445ms
523:    learn: 0.1884845        test: 0.7921444 best: 0.4584595 (18)        total: 446ms
524:    learn: 0.1884656        test: 0.7923332 best: 0.4584595 (18)        total: 446ms
525:    learn: 0.1884469        test: 0.7931394 best: 0.4584595 (18)        total: 447ms
526:    learn: 0.1884121        test: 0.7936445 best: 0.4584595 (18)        total: 447ms
527:    learn: 0.1883870        test: 0.7936269 best: 0.4584595 (18)        total: 448ms
528:    learn: 0.1883748        test: 0.7935290 best: 0.4584595 (18)        total: 449ms
529:    learn: 0.1883563        test: 0.7940429 best: 0.4584595 (18)        total: 450ms
530:    learn: 0.1883331        test: 0.7948319 best: 0.4584595 (18)        total: 450ms
531:    learn: 0.1883051        test: 0.7954384 best: 0.4584595 (18)        total: 451ms
532:    learn: 0.1882608        test: 0.7956559 best: 0.4584595 (18)        total: 452ms
533:    learn: 0.1882237        test: 0.7961954 best: 0.4584595 (18)        total: 452ms
534:    learn: 0.1881882        test: 0.7969480 best: 0.4584595 (18)        total: 453ms
535:    learn: 0.1881609        test: 0.7966673 best: 0.4584595 (18)        total: 453ms
536:    learn: 0.1881459        test: 0.7966460 best: 0.4584595 (18)        total: 454ms
537:    learn: 0.1881257        test: 0.7973207 best: 0.4584595 (18)        total: 454ms
538:    learn: 0.1880999        test: 0.7979252 best: 0.4584595 (18)        total: 455ms
539:    learn: 0.1880502        test: 0.7982246 best: 0.4584595 (18)        total: 456ms
540:    learn: 0.1880259        test: 0.7983003 best: 0.4584595 (18)        total: 456ms
541:    learn: 0.1880026        test: 0.7987245 best: 0.4584595 (18)        total: 457ms
542:    learn: 0.1879739        test: 0.7990029 best: 0.4584595 (18)        total: 457ms
543:    learn: 0.1879290        test: 0.7992677 best: 0.4584595 (18)        total: 458ms
544:    learn: 0.1879039        test: 0.7995255 best: 0.4584595 (18)        total: 459ms
545:    learn: 0.1878727        test: 0.7998200 best: 0.4584595 (18)        total: 460ms
546:    learn: 0.1878663        test: 0.7996995 best: 0.4584595 (18)        total: 461ms
547:    learn: 0.1878364        test: 0.8001064 best: 0.4584595 (18)        total: 462ms
548:    learn: 0.1878253        test: 0.8001869 best: 0.4584595 (18)        total: 463ms
549:    learn: 0.1878228        test: 0.8000468 best: 0.4584595 (18)        total: 464ms
550:    learn: 0.1877929        test: 0.8008645 best: 0.4584595 (18)        total: 465ms
551:    learn: 0.1877695        test: 0.8013350 best: 0.4584595 (18)        total: 465ms
552:    learn: 0.1877190        test: 0.8019823 best: 0.4584595 (18)        total: 466ms
553:    learn: 0.1876904        test: 0.8021503 best: 0.4584595 (18)        total: 466ms
554:    learn: 0.1876864        test: 0.8021677 best: 0.4584595 (18)        total: 467ms
555:    learn: 0.1876634        test: 0.8023949 best: 0.4584595 (18)        total: 468ms
556:    learn: 0.1876322        test: 0.8024218 best: 0.4584595 (18)        total: 468ms
557:    learn: 0.1876073        test: 0.8025922 best: 0.4584595 (18)        total: 469ms
558:    learn: 0.1875819        test: 0.8029593 best: 0.4584595 (18)        total: 469ms
559:    learn: 0.1875759        test: 0.8028758 best: 0.4584595 (18)        total: 470ms
560:    learn: 0.1875648        test: 0.8028324 best: 0.4584595 (18)        total: 471ms
561:    learn: 0.1875345        test: 0.8029510 best: 0.4584595 (18)        total: 472ms
562:    learn: 0.1875200        test: 0.8030259 best: 0.4584595 (18)        total: 473ms
563:    learn: 0.1875158        test: 0.8030452 best: 0.4584595 (18)        total: 473ms
564:    learn: 0.1874911        test: 0.8035400 best: 0.4584595 (18)        total: 474ms
565:    learn: 0.1874843        test: 0.8034789 best: 0.4584595 (18)        total: 475ms
566:    learn: 0.1874798        test: 0.8033723 best: 0.4584595 (18)        total: 475ms
567:    learn: 0.1874771        test: 0.8032765 best: 0.4584595 (18)        total: 476ms
568:    learn: 0.1874546        test: 0.8036039 best: 0.4584595 (18)        total: 476ms
569:    learn: 0.1874305        test: 0.8042445 best: 0.4584595 (18)        total: 477ms
570:    learn: 0.1874087        test: 0.8044648 best: 0.4584595 (18)        total: 478ms
571:    learn: 0.1873653        test: 0.8047555 best: 0.4584595 (18)        total: 478ms
572:    learn: 0.1873534        test: 0.8049525 best: 0.4584595 (18)        total: 480ms
573:    learn: 0.1873460        test: 0.8048770 best: 0.4584595 (18)        total: 480ms
574:    learn: 0.1873271        test: 0.8049745 best: 0.4584595 (18)        total: 481ms
575:    learn: 0.1872897        test: 0.8052493 best: 0.4584595 (18)        total: 482ms
576:    learn: 0.1872656        test: 0.8058369 best: 0.4584595 (18)        total: 483ms
577:    learn: 0.1872527        test: 0.8065338 best: 0.4584595 (18)        total: 484ms
578:    learn: 0.1872447        test: 0.8068923 best: 0.4584595 (18)        total: 484ms
579:    learn: 0.1872196        test: 0.8068907 best: 0.4584595 (18)        total: 485ms
580:    learn: 0.1871930        test: 0.8073007 best: 0.4584595 (18)        total: 486ms
581:    learn: 0.1871779        test: 0.8073286 best: 0.4584595 (18)        total: 487ms
582:    learn: 0.1871598        test: 0.8080394 best: 0.4584595 (18)        total: 487ms
583:    learn: 0.1871404        test: 0.8082456 best: 0.4584595 (18)        total: 488ms
584:    learn: 0.1871207        test: 0.8081797 best: 0.4584595 (18)        total: 489ms
585:    learn: 0.1871005        test: 0.8090302 best: 0.4584595 (18)        total: 490ms
586:    learn: 0.1870698        test: 0.8092636 best: 0.4584595 (18)        total: 490ms
587:    learn: 0.1870485        test: 0.8098461 best: 0.4584595 (18)        total: 491ms
588:    learn: 0.1870216        test: 0.8104005 best: 0.4584595 (18)        total: 492ms
589:    learn: 0.1869885        test: 0.8106366 best: 0.4584595 (18)        total: 494ms
590:    learn: 0.1869858        test: 0.8105502 best: 0.4584595 (18)        total: 494ms
591:    learn: 0.1869703        test: 0.8109272 best: 0.4584595 (18)        total: 495ms
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592:    learn: 0.1869434        test: 0.8113260 best: 0.4584595 (18)        total: 495ms
593:    learn: 0.1869254        test: 0.8123745 best: 0.4584595 (18)        total: 496ms
594:    learn: 0.1869171        test: 0.8129905 best: 0.4584595 (18)        total: 497ms
595:    learn: 0.1869068        test: 0.8131550 best: 0.4584595 (18)        total: 498ms
596:    learn: 0.1868921        test: 0.8134776 best: 0.4584595 (18)        total: 498ms
597:    learn: 0.1868599        test: 0.8139884 best: 0.4584595 (18)        total: 499ms
598:    learn: 0.1868374        test: 0.8140845 best: 0.4584595 (18)        total: 499ms
599:    learn: 0.1868262        test: 0.8149760 best: 0.4584595 (18)        total: 500ms
600:    learn: 0.1868099        test: 0.8151834 best: 0.4584595 (18)        total: 501ms
601:    learn: 0.1867831        test: 0.8161550 best: 0.4584595 (18)        total: 501ms
602:    learn: 0.1867579        test: 0.8169494 best: 0.4584595 (18)        total: 502ms
603:    learn: 0.1867364        test: 0.8175397 best: 0.4584595 (18)        total: 503ms
604:    learn: 0.1867144        test: 0.8177517 best: 0.4584595 (18)        total: 503ms
605:    learn: 0.1866960        test: 0.8178314 best: 0.4584595 (18)        total: 504ms
606:    learn: 0.1866704        test: 0.8182941 best: 0.4584595 (18)        total: 505ms
607:    learn: 0.1866667        test: 0.8181806 best: 0.4584595 (18)        total: 505ms
608:    learn: 0.1866512        test: 0.8180873 best: 0.4584595 (18)        total: 506ms
609:    learn: 0.1866276        test: 0.8184448 best: 0.4584595 (18)        total: 506ms
610:    learn: 0.1866054        test: 0.8188097 best: 0.4584595 (18)        total: 507ms
611:    learn: 0.1865920        test: 0.8193702 best: 0.4584595 (18)        total: 508ms
612:    learn: 0.1865709        test: 0.8201119 best: 0.4584595 (18)        total: 508ms
613:    learn: 0.1865119        test: 0.8205172 best: 0.4584595 (18)        total: 509ms
614:    learn: 0.1864943        test: 0.8208358 best: 0.4584595 (18)        total: 510ms
615:    learn: 0.1864818        test: 0.8213543 best: 0.4584595 (18)        total: 510ms
616:    learn: 0.1864773        test: 0.8212557 best: 0.4584595 (18)        total: 511ms
617:    learn: 0.1864450        test: 0.8225098 best: 0.4584595 (18)        total: 511ms
618:    learn: 0.1864034        test: 0.8230808 best: 0.4584595 (18)        total: 512ms
619:    learn: 0.1863897        test: 0.8234031 best: 0.4584595 (18)        total: 513ms
620:    learn: 0.1863826        test: 0.8238089 best: 0.4584595 (18)        total: 516ms
621:    learn: 0.1863635        test: 0.8245245 best: 0.4584595 (18)        total: 517ms
622:    learn: 0.1863356        test: 0.8253365 best: 0.4584595 (18)        total: 517ms
623:    learn: 0.1863261        test: 0.8252477 best: 0.4584595 (18)        total: 518ms
624:    learn: 0.1863140        test: 0.8255598 best: 0.4584595 (18)        total: 518ms
625:    learn: 0.1863099        test: 0.8256884 best: 0.4584595 (18)        total: 519ms
626:    learn: 0.1863007        test: 0.8256451 best: 0.4584595 (18)        total: 520ms
627:    learn: 0.1862965        test: 0.8257256 best: 0.4584595 (18)        total: 520ms
628:    learn: 0.1862756        test: 0.8260704 best: 0.4584595 (18)        total: 521ms
629:    learn: 0.1862698        test: 0.8259816 best: 0.4584595 (18)        total: 521ms
630:    learn: 0.1862641        test: 0.8254005 best: 0.4584595 (18)        total: 522ms
631:    learn: 0.1862495        test: 0.8263509 best: 0.4584595 (18)        total: 523ms
632:    learn: 0.1862305        test: 0.8264371 best: 0.4584595 (18)        total: 523ms
633:    learn: 0.1862125        test: 0.8270726 best: 0.4584595 (18)        total: 524ms
634:    learn: 0.1861708        test: 0.8267523 best: 0.4584595 (18)        total: 524ms
635:    learn: 0.1861533        test: 0.8272640 best: 0.4584595 (18)        total: 525ms
636:    learn: 0.1861391        test: 0.8278943 best: 0.4584595 (18)        total: 526ms
637:    learn: 0.1861198        test: 0.8284697 best: 0.4584595 (18)        total: 526ms
638:    learn: 0.1861155        test: 0.8283389 best: 0.4584595 (18)        total: 527ms
639:    learn: 0.1860850        test: 0.8285212 best: 0.4584595 (18)        total: 527ms
640:    learn: 0.1860565        test: 0.8292308 best: 0.4584595 (18)        total: 528ms
641:    learn: 0.1860286        test: 0.8294082 best: 0.4584595 (18)        total: 529ms
642:    learn: 0.1860105        test: 0.8293045 best: 0.4584595 (18)        total: 530ms
643:    learn: 0.1859953        test: 0.8294842 best: 0.4584595 (18)        total: 530ms
644:    learn: 0.1859662        test: 0.8295830 best: 0.4584595 (18)        total: 531ms
645:    learn: 0.1859548        test: 0.8297106 best: 0.4584595 (18)        total: 532ms
646:    learn: 0.1859334        test: 0.8297427 best: 0.4584595 (18)        total: 533ms
647:    learn: 0.1858963        test: 0.8301162 best: 0.4584595 (18)        total: 533ms
648:    learn: 0.1858805        test: 0.8305896 best: 0.4584595 (18)        total: 534ms
649:    learn: 0.1858477        test: 0.8308140 best: 0.4584595 (18)        total: 535ms
650:    learn: 0.1858314        test: 0.8310173 best: 0.4584595 (18)        total: 535ms
651:    learn: 0.1858233        test: 0.8309492 best: 0.4584595 (18)        total: 536ms
652:    learn: 0.1858089        test: 0.8310279 best: 0.4584595 (18)        total: 536ms
653:    learn: 0.1857984        test: 0.8315896 best: 0.4584595 (18)        total: 537ms
654:    learn: 0.1857852        test: 0.8317994 best: 0.4584595 (18)        total: 538ms
655:    learn: 0.1857708        test: 0.8325976 best: 0.4584595 (18)        total: 538ms
656:    learn: 0.1857444        test: 0.8327327 best: 0.4584595 (18)        total: 539ms
657:    learn: 0.1857184        test: 0.8334752 best: 0.4584595 (18)        total: 539ms
658:    learn: 0.1856916        test: 0.8335494 best: 0.4584595 (18)        total: 540ms
659:    learn: 0.1856692        test: 0.8335802 best: 0.4584595 (18)        total: 540ms
660:    learn: 0.1856528        test: 0.8340764 best: 0.4584595 (18)        total: 541ms
661:    learn: 0.1856329        test: 0.8347925 best: 0.4584595 (18)        total: 542ms
662:    learn: 0.1856203        test: 0.8351237 best: 0.4584595 (18)        total: 542ms
663:    learn: 0.1856094        test: 0.8344673 best: 0.4584595 (18)        total: 543ms
664:    learn: 0.1855919        test: 0.8344513 best: 0.4584595 (18)        total: 543ms
665:    learn: 0.1855801        test: 0.8352033 best: 0.4584595 (18)        total: 544ms
666:    learn: 0.1855356        test: 0.8355817 best: 0.4584595 (18)        total: 544ms
667:    learn: 0.1855222        test: 0.8361691 best: 0.4584595 (18)        total: 545ms
668:    learn: 0.1855166        test: 0.8360788 best: 0.4584595 (18)        total: 546ms
669:    learn: 0.1854940        test: 0.8359251 best: 0.4584595 (18)        total: 546ms
670:    learn: 0.1854805        test: 0.8357545 best: 0.4584595 (18)        total: 547ms
671:    learn: 0.1854617        test: 0.8357873 best: 0.4584595 (18)        total: 547ms
672:    learn: 0.1854510        test: 0.8359200 best: 0.4584595 (18)        total: 548ms
673:    learn: 0.1854241        test: 0.8360912 best: 0.4584595 (18)        total: 549ms
674:    learn: 0.1854145        test: 0.8362181 best: 0.4584595 (18)        total: 549ms
675:    learn: 0.1853974        test: 0.8363216 best: 0.4584595 (18)        total: 550ms
676:    learn: 0.1853848        test: 0.8364002 best: 0.4584595 (18)        total: 550ms
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676:    learn: 0.1853848        test: 0.8364002 best: 0.4584595 (18)        total: 550ms
677:    learn: 0.1853794        test: 0.8363383 best: 0.4584595 (18)        total: 551ms
678:    learn: 0.1853629        test: 0.8368014 best: 0.4584595 (18)        total: 554ms
679:    learn: 0.1853449        test: 0.8373635 best: 0.4584595 (18)        total: 555ms
680:    learn: 0.1853337        test: 0.8377403 best: 0.4584595 (18)        total: 555ms
681:    learn: 0.1853228        test: 0.8384581 best: 0.4584595 (18)        total: 556ms
682:    learn: 0.1853142        test: 0.8386008 best: 0.4584595 (18)        total: 557ms
683:    learn: 0.1853116        test: 0.8385507 best: 0.4584595 (18)        total: 557ms
684:    learn: 0.1853058        test: 0.8383354 best: 0.4584595 (18)        total: 558ms
685:    learn: 0.1852954        test: 0.8385777 best: 0.4584595 (18)        total: 558ms
686:    learn: 0.1852878        test: 0.8387683 best: 0.4584595 (18)        total: 559ms
687:    learn: 0.1852832        test: 0.8382599 best: 0.4584595 (18)        total: 559ms
688:    learn: 0.1852712        test: 0.8384737 best: 0.4584595 (18)        total: 560ms
689:    learn: 0.1852617        test: 0.8389511 best: 0.4584595 (18)        total: 561ms
690:    learn: 0.1852514        test: 0.8391823 best: 0.4584595 (18)        total: 561ms
691:    learn: 0.1852394        test: 0.8397851 best: 0.4584595 (18)        total: 562ms
692:    learn: 0.1852294        test: 0.8399289 best: 0.4584595 (18)        total: 562ms
693:    learn: 0.1852086        test: 0.8407252 best: 0.4584595 (18)        total: 563ms
694:    learn: 0.1852014        test: 0.8406504 best: 0.4584595 (18)        total: 564ms
695:    learn: 0.1851963        test: 0.8410079 best: 0.4584595 (18)        total: 564ms
696:    learn: 0.1851849        test: 0.8415744 best: 0.4584595 (18)        total: 565ms
697:    learn: 0.1851691        test: 0.8417113 best: 0.4584595 (18)        total: 565ms
698:    learn: 0.1851484        test: 0.8422852 best: 0.4584595 (18)        total: 566ms
699:    learn: 0.1851286        test: 0.8429246 best: 0.4584595 (18)        total: 567ms
700:    learn: 0.1851225        test: 0.8431221 best: 0.4584595 (18)        total: 568ms
701:    learn: 0.1851138        test: 0.8432606 best: 0.4584595 (18)        total: 568ms
702:    learn: 0.1850922        test: 0.8434301 best: 0.4584595 (18)        total: 569ms
703:    learn: 0.1850674        test: 0.8435411 best: 0.4584595 (18)        total: 570ms
704:    learn: 0.1850512        test: 0.8436802 best: 0.4584595 (18)        total: 571ms
705:    learn: 0.1850435        test: 0.8436636 best: 0.4584595 (18)        total: 571ms
706:    learn: 0.1850305        test: 0.8437498 best: 0.4584595 (18)        total: 572ms
707:    learn: 0.1850168        test: 0.8438987 best: 0.4584595 (18)        total: 573ms
708:    learn: 0.1849937        test: 0.8446221 best: 0.4584595 (18)        total: 574ms
709:    learn: 0.1849825        test: 0.8450589 best: 0.4584595 (18)        total: 575ms
710:    learn: 0.1849672        test: 0.8450147 best: 0.4584595 (18)        total: 576ms
711:    learn: 0.1849355        test: 0.8453080 best: 0.4584595 (18)        total: 577ms
712:    learn: 0.1849252        test: 0.8448620 best: 0.4584595 (18)        total: 577ms
713:    learn: 0.1849036        test: 0.8455712 best: 0.4584595 (18)        total: 578ms
714:    learn: 0.1848983        test: 0.8456584 best: 0.4584595 (18)        total: 579ms
715:    learn: 0.1848903        test: 0.8456427 best: 0.4584595 (18)        total: 579ms
716:    learn: 0.1848715        test: 0.8464239 best: 0.4584595 (18)        total: 580ms
717:    learn: 0.1848614        test: 0.8467086 best: 0.4584595 (18)        total: 581ms
718:    learn: 0.1848411        test: 0.8474081 best: 0.4584595 (18)        total: 581ms
719:    learn: 0.1848218        test: 0.8480909 best: 0.4584595 (18)        total: 582ms
720:    learn: 0.1848138        test: 0.8483305 best: 0.4584595 (18)        total: 582ms
721:    learn: 0.1848094        test: 0.8481666 best: 0.4584595 (18)        total: 583ms
722:    learn: 0.1848016        test: 0.8483949 best: 0.4584595 (18)        total: 584ms
723:    learn: 0.1847998        test: 0.8484509 best: 0.4584595 (18)        total: 584ms
724:    learn: 0.1847798        test: 0.8488680 best: 0.4584595 (18)        total: 585ms
725:    learn: 0.1847605        test: 0.8493858 best: 0.4584595 (18)        total: 586ms
726:    learn: 0.1847446        test: 0.8494794 best: 0.4584595 (18)        total: 586ms
727:    learn: 0.1847192        test: 0.8496791 best: 0.4584595 (18)        total: 587ms
728:    learn: 0.1847073        test: 0.8502208 best: 0.4584595 (18)        total: 587ms
729:    learn: 0.1846971        test: 0.8504270 best: 0.4584595 (18)        total: 588ms
730:    learn: 0.1846860        test: 0.8509900 best: 0.4584595 (18)        total: 588ms
731:    learn: 0.1846674        test: 0.8511640 best: 0.4584595 (18)        total: 589ms
732:    learn: 0.1846554        test: 0.8517212 best: 0.4584595 (18)        total: 590ms
733:    learn: 0.1846518        test: 0.8521317 best: 0.4584595 (18)        total: 590ms
734:    learn: 0.1846402        test: 0.8525325 best: 0.4584595 (18)        total: 591ms
735:    learn: 0.1846193        test: 0.8526039 best: 0.4584595 (18)        total: 591ms
736:    learn: 0.1846149        test: 0.8524733 best: 0.4584595 (18)        total: 592ms
737:    learn: 0.1846028        test: 0.8532485 best: 0.4584595 (18)        total: 593ms
738:    learn: 0.1845844        test: 0.8535259 best: 0.4584595 (18)        total: 593ms
739:    learn: 0.1845670        test: 0.8541336 best: 0.4584595 (18)        total: 594ms
740:    learn: 0.1845501        test: 0.8542888 best: 0.4584595 (18)        total: 594ms
741:    learn: 0.1845365        test: 0.8542417 best: 0.4584595 (18)        total: 595ms
742:    learn: 0.1845176        test: 0.8546165 best: 0.4584595 (18)        total: 596ms
743:    learn: 0.1845058        test: 0.8544281 best: 0.4584595 (18)        total: 596ms
744:    learn: 0.1844672        test: 0.8538586 best: 0.4584595 (18)        total: 597ms
745:    learn: 0.1844546        test: 0.8543229 best: 0.4584595 (18)        total: 597ms
746:    learn: 0.1844376        test: 0.8549098 best: 0.4584595 (18)        total: 598ms
747:    learn: 0.1844245        test: 0.8554378 best: 0.4584595 (18)        total: 599ms
748:    learn: 0.1844118        test: 0.8560118 best: 0.4584595 (18)        total: 599ms
749:    learn: 0.1844018        test: 0.8562005 best: 0.4584595 (18)        total: 600ms
750:    learn: 0.1843877        test: 0.8567992 best: 0.4584595 (18)        total: 601ms
751:    learn: 0.1843778        test: 0.8568398 best: 0.4584595 (18)        total: 602ms
752:    learn: 0.1843686        test: 0.8573261 best: 0.4584595 (18)        total: 602ms
753:    learn: 0.1843556        test: 0.8578511 best: 0.4584595 (18)        total: 603ms
754:    learn: 0.1843326        test: 0.8580092 best: 0.4584595 (18)        total: 603ms
755:    learn: 0.1843182        test: 0.8585979 best: 0.4584595 (18)        total: 604ms
756:    learn: 0.1843026        test: 0.8593168 best: 0.4584595 (18)        total: 605ms
757:    learn: 0.1842911        test: 0.8598165 best: 0.4584595 (18)        total: 605ms
758:    learn: 0.1842843        test: 0.8598677 best: 0.4584595 (18)        total: 606ms
759:    learn: 0.1842769        test: 0.8599981 best: 0.4584595 (18)        total: 606ms
760:    learn: 0.1842680        test: 0.8603546 best: 0.4584595 (18)        total: 607ms
```

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761:    learn: 0.1842551        test: 0.8609494 best: 0.4584595 (18)    total: 607ms
762:    learn: 0.1842437        test: 0.8612273 best: 0.4584595 (18)    total: 608ms
763:    learn: 0.1842370        test: 0.8613799 best: 0.4584595 (18)    total: 609ms
764:    learn: 0.1842307        test: 0.8615775 best: 0.4584595 (18)    total: 609ms
765:    learn: 0.1842190        test: 0.8615628 best: 0.4584595 (18)    total: 610ms
766:    learn: 0.1842126        test: 0.8615107 best: 0.4584595 (18)    total: 610ms
767:    learn: 0.1841902        test: 0.8616693 best: 0.4584595 (18)    total: 611ms
768:    learn: 0.1841739        test: 0.8617582 best: 0.4584595 (18)    total: 612ms
769:    learn: 0.1841640        test: 0.8625478 best: 0.4584595 (18)    total: 612ms
770:    learn: 0.1841515        test: 0.8629260 best: 0.4584595 (18)    total: 613ms
771:    learn: 0.1841456        test: 0.8628725 best: 0.4584595 (18)    total: 614ms
772:    learn: 0.1841278        test: 0.8630332 best: 0.4584595 (18)    total: 614ms
773:    learn: 0.1841115        test: 0.8637004 best: 0.4584595 (18)    total: 615ms
774:    learn: 0.1841001        test: 0.8636098 best: 0.4584595 (18)    total: 615ms
775:    learn: 0.1840910        test: 0.8636654 best: 0.4584595 (18)    total: 616ms
776:    learn: 0.1840805        test: 0.8641180 best: 0.4584595 (18)    total: 616ms
777:    learn: 0.1840734        test: 0.8645177 best: 0.4584595 (18)    total: 617ms
778:    learn: 0.1840574        test: 0.8651918 best: 0.4584595 (18)    total: 618ms
779:    learn: 0.1840551        test: 0.8653138 best: 0.4584595 (18)    total: 618ms
780:    learn: 0.1840425        test: 0.8658649 best: 0.4584595 (18)    total: 619ms
781:    learn: 0.1840388        test: 0.8660722 best: 0.4584595 (18)    total: 620ms
782:    learn: 0.1840371        test: 0.8660632 best: 0.4584595 (18)    total: 620ms
783:    learn: 0.1840311        test: 0.8664450 best: 0.4584595 (18)    total: 621ms
784:    learn: 0.1840196        test: 0.8665578 best: 0.4584595 (18)    total: 621ms
785:    learn: 0.1840047        test: 0.8666832 best: 0.4584595 (18)    total: 622ms
786:    learn: 0.1839970        test: 0.8670081 best: 0.4584595 (18)    total: 623ms
787:    learn: 0.1839891        test: 0.8672041 best: 0.4584595 (18)    total: 623ms
788:    learn: 0.1839774        test: 0.8674622 best: 0.4584595 (18)    total: 624ms
789:    learn: 0.1839448        test: 0.8677326 best: 0.4584595 (18)    total: 625ms
790:    learn: 0.1839351        test: 0.8676252 best: 0.4584595 (18)    total: 625ms
791:    learn: 0.1839239        test: 0.8680484 best: 0.4584595 (18)    total: 626ms
792:    learn: 0.1839146        test: 0.8680048 best: 0.4584595 (18)    total: 626ms
793:    learn: 0.1838979        test: 0.8682944 best: 0.4584595 (18)    total: 628ms
794:    learn: 0.1838932        test: 0.8684449 best: 0.4584595 (18)    total: 628ms
795:    learn: 0.1838874        test: 0.8690152 best: 0.4584595 (18)    total: 629ms
796:    learn: 0.1838777        test: 0.8693335 best: 0.4584595 (18)    total: 630ms
797:    learn: 0.1838591        test: 0.8697704 best: 0.4584595 (18)    total: 630ms
798:    learn: 0.1838531        test: 0.8700956 best: 0.4584595 (18)    total: 631ms
799:    learn: 0.1838424        test: 0.8701591 best: 0.4584595 (18)    total: 631ms
800:    learn: 0.1838324        test: 0.8706875 best: 0.4584595 (18)    total: 632ms
801:    learn: 0.1838081        test: 0.8711470 best: 0.4584595 (18)    total: 633ms
802:    learn: 0.1838012        test: 0.8711292 best: 0.4584595 (18)    total: 633ms
803:    learn: 0.1837983        test: 0.8711755 best: 0.4584595 (18)    total: 634ms
804:    learn: 0.1837883        test: 0.8710930 best: 0.4584595 (18)    total: 634ms
805:    learn: 0.1837786        test: 0.8712022 best: 0.4584595 (18)    total: 635ms
806:    learn: 0.1837725        test: 0.8711445 best: 0.4584595 (18)    total: 636ms
807:    learn: 0.1837669        test: 0.8714710 best: 0.4584595 (18)    total: 637ms
808:    learn: 0.1837519        test: 0.8715542 best: 0.4584595 (18)    total: 638ms
809:    learn: 0.1837402        test: 0.8721180 best: 0.4584595 (18)    total: 638ms
810:    learn: 0.1837374        test: 0.8724714 best: 0.4584595 (18)    total: 639ms
811:    learn: 0.1837352        test: 0.8724879 best: 0.4584595 (18)    total: 640ms
812:    learn: 0.1837329        test: 0.8724345 best: 0.4584595 (18)    total: 640ms
813:    learn: 0.1837192        test: 0.8728921 best: 0.4584595 (18)    total: 641ms
814:    learn: 0.1836995        test: 0.8730320 best: 0.4584595 (18)    total: 641ms
815:    learn: 0.1836916        test: 0.8726428 best: 0.4584595 (18)    total: 642ms
816:    learn: 0.1836874        test: 0.8725256 best: 0.4584595 (18)    total: 643ms
817:    learn: 0.1836853        test: 0.8725064 best: 0.4584595 (18)    total: 643ms
818:    learn: 0.1836801        test: 0.8724543 best: 0.4584595 (18)    total: 644ms
819:    learn: 0.1836659        test: 0.8730319 best: 0.4584595 (18)    total: 644ms
820:    learn: 0.1836558        test: 0.8733020 best: 0.4584595 (18)    total: 645ms
821:    learn: 0.1836526        test: 0.8732091 best: 0.4584595 (18)    total: 646ms
822:    learn: 0.1836458        test: 0.8735966 best: 0.4584595 (18)    total: 646ms
823:    learn: 0.1836387        test: 0.8739547 best: 0.4584595 (18)    total: 647ms
824:    learn: 0.1836279        test: 0.8737727 best: 0.4584595 (18)    total: 647ms
825:    learn: 0.1836256        test: 0.8734619 best: 0.4584595 (18)    total: 648ms
826:    learn: 0.1836210        test: 0.8734770 best: 0.4584595 (18)    total: 648ms
827:    learn: 0.1836159        test: 0.8738041 best: 0.4584595 (18)    total: 649ms
828:    learn: 0.1836059        test: 0.8740988 best: 0.4584595 (18)    total: 650ms
829:    learn: 0.1835938        test: 0.8741894 best: 0.4584595 (18)    total: 650ms
830:    learn: 0.1835793        test: 0.8747604 best: 0.4584595 (18)    total: 651ms
831:    learn: 0.1835671        test: 0.8749167 best: 0.4584595 (18)    total: 651ms
832:    learn: 0.1835579        test: 0.8750581 best: 0.4584595 (18)    total: 652ms
833:    learn: 0.1835522        test: 0.8750931 best: 0.4584595 (18)    total: 653ms
834:    learn: 0.1835436        test: 0.8750865 best: 0.4584595 (18)    total: 653ms
835:    learn: 0.1835291        test: 0.8750385 best: 0.4584595 (18)    total: 654ms
836:    learn: 0.1835246        test: 0.8754897 best: 0.4584595 (18)    total: 654ms
837:    learn: 0.1835172        test: 0.8755502 best: 0.4584595 (18)    total: 655ms
838:    learn: 0.1835066        test: 0.8761770 best: 0.4584595 (18)    total: 656ms
839:    learn: 0.1834885        test: 0.8763345 best: 0.4584595 (18)    total: 657ms
840:    learn: 0.1834867        test: 0.8761613 best: 0.4584595 (18)    total: 658ms
841:    learn: 0.1834773        test: 0.8764311 best: 0.4584595 (18)    total: 659ms
842:    learn: 0.1834639        test: 0.8764718 best: 0.4584595 (18)    total: 659ms
843:    learn: 0.1834519        test: 0.8765116 best: 0.4584595 (18)    total: 660ms
844:    learn: 0.1834473        test: 0.8762675 best: 0.4584595 (18)    total: 661ms
845:    learn: 0.1834368        test: 0.8767673 best: 0.4584595 (18)    total: 661ms
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846:    learn: 0.1834208      test: 0.8768649 best: 0.4584595 (18)      total: 663ms
847:    learn: 0.1833922      test: 0.8763871 best: 0.4584595 (18)      total: 663ms
848:    learn: 0.1833791      test: 0.8769377 best: 0.4584595 (18)      total: 664ms
849:    learn: 0.1833660      test: 0.8772514 best: 0.4584595 (18)      total: 665ms
850:    learn: 0.1833599      test: 0.8772348 best: 0.4584595 (18)      total: 666ms
851:    learn: 0.1833467      test: 0.8776037 best: 0.4584595 (18)      total: 667ms
852:    learn: 0.1833353      test: 0.8776160 best: 0.4584595 (18)      total: 668ms
853:    learn: 0.1833310      test: 0.8779686 best: 0.4584595 (18)      total: 668ms
854:    learn: 0.1833214      test: 0.8782478 best: 0.4584595 (18)      total: 669ms
855:    learn: 0.1833146      test: 0.8782277 best: 0.4584595 (18)      total: 670ms
856:    learn: 0.1833045      test: 0.8782292 best: 0.4584595 (18)      total: 671ms
857:    learn: 0.1832939      test: 0.8787553 best: 0.4584595 (18)      total: 672ms
858:    learn: 0.1832853      test: 0.8787230 best: 0.4584595 (18)      total: 673ms
859:    learn: 0.1832764      test: 0.8792634 best: 0.4584595 (18)      total: 674ms
860:    learn: 0.1832672      test: 0.8794803 best: 0.4584595 (18)      total: 674ms
861:    learn: 0.1832574      test: 0.8796407 best: 0.4584595 (18)      total: 675ms
862:    learn: 0.1832406      test: 0.8797780 best: 0.4584595 (18)      total: 676ms
863:    learn: 0.1832337      test: 0.8800289 best: 0.4584595 (18)      total: 676ms
864:    learn: 0.1832298      test: 0.8801863 best: 0.4584595 (18)      total: 677ms
865:    learn: 0.1832198      test: 0.8802777 best: 0.4584595 (18)      total: 678ms
866:    learn: 0.1832027      test: 0.8801259 best: 0.4584595 (18)      total: 678ms
867:    learn: 0.1831962      test: 0.8805305 best: 0.4584595 (18)      total: 679ms
868:    learn: 0.1831869      test: 0.8808429 best: 0.4584595 (18)      total: 679ms
869:    learn: 0.1831735      test: 0.8813747 best: 0.4584595 (18)      total: 680ms
870:    learn: 0.1831609      test: 0.8811010 best: 0.4584595 (18)      total: 680ms
871:    learn: 0.1831554      test: 0.8814999 best: 0.4584595 (18)      total: 681ms
872:    learn: 0.1831401      test: 0.8815006 best: 0.4584595 (18)      total: 682ms
873:    learn: 0.1831297      test: 0.8820323 best: 0.4584595 (18)      total: 682ms
874:    learn: 0.1831159      test: 0.8822437 best: 0.4584595 (18)      total: 683ms
875:    learn: 0.1831027      test: 0.8821898 best: 0.4584595 (18)      total: 683ms
876:    learn: 0.1830935      test: 0.8823839 best: 0.4584595 (18)      total: 684ms
877:    learn: 0.1830833      test: 0.8824863 best: 0.4584595 (18)      total: 684ms
878:    learn: 0.1830753      test: 0.8824917 best: 0.4584595 (18)      total: 685ms
879:    learn: 0.1830676      test: 0.8825092 best: 0.4584595 (18)      total: 686ms
880:    learn: 0.1830527      test: 0.8832451 best: 0.4584595 (18)      total: 686ms
881:    learn: 0.1830415      test: 0.8833102 best: 0.4584595 (18)      total: 687ms
882:    learn: 0.1830235      test: 0.8835098 best: 0.4584595 (18)      total: 687ms
883:    learn: 0.1830192      test: 0.8836195 best: 0.4584595 (18)      total: 688ms
884:    learn: 0.1830114      test: 0.8836111 best: 0.4584595 (18)      total: 689ms
885:    learn: 0.1830022      test: 0.8841265 best: 0.4584595 (18)      total: 689ms
886:    learn: 0.1829957      test: 0.8842827 best: 0.4584595 (18)      total: 690ms
887:    learn: 0.1829861      test: 0.8844157 best: 0.4584595 (18)      total: 690ms
888:    learn: 0.1829751      test: 0.8845691 best: 0.4584595 (18)      total: 691ms
889:    learn: 0.1829662      test: 0.8848165 best: 0.4584595 (18)      total: 691ms
890:    learn: 0.1829554      test: 0.8853910 best: 0.4584595 (18)      total: 692ms
891:    learn: 0.1829389      test: 0.8855681 best: 0.4584595 (18)      total: 693ms
892:    learn: 0.1829190      test: 0.8862090 best: 0.4584595 (18)      total: 693ms
893:    learn: 0.1829094      test: 0.8865618 best: 0.4584595 (18)      total: 694ms
894:    learn: 0.1829025      test: 0.8866229 best: 0.4584595 (18)      total: 695ms
895:    learn: 0.1828987      test: 0.8869434 best: 0.4584595 (18)      total: 695ms
896:    learn: 0.1828945      test: 0.8870288 best: 0.4584595 (18)      total: 696ms
897:    learn: 0.1828860      test: 0.8871037 best: 0.4584595 (18)      total: 696ms
898:    learn: 0.1828835      test: 0.8869772 best: 0.4584595 (18)      total: 697ms
899:    learn: 0.1828785      test: 0.8870683 best: 0.4584595 (18)      total: 698ms
900:    learn: 0.1828711      test: 0.8875750 best: 0.4584595 (18)      total: 699ms
901:    learn: 0.1828649      test: 0.8881454 best: 0.4584595 (18)      total: 700ms
902:    learn: 0.1828601      test: 0.8881550 best: 0.4584595 (18)      total: 700ms
903:    learn: 0.1828535      test: 0.8884284 best: 0.4584595 (18)      total: 701ms
904:    learn: 0.1828441      test: 0.8885707 best: 0.4584595 (18)      total: 702ms
905:    learn: 0.1828372      test: 0.8888971 best: 0.4584595 (18)      total: 702ms
906:    learn: 0.1828240      test: 0.8890063 best: 0.4584595 (18)      total: 703ms
907:    learn: 0.1828136      test: 0.8893252 best: 0.4584595 (18)      total: 703ms
908:    learn: 0.1828056      test: 0.8895975 best: 0.4584595 (18)      total: 704ms
909:    learn: 0.1827988      test: 0.8896541 best: 0.4584595 (18)      total: 705ms
910:    learn: 0.1827915      test: 0.8897597 best: 0.4584595 (18)      total: 705ms
911:    learn: 0.1827842      test: 0.8902268 best: 0.4584595 (18)      total: 706ms
912:    learn: 0.1827770      test: 0.8904844 best: 0.4584595 (18)      total: 706ms
913:    learn: 0.1827637      test: 0.8905909 best: 0.4584595 (18)      total: 707ms
914:    learn: 0.1827538      test: 0.8908575 best: 0.4584595 (18)      total: 708ms
915:    learn: 0.1827410      test: 0.8915240 best: 0.4584595 (18)      total: 708ms
916:    learn: 0.1827347      test: 0.8911783 best: 0.4584595 (18)      total: 709ms
917:    learn: 0.1827289      test: 0.8912324 best: 0.4584595 (18)      total: 709ms
918:    learn: 0.1827248      test: 0.8913292 best: 0.4584595 (18)      total: 710ms
919:    learn: 0.1827233      test: 0.8914192 best: 0.4584595 (18)      total: 711ms
920:    learn: 0.1827117      test: 0.8918877 best: 0.4584595 (18)      total: 711ms
921:    learn: 0.1827097      test: 0.8920358 best: 0.4584595 (18)      total: 712ms
922:    learn: 0.1827039      test: 0.8925188 best: 0.4584595 (18)      total: 712ms
923:    learn: 0.1826963      test: 0.8928338 best: 0.4584595 (18)      total: 713ms
924:    learn: 0.1826835      test: 0.8930541 best: 0.4584595 (18)      total: 714ms
925:    learn: 0.1826719      test: 0.8934325 best: 0.4584595 (18)      total: 715ms
926:    learn: 0.1826645      test: 0.8938287 best: 0.4584595 (18)      total: 716ms
927:    learn: 0.1826594      test: 0.8939755 best: 0.4584595 (18)      total: 716ms
928:    learn: 0.1826475      test: 0.8940695 best: 0.4584595 (18)      total: 717ms
929:    learn: 0.1826387      test: 0.8941947 best: 0.4584595 (18)      total: 718ms
930:    learn: 0.1826347      test: 0.8945616 best: 0.4584595 (18)      total: 718ms
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931:   learn: 0.1826269       test: 0.8947691 best: 0.4584595 (18)      total: 719ms
932:   learn: 0.1826248       test: 0.8946177 best: 0.4584595 (18)      total: 719ms
933:   learn: 0.1826221       test: 0.8944962 best: 0.4584595 (18)      total: 720ms
934:   learn: 0.1826120       test: 0.8946386 best: 0.4584595 (18)      total: 721ms
935:   learn: 0.1826035       test: 0.8947766 best: 0.4584595 (18)      total: 721ms
936:   learn: 0.1825974       test: 0.8952423 best: 0.4584595 (18)      total: 722ms
937:   learn: 0.1825926       test: 0.8955206 best: 0.4584595 (18)      total: 722ms
938:   learn: 0.1825800       test: 0.8956323 best: 0.4584595 (18)      total: 723ms
939:   learn: 0.1825779       test: 0.8955302 best: 0.4584595 (18)      total: 723ms
940:   learn: 0.1825686       test: 0.8958318 best: 0.4584595 (18)      total: 724ms
941:   learn: 0.1825668       test: 0.8957471 best: 0.4584595 (18)      total: 725ms
942:   learn: 0.1825613       test: 0.8960785 best: 0.4584595 (18)      total: 725ms
943:   learn: 0.1825556       test: 0.8962064 best: 0.4584595 (18)      total: 726ms
944:   learn: 0.1825454       test: 0.8966605 best: 0.4584595 (18)      total: 727ms
945:   learn: 0.1825372       test: 0.8969309 best: 0.4584595 (18)      total: 727ms
946:   learn: 0.1825286       test: 0.8971643 best: 0.4584595 (18)      total: 728ms
947:   learn: 0.1825186       test: 0.8972903 best: 0.4584595 (18)      total: 728ms
948:   learn: 0.1825133       test: 0.8975898 best: 0.4584595 (18)      total: 729ms
949:   learn: 0.1825063       test: 0.8976291 best: 0.4584595 (18)      total: 730ms
950:   learn: 0.1824993       test: 0.8979590 best: 0.4584595 (18)      total: 730ms
951:   learn: 0.1824930       test: 0.8981507 best: 0.4584595 (18)      total: 731ms
952:   learn: 0.1824893       test: 0.8982618 best: 0.4584595 (18)      total: 731ms
953:   learn: 0.1824840       test: 0.8986433 best: 0.4584595 (18)      total: 732ms
954:   learn: 0.1824803       test: 0.8985864 best: 0.4584595 (18)      total: 733ms
955:   learn: 0.1824742       test: 0.8988188 best: 0.4584595 (18)      total: 734ms
956:   learn: 0.1824706       test: 0.8991905 best: 0.4584595 (18)      total: 735ms
957:   learn: 0.1824694       test: 0.8991852 best: 0.4584595 (18)      total: 736ms
958:   learn: 0.1824663       test: 0.8993765 best: 0.4584595 (18)      total: 736ms
959:   learn: 0.1824584       test: 0.8991753 best: 0.4584595 (18)      total: 737ms
960:   learn: 0.1824502       test: 0.8992726 best: 0.4584595 (18)      total: 738ms
961:   learn: 0.1824485       test: 0.8991423 best: 0.4584595 (18)      total: 738ms
962:   learn: 0.1824450       test: 0.8994813 best: 0.4584595 (18)      total: 739ms
963:   learn: 0.1824430       test: 0.8995212 best: 0.4584595 (18)      total: 739ms
964:   learn: 0.1824400       test: 0.8994682 best: 0.4584595 (18)      total: 740ms
965:   learn: 0.1824351       test: 0.8994806 best: 0.4584595 (18)      total: 741ms
966:   learn: 0.1824273       test: 0.8999574 best: 0.4584595 (18)      total: 741ms
967:   learn: 0.1824207       test: 0.9002927 best: 0.4584595 (18)      total: 742ms
968:   learn: 0.1824136       test: 0.9002043 best: 0.4584595 (18)      total: 742ms
969:   learn: 0.1824081       test: 0.9003394 best: 0.4584595 (18)      total: 743ms
970:   learn: 0.1824030       test: 0.9003374 best: 0.4584595 (18)      total: 743ms
971:   learn: 0.1823925       test: 0.9006717 best: 0.4584595 (18)      total: 744ms
972:   learn: 0.1823833       test: 0.9015285 best: 0.4584595 (18)      total: 745ms
973:   learn: 0.1823721       test: 0.9016487 best: 0.4584595 (18)      total: 745ms
974:   learn: 0.1823670       test: 0.9018128 best: 0.4584595 (18)      total: 746ms
975:   learn: 0.1823653       test: 0.9017962 best: 0.4584595 (18)      total: 746ms
976:   learn: 0.1823589       test: 0.9021003 best: 0.4584595 (18)      total: 747ms
977:   learn: 0.1823472       test: 0.9028203 best: 0.4584595 (18)      total: 748ms
978:   learn: 0.1823371       test: 0.9030778 best: 0.4584595 (18)      total: 748ms
979:   learn: 0.1823295       test: 0.9031420 best: 0.4584595 (18)      total: 749ms
980:   learn: 0.1823231       test: 0.9034930 best: 0.4584595 (18)      total: 749ms
981:   learn: 0.1823097       test: 0.9036162 best: 0.4584595 (18)      total: 750ms
982:   learn: 0.1823062       test: 0.9036519 best: 0.4584595 (18)      total: 750ms
983:   learn: 0.1823034       test: 0.9036292 best: 0.4584595 (18)      total: 751ms
984:   learn: 0.1822952       test: 0.9041396 best: 0.4584595 (18)      total: 752ms
985:   learn: 0.1822871       test: 0.9041553 best: 0.4584595 (18)      total: 752ms
986:   learn: 0.1822772       test: 0.9044823 best: 0.4584595 (18)      total: 753ms
987:   learn: 0.1822728       test: 0.9049117 best: 0.4584595 (18)      total: 754ms
988:   learn: 0.1822624       test: 0.9047628 best: 0.4584595 (18)      total: 755ms
989:   learn: 0.1822556       test: 0.9049201 best: 0.4584595 (18)      total: 756ms
990:   learn: 0.1822497       test: 0.9052169 best: 0.4584595 (18)      total: 756ms
991:   learn: 0.1822407       test: 0.9053540 best: 0.4584595 (18)      total: 757ms
992:   learn: 0.1822392       test: 0.9052651 best: 0.4584595 (18)      total: 757ms
993:   learn: 0.1822328       test: 0.9057869 best: 0.4584595 (18)      total: 758ms
994:   learn: 0.1822277       test: 0.9065278 best: 0.4584595 (18)      total: 759ms
995:   learn: 0.1822197       test: 0.9065830 best: 0.4584595 (18)      total: 759ms
996:   learn: 0.1822107       test: 0.9067203 best: 0.4584595 (18)      total: 760ms
997:   learn: 0.1822058       test: 0.9070180 best: 0.4584595 (18)      total: 760ms
998:   learn: 0.1821994       test: 0.9072990 best: 0.4584595 (18)      total: 761ms
999:   learn: 0.1821970       test: 0.9075108 best: 0.4584595 (18)      total: 762ms


bestTest = 0.4584594843
bestIteration = 18

Shrink model to first 19 iterations.
<catboost.core.CatBoostClassifier at 0x20cddd053f0>
```

```python
y_pred_catboost = catboost.predict(x_test)


from sklearn.metrics import classification_report,accuracy_score
print(classification_report(y_test,y_pred_catboost))
print(f"دقت مدل : {accuracy_score(y_test,y_pred_catboost):.3f}")
```

	precision	recall	f1-score	support
0	0.85	1.00	0.92	33
1	0.00	0.00	0.00	6
accuracy			0.85	39
macro avg	0.42	0.50	0.46	39
weighted avg	0.72	0.85	0.78	39

دقت مدل : 0.846

CoxPHFitter

مدل کاکس ∨

```
from lifelines import CoxPHFitter


datacox = pd.read_csv('DATA1.csv')
df_cox = datacox.iloc[:,3:5]
```

محاسبه زمان بر اساس روز برای الگوریتم کاکس ∨

```
import pandas as pd

# تبدیل ستون‌های admission و Release_date خطاها مدیریت با تاریخ فرمت به
df_cox['admission'] = pd.to_datetime(df_cox['admission'], format='%y/%m/%d', errors='coerce')
df_cox['Release_date'] = pd.to_datetime(df_cox['Release_date'], format='%y/%m/%d', errors='coerce')

# نامعتبر تاریخ‌های بررسی
invalid_dates = df_cox[df_cox['admission'].isna() | df_cox['Release_date'].isna()]
if not invalid_dates.empty:
    print("Invalid dates found:")
    print(invalid_dates)
    # کنید حذف را نامعتبر مقادیر یا کنید اصلاح را خطاها می‌توانید است نیاز اگر
    df_cox = df_cox.dropna(subset=['admission', 'Release_date'])

# بین زمان مدت محاسبه admission و Release_date جدید ستون در آن ذخیره و 'time'
df_cox['time'] = (df_cox['Release_date'] - df_cox['admission']).dt.days

# از سطر چند اولین نمایش DataFrame بررسی برای
print(df_cox.head())
```

```
Invalid dates found:
      admission Release_date
53   1983-12-19          NaT
66          NaT   1989-01-10
161  1990-02-28          NaT
162         NaT   1990-05-01
167  1990-04-18          NaT
174  1990-10-12          NaT
179  1990-09-16          NaT
203  1991-11-24          NaT
211  1992-03-11          NaT
227  1992-11-06          NaT
229  1992-07-06          NaT
231  1992-08-03          NaT
    admission Release_date  time
0  1982-10-02   1986-02-25  1242
1  1982-08-13   1985-12-25  1230
2  1982-08-08   1985-10-02  1151
3  1981-12-12   1991-12-08  3648
4  1982-05-18   1985-06-21  1130
```

```
dataforcox = pd.concat([dataclean,df_cox],axis=1)
```

```
dataforcox.drop(['admission','Release_date'],axis=1,inplace=True)
```

```
dataforcox.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 259 entries, 0 to 258
Data columns (total 17 columns):
 #   Column                      Non-Null Count  Dtype
---  ------                      --------------  -----
 0   Gender                      259 non-null    int64
 1   Age                         259 non-null    int32
 2   ت تشخیص متاستاز مغزی  259    non-null    int32
 3   ت تشخیص متاستاز بیضه  259    non-null    int32
 4   تشخیص          259          non-null    int64
 5   اسپلنومگالی         259       non-null    int32
 6   هپاتومگالی          259        non-null    int32
 7   نتیجه ی درمان       259       non-null    int32
 8   A+                          259 non-null    int32
 9   A-                          259 non-null    int32
 10  AB+                         259 non-null    int32
 11  AB-                         259 non-null    int32
 12  B+                          259 non-null    int32
 13  B-                          259 non-null    int32
 14  O+                          259 non-null    int32
 15  O-                          259 non-null    int32
 16  time                        247 non-null    float64
dtypes: float64(1), int32(14), int64(2)
memory usage: 20.4 KB
```

dataforcox

	Gender	Age	ت تشخیص متاستاز مغزی	ت تشخیص متاستاز بیضه	تشخیص	اسپلنومگالی	هپاتومگالی	نتیجه ی درمان	A+	A-	AB+	AB-	B+	B-	O
0	1	3	0	1	1	1	1	1	0	0	0	0	0	1	
1	1	11	0	0	1	1	1	1	0	0	0	0	0	0	
2	1	5	0	0	1	1	1	1	0	0	0	0	0	0	
3	0	10	1	0	1	1	1	1	0	0	0	0	1		
4	0	11	0	0	1	1	1	1	0	0	0	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
254	0	1	0	0	0	1	1	1	0	0	0	0	0	0	
255	1	3	1	0	0	1	1	0	0	0	0	0	0	0	
256	1	10	0	0	0	1	1	0	0	0	0	0	1	0	
257	1	2	1	0	0	0	0	0	1	0	0	0	0	0	

```python
column_to_move = 'نتیجه ی درمان'
df = dataforcox[[col for col in dataforcox.columns if col != column_to_move] + [column_to_move]]
```

```python
df['time'].isnull().sum()
```

12

```python
mean_time = df['time'].mean()
```

```python
# پر کردن مقادیر null با میانگین
df['time'].fillna(mean_time, inplace=True)
```

```python
df['time'].isnull().sum()
```

0

```python
df.isnull().sum()
```

```
Gender                      0
Age                         0
ت تشخیص متاستاز مغزی  0
ت تشخیص متاستاز بیضه  0
تشخیص          0
اسپلنومگالی         0
هپاتومگالی          0
A+                          0
```

ChatGPT

```
A-                    0
AB+                   0
AB-                   0
B+                    0
B-                    0
O+                    0
O-                    0
time                  0
نتیجه ی درمان          0
dtype: int64
```

```python
from lifelines import CoxPHFitter
```