Домашнее задание по курсу ММО

Васильев А.Р. ИУ5-24М

Шаги выполнения ДЗ:

1) Поиск и выбор набора данных для построения моделей машинного обучения. На основе выбранного набора данных студент должен построить модели машинного обучения для решения или задачи классификации, или задачи регрессии.

2) Проведение разведочного анализа данных. Построение графиков, необходимых для понимания структуры данных. Анализ и заполнение пропусков в данных.

3) Выбор признаков, подходящих для построения моделей. Кодирование категориальных признаков Масштабирование данных. Формирование вспомогательных признаков, улучшающих качество моделей.

4) Проведение корреляционного анализа данных. Формирование промежуточных выводов о возможности построения моделей машинного обучения. В зависимости от набора данных, порядок выполнения пунктов 2, 3, 4 может быть изменен.

5) Выбор метрик для последующей оценки качества моделей. Необходимо выбрать не менее двух метрик и обосновать выбор.

6) Выбор наиболее подходящих моделей для решения задачи классификации или регрессии. Необходимо использовать не менее трех моделей, хотя бы одна из которых должна быть ансамблевой.

7) Формирование обучающей и тестовой выборок на основе исходного набора данных. Построение базового решения (baseline) для выбранных моделей без подбора гиперпараметров. Производится обучение моделей на основе обучающей выборки и оценка качества моделей на основе тестовой выборки.

8) Подбор гиперпараметров для выбранных моделей. Рекомендуется подбирать не более 1-2 гиперпараметров. Рекомендуется использовать методы кросс-валидации. В зависимости от используемой библиотеки можно применять функцию GridSearchCV, использовать перебор параметров в цикле, или использовать другие методы.

9) Повторение пункта 8 для найденных оптимальных значений гиперпараметров.

10) Сравнение качества полученных моделей с качеством baseline-моделей.

11) Формирование выводов о качестве построенных моделей на основе выбранных метрик.

In [2]:
```
!pip install --upgrade pip
!pip install --upgrade imbalanced-learn
```

Collecting pip

```
        Downloading https://files.pythonhosted.org/packages/cd/6f/43037c7bcc8bd8ba7c907425
6b1a11596daa15555808ec748048c1507f08/pip-21.1.1-py3-none-any.whl (1.5MB)
        |████████████████████████████████| 1.6MB 11.6MB/s
Installing collected packages: pip
  Found existing installation: pip 19.3.1
    Uninstalling pip-19.3.1:
      Successfully uninstalled pip-19.3.1
Successfully installed pip-21.1.1
Requirement already satisfied: imbalanced-learn in /usr/local/lib/python3.7/dist-pac
kages (0.4.3)
Collecting imbalanced-learn
  Downloading imbalanced_learn-0.8.0-py3-none-any.whl (206 kB)
        |████████████████████████████████| 206 kB 13.7 MB/s
Collecting scikit-learn>=0.24
  Downloading scikit_learn-0.24.2-cp37-cp37m-manylinux2010_x86_64.whl (22.3 MB)
        |████████████████████████████████| 22.3 MB 1.7 MB/s
Requirement already satisfied: scipy>=0.19.1 in /usr/local/lib/python3.7/dist-packag
es (from imbalanced-learn) (1.4.1)
Requirement already satisfied: numpy>=1.13.3 in /usr/local/lib/python3.7/dist-packag
es (from imbalanced-learn) (1.19.5)
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.7/dist-package
s (from imbalanced-learn) (1.0.1)
Collecting threadpoolctl>=2.0.0
  Downloading threadpoolctl-2.1.0-py3-none-any.whl (12 kB)
Installing collected packages: threadpoolctl, scikit-learn, imbalanced-learn
  Attempting uninstall: scikit-learn
    Found existing installation: scikit-learn 0.22.2.post1
    Uninstalling scikit-learn-0.22.2.post1:
      Successfully uninstalled scikit-learn-0.22.2.post1
  Attempting uninstall: imbalanced-learn
    Found existing installation: imbalanced-learn 0.4.3
    Uninstalling imbalanced-learn-0.4.3:
      Successfully uninstalled imbalanced-learn-0.4.3
Successfully installed imbalanced-learn-0.8.0 scikit-learn-0.24.2 threadpoolctl-2.1.
0
WARNING: Running pip as root will break packages and permissions. You should install
packages reliably by using venv: https://pip.pypa.io/warnings/venv
```

In [ ]:
```python
!pip install category-encoders
!pip install catboost
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from category_encoders import TargetEncoder
```

link to competition

1)Поиск и выбор набора данных

In [ ]:
```python
!pip install kaggle
import os
os.environ['KAGGLE_USERNAME'] = "XXXXXXXXXXXXXXXXXXXXXXXX"
os.environ['KAGGLE_KEY'] = "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

!kaggle competitions download -c springleaf-marketing-response
!unzip test.csv.zip
!unzip train.csv.zip
```

In [4]:
```python
df = pd.read_csv('train.csv', chunksize=40000)
```

In [5]:
```python
chunk = df.get_chunk()

chunk_df = chunk
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel/zmqshell.py:537: DtypeWarning: Colu
mns (8,9,10,11,12,43,157,196,214,225,228,229,231,235,238) have mixed types.Specify d
type option on import or set low_memory=False.
  return super(ZMQInteractiveShell, self).run_cell(*args, **kwargs)
```

2)Проведение разведочного анализа данных

In [6]:
```python
chunk_df.target.unique()
```

Out[6]: `array([0, 1])`

Видим дисбаланс классов

In [7]:
```python
chunk_df.target.value_counts().plot(kind='bar')   # дисбаланс классов!
```

Out[7]: `<matplotlib.axes._subplots.AxesSubplot at 0x7f66894d1490>`
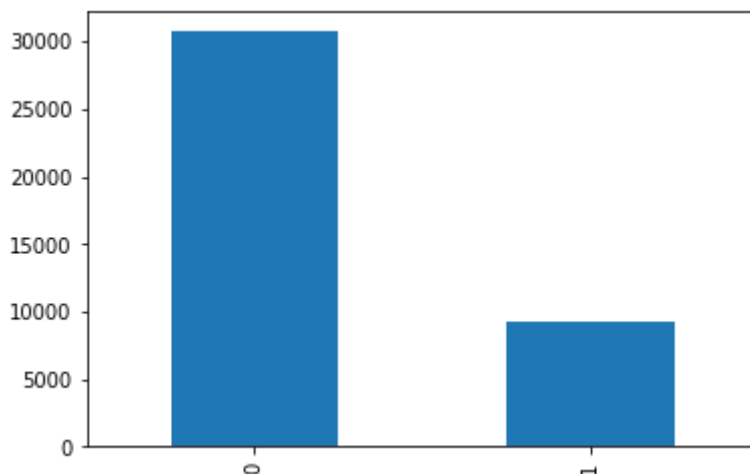
Все ID уникальны

In [8]:
```python
len(chunk_df.ID.unique())
```

Out[8]: `40000`

3) Корреляционный анализ

In [48]:
```python
plt.figure(figsize=(25, 10))
ax = sns.heatmap(chunk_df.iloc[:, 2:].corr())
plt.title('Корреляция')
plt.show()
```
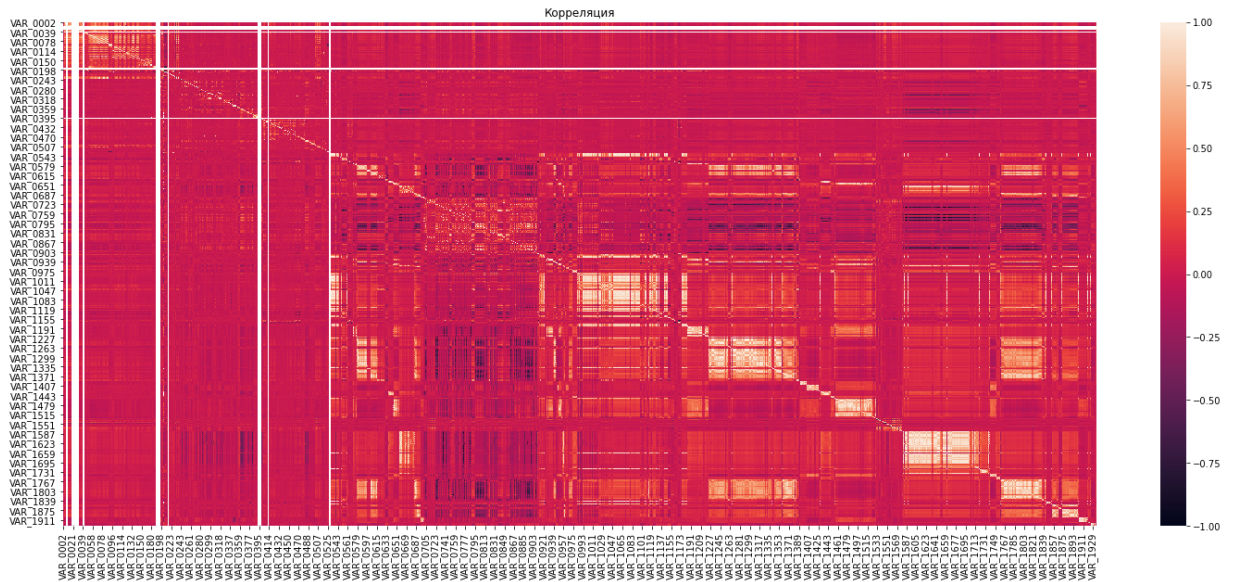
4) Выбор признаков, подходящих для построения моделей

```
In [9]:  obj_columns = [i for i in chunk_df.columns if chunk_df[i].dtype == 'O']
         obj_columns.__len__()
```

Out[9]: 51

```
In [10]:  for col in obj_columns:
            print(col, chunk_df[col].unique())
```

```
VAR_0001 ['H' 'R' 'Q']
VAR_0005 ['C' 'B' 'N' 'S']
VAR_0008 [False nan]
VAR_0009 [False nan]
VAR_0010 [False nan]
VAR_0011 [False nan]
VAR_0012 [False nan]
VAR_0043 [False nan]
VAR_0044 ['[]' nan]
VAR_0073 [nan '04SEP12:00:00:00' '26JAN12:00:00:00' ... '13JUN10:00:00:00'
 '26OCT09:00:00:00' '11JUN11:00:00:00']
VAR_0075 ['08NOV11:00:00:00' '10NOV11:00:00:00' '13DEC11:00:00:00' ...
 '29AUG07:00:00:00' '16MAR07:00:00:00' '16APR09:00:00:00']
VAR_0156 [nan '14JUL11:00:00:00' '21NOV11:00:00:00' '13APR12:00:00:00'
 '02AUG11:00:00:00' '10DEC11:00:00:00' '05MAY11:00:00:00'
 '27DEC11:00:00:00' '17NOV11:00:00:00' '27APR11:00:00:00'
 '15SEP11:00:00:00' '19JUL11:00:00:00' '01JUN12:00:00:00'
 '28MAR12:00:00:00' '18MAY12:00:00:00' '05DEC11:00:00:00'
 '09NOV11:00:00:00' '22JUN11:00:00:00' '25JUN12:00:00:00'
 '23MAY12:00:00:00' '12APR11:00:00:00' '13OCT11:00:00:00'
 '05MAR12:00:00:00' '01JAN12:00:00:00' '27NOV11:00:00:00'
 '06OCT11:00:00:00' '14NOV08:00:00:00' '25APR12:00:00:00'
 '28AUG12:00:00:00' '01OCT11:00:00:00' '28FEB12:00:00:00'
 '11SEP12:00:00:00' '04APR12:00:00:00' '01OCT09:00:00:00'
 '27APR12:00:00:00' '04MAY12:00:00:00' '22AUG11:00:00:00'
 '25JUL11:00:00:00' '19JUN12:00:00:00' '31JUL12:00:00:00'
 '27JUN12:00:00:00' '13SEP11:00:00:00' '24MAY12:00:00:00'
 '03MAY11:00:00:00' '16JUL11:00:00:00' '06MAY11:00:00:00'
 '02JAN12:00:00:00' '02JUL12:00:00:00' '23APR12:00:00:00'
 '30NOV11:00:00:00' '07MAR12:00:00:00' '22SEP09:00:00:00'
 '09AUG11:00:00:00' '23NOV11:00:00:00' '29MAY12:00:00:00'
 '11MAY12:00:00:00' '06JAN12:00:00:00' '01MAR12:00:00:00'
```

```
             '18OCT11:00:00:00'  '07SEP12:00:00:00'  '22APR11:00:00:00'
             '04JUL12:00:00:00'  '12DEC11:00:00:00'  '11SEP11:00:00:00'
             '09JUL12:00:00:00'  '09APR12:00:00:00'  '19DEC11:00:00:00'
             '30SEP11:00:00:00'  '08DEC11:00:00:00'  '12OCT11:00:00:00'
             '11JUN11:00:00:00'  '21JUN11:00:00:00'  '24NOV11:00:00:00'
             '20OCT11:00:00:00'  '13AUG12:00:00:00'  '08OCT12:00:00:00'
             '20JUL12:00:00:00'  '15OCT11:00:00:00'  '08JUL12:00:00:00'
             '05JUL12:00:00:00'  '13JUL12:00:00:00'  '07JUN12:00:00:00'
             '08SEP11:00:00:00'  '25SEP12:00:00:00'  '20JUL11:00:00:00'
             '05JUL11:00:00:00'  '09MAY11:00:00:00'  '04AUG11:00:00:00'
             '07JUL12:00:00:00'  '16AUG11:00:00:00'  '12MAR12:00:00:00'
             '28DEC11:00:00:00'  '03OCT12:00:00:00'  '27AUG12:00:00:00'
             '11JAN12:00:00:00'  '24OCT11:00:00:00'  '16FEB12:00:00:00'
             '03MAY12:00:00:00'  '22MAY12:00:00:00'  '16DEC11:00:00:00'
             '26FEB12:00:00:00'  '11JUL11:00:00:00'  '02APR12:00:00:00'
             '13DEC11:00:00:00'  '09OCT12:00:00:00'  '08MAR12:00:00:00'
             '17MAY12:00:00:00'  '15NOV11:00:00:00'  '05APR11:00:00:00'
             '09DEC11:00:00:00'  '05AUG11:00:00:00'  '22SEP11:00:00:00'
             '08AUG12:00:00:00'  '13DEC10:00:00:00'  '26MAR12:00:00:00'
             '30JUN11:00:00:00'  '06APR11:00:00:00'  '06JUL12:00:00:00'
             '01DEC11:00:00:00'  '31MAY12:00:00:00'  '10JUL11:00:00:00'
             '07JUN11:00:00:00'  '23SEP11:00:00:00'  '28JUN12:00:00:00'
             '30MAY12:00:00:00'  '11OCT11:00:00:00'  '07MAY11:00:00:00'
             '26JUL12:00:00:00'  '03JUN11:00:00:00'  '05OCT11:00:00:00'
             '02JUN12:00:00:00'  '09JUN11:00:00:00'  '15DEC11:00:00:00'
             '08JUN12:00:00:00'  '29AUG12:00:00:00'  '26DEC11:00:00:00'
             '03APR12:00:00:00'  '07SEP11:00:00:00'  '17OCT11:00:00:00'
             '10JUN12:00:00:00'  '06FEB12:00:00:00'  '15JUN12:00:00:00'
             '14OCT12:00:00:00'  '01NOV11:00:00:00'  '15AUG11:00:00:00'
             '23JUL11:00:00:00'  '04DEC11:00:00:00'  '18NOV11:00:00:00'
             '13MAR12:00:00:00'  '26OCT11:00:00:00'  '03SEP12:00:00:00'
             '27MAY12:00:00:00'  '24APR12:00:00:00'  '19MAR12:00:00:00'
             '06JUL11:00:00:00'  '19JAN12:00:00:00'  '12JUN12:00:00:00'
             '29APR11:00:00:00'  '25MAY12:00:00:00'  '08DEC08:00:00:00'
             '20JUN12:00:00:00'  '17JUL12:00:00:00'  '05OCT12:00:00:00'
             '06JUN11:00:00:00'  '29JUN12:00:00:00'  '12JUL12:00:00:00'
             '27SEP11:00:00:00'  '17OCT12:00:00:00'  '09SEP11:00:00:00'
             '26MAY11:00:00:00'  '29JUN11:00:00:00'  '02OCT12:00:00:00'
             '09JAN12:00:00:00'  '09FEB12:00:00:00'  '06JUN12:00:00:00'
             '08APR11:00:00:00'  '08MAY12:00:00:00'  '29AUG11:00:00:00'
             '25JAN12:00:00:00'  '25OCT11:00:00:00'  '07MAY12:00:00:00'
             '18SEP11:00:00:00'  '03DEC11:00:00:00'  '14JUN12:00:00:00'
             '13JUL11:00:00:00'  '02MAR12:00:00:00'  '21DEC11:00:00:00'
             '18OCT12:00:00:00'  '16APR12:00:00:00'  '16JAN12:00:00:00'
             '10APR12:00:00:00'  '28NOV11:00:00:00'  '05MAR10:00:00:00'
             '20DEC11:00:00:00'  '31AUG11:00:00:00'  '12APR12:00:00:00'
             '14SEP11:00:00:00'  '26APR11:00:00:00'  '10MAY11:00:00:00'
             '05FEB12:00:00:00'  '16SEP11:00:00:00'  '05MAY12:00:00:00'
             '05OCT10:00:00:00'  '26AUG11:00:00:00'  '26JUN12:00:00:00'
             '18AUG11:00:00:00'  '29SEP12:00:00:00'  '04SEP12:00:00:00'
             '14MAY12:00:00:00'  '22MAR12:00:00:00'  '31DEC09:00:00:00'
             '28JUN11:00:00:00'  '25NOV11:00:00:00'  '15MAR12:00:00:00'
             '01OCT12:00:00:00'  '24JUL12:00:00:00'  '14FEB12:00:00:00'
             '10NOV10:00:00:00'  '24JUN12:00:00:00'  '03JUN12:00:00:00'
             '20SEP12:00:00:00'  '17JUN12:00:00:00'  '11JUL12:00:00:00'
             '01MAY12:00:00:00'  '30DEC11:00:00:00'  '19MAY12:00:00:00'
             '21FEB12:00:00:00'  '18DEC11:00:00:00'  '10JAN12:00:00:00'
             '18FEB12:00:00:00'  '12MAY12:00:00:00'  '13NOV11:00:00:00'
             '06NOV11:00:00:00'  '07JUL11:00:00:00'  '20JAN12:00:00:00'
             '15JAN12:00:00:00'  '20SEP11:00:00:00'  '17MAR12:00:00:00'
             '10OCT11:00:00:00'  '19AUG11:00:00:00'  '02SEP11:00:00:00'
             '26AUG12:00:00:00'  '25AUG12:00:00:00'  '23MAR12:00:00:00'
             '05SEP11:00:00:00'  '19APR12:00:00:00'  '04JUL11:00:00:00'
             '12FEB12:00:00:00'  '16AUG12:00:00:00'  '04JUN12:00:00:00'
             '23JUN11:00:00:00'  '16NOV11:00:00:00'  '03OCT11:00:00:00'
             '27MAY11:00:00:00'  '04OCT12:00:00:00'  '14JAN12:00:00:00'
             '12AUG11:00:00:00'  '04NOV11:00:00:00'  '16DEC10:00:00:00'
             '20FEB12:00:00:00'  '24JAN12:00:00:00'  '31OCT11:00:00:00'
             '13JUN11:00:00:00'  '24MAY11:00:00:00'  '23AUG11:00:00:00'
```

```
'12JUN11:00:00:00'  '25JUL12:00:00:00'  '19SEP11:00:00:00'
'30OCT11:00:00:00'  '08JUN11:00:00:00'  '10AUG11:00:00:00'
'23JAN12:00:00:00'  '05MAY10:00:00:00'  '04MAY11:00:00:00'
'23JUN12:00:00:00'  '14OCT11:00:00:00'  '19APR11:00:00:00'
'21JUN12:00:00:00'  '27FEB12:00:00:00'  '14APR11:00:00:00'
'27SEP12:00:00:00'  '11AUG12:00:00:00'  '14MAR12:00:00:00'
'15APR11:00:00:00'  '15AUG12:00:00:00'  '22JUL12:00:00:00'
'19JUN11:00:00:00'  '17JAN12:00:00:00'  '12NOV11:00:00:00'
'17AUG11:00:00:00'  '21AUG11:00:00:00'  '12MAY11:00:00:00'
'31MAY11:00:00:00'  '25AUG11:00:00:00'  '10MAY12:00:00:00'
'26MAY12:00:00:00'  '23DEC11:00:00:00'  '18MAY11:00:00:00'
'28MAY12:00:00:00'  '21SEP12:00:00:00'  '03JUL12:00:00:00'
'02JUN11:00:00:00'  '30AUG11:00:00:00'  '01DEC10:00:00:00'
'05JUN12:00:00:00'  '16JUN12:00:00:00'  '09SEP09:00:00:00'
'21MAY12:00:00:00'  '29DEC10:00:00:00'  '20MAY12:00:00:00'
'13SEP12:00:00:00'  '14DEC11:00:00:00'  '01SEP11:00:00:00'
'23OCT12:00:00:00'  '18APR11:00:00:00'  '07NOV11:00:00:00'
'05APR12:00:00:00'  '22SEP12:00:00:00'  '04JAN12:00:00:00'
'16OCT11:00:00:00'  '30AUG12:00:00:00'  '07OCT09:00:00:00'
'02MAY12:00:00:00'  '26SEP11:00:00:00'  '07DEC11:00:00:00'
'26JUL11:00:00:00'  '22JAN10:00:00:00'  '30JUL12:00:00:00'
'25MAY11:00:00:00'  '29OCT11:00:00:00'  '06SEP11:00:00:00'
'27OCT11:00:00:00'  '12JUL11:00:00:00'  '17JUL11:00:00:00'
'13APR11:00:00:00'  '11NOV11:00:00:00'  '21MAR12:00:00:00'
'22JUN12:00:00:00'  '30APR12:00:00:00'  '14MAY11:00:00:00'
'17MAY11:00:00:00'  '23AUG12:00:00:00'  '29JUL11:00:00:00'
'10JUL10:00:00:00'  '28JUL11:00:00:00'  '27JUL12:00:00:00'
'03NOV11:00:00:00'  '11APR12:00:00:00'  '13MAY11:00:00:00'
'20NOV11:00:00:00'  '31JAN12:00:00:00'  '30JUN12:00:00:00'
'09MAY12:00:00:00'  '21JAN12:00:00:00'  '07AUG12:00:00:00'
'02NOV11:00:00:00'  '13JUN12:00:00:00'  '29FEB12:00:00:00'
'29MAR12:00:00:00'  '17SEP12:00:00:00'  '03FEB12:00:00:00'
'10JUN11:00:00:00'  '30NOV10:00:00:00'  '24AUG11:00:00:00'
'26NOV11:00:00:00'  '22AUG12:00:00:00'  '07OCT12:00:00:00'
'14AUG12:00:00:00'  '22APR12:00:00:00'  '15JUN11:00:00:00'
'06AUG12:00:00:00'  '02MAY11:00:00:00'  '08JUL11:00:00:00'
'26APR12:00:00:00'  '18JUN12:00:00:00'  '12SEP11:00:00:00'
'11DEC11:00:00:00'  '19OCT12:00:00:00'  '14NOV11:00:00:00'
'13JAN12:00:00:00'  '12JAN12:00:00:00'  '23MAY11:00:00:00'
'26SEP12:00:00:00'  '17SEP11:00:00:00'  '20APR12:00:00:00'
'12SEP12:00:00:00'  '08NOV11:00:00:00'  '13MAY12:00:00:00'
'10JUL12:00:00:00'  '04OCT11:00:00:00'  '27MAR12:00:00:00'
'11APR11:00:00:00'  '16JUL12:00:00:00'  '24SEP11:00:00:00'
'17DEC11:00:00:00'  '29DEC11:00:00:00'  '19MAY10:00:00:00'
'03JAN12:00:00:00'  '21MAR11:00:00:00'  '26JAN12:00:00:00'
'24SEP12:00:00:00'  '06OCT12:00:00:00'  '30SEP12:00:00:00'
'11AUG11:00:00:00'  '30JUL11:00:00:00'  '18JAN12:00:00:00'
'16JUN11:00:00:00'  '05SEP12:00:00:00'  '11MAY11:00:00:00'
'01FEB12:00:00:00'  '28DEC09:00:00:00'  '14JUL12:00:00:00'
'21MAY11:00:00:00'  '18SEP12:00:00:00'  '29SEP11:00:00:00'
'16NOV10:00:00:00'  '14SEP12:00:00:00'  '09OCT09:00:00:00'
'31DEC11:00:00:00'  '28AUG11:00:00:00'  '28JAN12:00:00:00'
'31AUG12:00:00:00'  '04SEP11:00:00:00'  '06DEC11:00:00:00'
'25MAR12:00:00:00'  '01AUG12:00:00:00'  '03AUG11:00:00:00'
'03SEP11:00:00:00'  '17FEB12:00:00:00'  '07OCT11:00:00:00'
'19SEP12:00:00:00'  '29NOV11:00:00:00'  '14AUG11:00:00:00'
'09AUG12:00:00:00'  '18JUL12:00:00:00'  '28OCT11:00:00:00'
'24DEC11:00:00:00'  '25SEP11:00:00:00'  '10NOV11:00:00:00'
'29OCT09:00:00:00'  '17APR12:00:00:00'  '05JAN12:00:00:00'
'21SEP11:00:00:00'  '18DEC09:00:00:00'  '20AUG12:00:00:00'
'07SEP10:00:00:00'  '07DEC10:00:00:00'  '20AUG11:00:00:00'
'09APR11:00:00:00'  '27JUL11:00:00:00'  '30MAY11:00:00:00'
'15OCT12:00:00:00'  '05NOV11:00:00:00'  '14APR12:00:00:00'
'22NOV11:00:00:00'  '03NOV09:00:00:00'  '11NOV09:00:00:00'
'01APR12:00:00:00'  '08FEB12:00:00:00'  '12OCT12:00:00:00'
'16MAR12:00:00:00'  '22OCT11:00:00:00'  '16MAY11:00:00:00'
'06SEP12:00:00:00'  '10MAR12:00:00:00'  '10FEB11:00:00:00'
'11JUN12:00:00:00'  '02SEP10:00:00:00'  '22FEB12:00:00:00'
'04FEB12:00:00:00'  '15MAY12:00:00:00'  '09JUN12:00:00:00'
```

```
                '17JUN11:00:00:00'  '02FEB12:00:00:00'  '15SEP12:00:00:00'
                '30OCT09:00:00:00'  '15JUL11:00:00:00'  '08OCT11:00:00:00'
                '22DEC11:00:00:00'  '27AUG11:00:00:00'  '07JAN12:00:00:00'
                '28APR12:00:00:00'  '23OCT09:00:00:00'  '23FEB12:00:00:00'
                '27JAN12:00:00:00'  '30APR11:00:00:00'  '08APR12:00:00:00'
                '23MAR09:00:00:00'  '28SEP11:00:00:00'  '10APR11:00:00:00'
                '02MAR11:00:00:00'  '15JAN09:00:00:00'  '21OCT11:00:00:00'
                '26FEB11:00:00:00'  '19JUN09:00:00:00'  '19MAY11:00:00:00'
                '25APR11:00:00:00'  '26NOV08:00:00:00'  '06MAY12:00:00:00'
                '22JUL11:00:00:00'  '30JAN12:00:00:00'  '01MAY11:00:00:00'
                '08MAY10:00:00:00'  '18JUN11:00:00:00'  '25OCT12:00:00:00'
                '08AUG11:00:00:00'  '01AUG11:00:00:00'  '20MAY11:00:00:00'
                '21APR12:00:00:00'  '09JUL11:00:00:00'  '23FEB09:00:00:00'
                '25SEP09:00:00:00'  '01JUL12:00:00:00'  '08JAN12:00:00:00'
                '29DEC09:00:00:00'  '28JUL12:00:00:00'  '23JUL12:00:00:00'
                '24APR11:00:00:00'  '24AUG12:00:00:00'  '18JUL11:00:00:00'
                '17DEC10:00:00:00'  '02AUG12:00:00:00'  '20NOV09:00:00:00'
                '21APR11:00:00:00'  '22MAY11:00:00:00'  '10JUN10:00:00:00'
                '09MAR12:00:00:00'  '01JUN11:00:00:00'  '19OCT11:00:00:00'
                '09OCT11:00:00:00'  '11OCT12:00:00:00'  '17OCT08:00:00:00'
                '14JUL09:00:00:00'  '02DEC11:00:00:00'  '29MAY11:00:00:00'
                '10SEP12:00:00:00']
        VAR_0157 [nan '05JUL12:00:00:00' '05JUN11:00:00:00' '26MAY12:00:00:00'
                '11AUG11:00:00:00'  '16JUN12:00:00:00'  '27JAN12:00:00:00'
                '29APR12:00:00:00'  '20APR12:00:00:00'  '23MAY11:00:00:00'
                '13DEC11:00:00:00'  '13JUN12:00:00:00'  '16APR12:00:00:00'
                '21AUG11:00:00:00'  '09AUG12:00:00:00'  '09MAR12:00:00:00'
                '23JUL12:00:00:00'  '20JUL12:00:00:00'  '07JUN12:00:00:00'
                '23NOV11:00:00:00'  '19MAY12:00:00:00'  '12FEB12:00:00:00'
                '31JUL12:00:00:00'  '19JUN12:00:00:00'  '31AUG11:00:00:00'
                '27FEB12:00:00:00'  '15JUN11:00:00:00'  '13OCT11:00:00:00'
                '16JAN12:00:00:00'  '25OCT11:00:00:00'  '27MAR12:00:00:00'
                '01JAN09:00:00:00'  '02SEP11:00:00:00'  '11MAR12:00:00:00'
                '16NOV11:00:00:00'  '09JUN12:00:00:00'  '01JUL12:00:00:00'
                '06MAR12:00:00:00'  '13JUN10:00:00:00'  '12MAR12:00:00:00'
                '19MAR12:00:00:00'  '14FEB12:00:00:00'  '25JAN12:00:00:00'
                '07MAR12:00:00:00'  '11SEP11:00:00:00'  '12OCT11:00:00:00'
                '23DEC11:00:00:00'  '07FEB12:00:00:00'  '06APR12:00:00:00'
                '25DEC11:00:00:00'  '08MAR12:00:00:00'  '31MAY12:00:00:00'
                '21MAR12:00:00:00'  '15JUN12:00:00:00'  '01APR11:00:00:00'
                '06JAN12:00:00:00'  '31OCT11:00:00:00'  '13MAR12:00:00:00'
                '14OCT11:00:00:00'  '01JUN12:00:00:00'  '11OCT11:00:00:00'
                '07SEP12:00:00:00'  '21JUN12:00:00:00'  '14NOV11:00:00:00'
                '14JUN12:00:00:00'  '04OCT10:00:00:00'  '21OCT11:00:00:00'
                '30MAR12:00:00:00'  '12JAN12:00:00:00'  '30AUG12:00:00:00'
                '07OCT11:00:00:00'  '27OCT11:00:00:00'  '29APR11:00:00:00'
                '07MAY10:00:00:00'  '14JAN12:00:00:00'  '02MAY12:00:00:00'
                '08MAY12:00:00:00'  '19NOV11:00:00:00'  '03MAR12:00:00:00'
                '05MAR12:00:00:00'  '09MAY12:00:00:00'  '17DEC11:00:00:00'
                '11DEC11:00:00:00'  '17APR12:00:00:00'  '18AUG11:00:00:00'
                '29DEC11:00:00:00'  '19APR12:00:00:00'  '18SEP12:00:00:00'
                '11AUG12:00:00:00'  '23MAY12:00:00:00'  '31OCT12:00:00:00'
                '20AUG10:00:00:00'  '24JUN12:00:00:00'  '04JUL12:00:00:00'
                '12AUG12:00:00:00'  '01APR12:00:00:00'  '17NOV11:00:00:00'
                '03JUN12:00:00:00'  '12APR12:00:00:00'  '06OCT11:00:00:00'
                '02OCT12:00:00:00'  '11FEB12:00:00:00'  '15APR12:00:00:00'
                '20JUN12:00:00:00'  '05SEP12:00:00:00'  '24JUL12:00:00:00'
                '26JUN12:00:00:00'  '02AUG12:00:00:00'  '16DEC11:00:00:00'
                '18JAN12:00:00:00'  '02MAR12:00:00:00'  '06JUN12:00:00:00'
                '28SEP12:00:00:00'  '10AUG12:00:00:00'  '03JAN12:00:00:00'
                '06SEP12:00:00:00'  '23AUG12:00:00:00'  '14MAR12:00:00:00'
                '05JUN10:00:00:00'  '14JUL11:00:00:00'  '27APR12:00:00:00'
                '30JUN12:00:00:00'  '05AUG12:00:00:00'  '29SEP12:00:00:00'
                '23AUG11:00:00:00'  '25MAR12:00:00:00'  '10MAY12:00:00:00'
                '29SEP11:00:00:00'  '22AUG12:00:00:00'  '09APR12:00:00:00'
                '07JUL12:00:00:00'  '18JUL12:00:00:00'  '26APR12:00:00:00'
                '01JAN12:00:00:00'  '18JUN12:00:00:00'  '20SEP11:00:00:00'
                '29OCT11:00:00:00'  '07AUG12:00:00:00'  '17AUG12:00:00:00'
                '19FEB12:00:00:00'  '29MAR12:00:00:00'  '04MAY12:00:00:00'
```

```
                '10JUL12:00:00:00'  '06JUL12:00:00:00'  '09JAN11:00:00:00'
                '17OCT11:00:00:00'  '09NOV11:00:00:00'  '20OCT11:00:00:00'
                '29JUN12:00:00:00'  '30JAN10:00:00:00'  '10NOV10:00:00:00'
                '03SEP11:00:00:00'  '23FEB12:00:00:00'  '19JAN12:00:00:00'
                '22JUN12:00:00:00'  '18MAY12:00:00:00'  '03JAN11:00:00:00'
                '23SEP11:00:00:00'  '16AUG11:00:00:00'  '13MAY12:00:00:00'
                '24AUG12:00:00:00'  '29NOV11:00:00:00'  '25JUL12:00:00:00'
                '25JUN12:00:00:00'  '15DEC11:00:00:00'  '20SEP12:00:00:00'
                '01SEP11:00:00:00'  '08DEC11:00:00:00'  '08JUL12:00:00:00'
                '16MAY12:00:00:00'  '16FEB12:00:00:00'  '28JAN12:00:00:00'
                '29AUG12:00:00:00'  '08JUN12:00:00:00'  '11NOV11:00:00:00'
                '10OCT12:00:00:00'  '01MAY12:00:00:00'  '30OCT09:00:00:00'
                '24SEP12:00:00:00'  '10NOV11:00:00:00'  '16JAN09:00:00:00'
                '14JUL12:00:00:00'  '21JUL12:00:00:00'  '28JUL12:00:00:00'
                '24AUG11:00:00:00'  '30NOV11:00:00:00'  '02DEC11:00:00:00'
                '04JAN12:00:00:00'  '04APR12:00:00:00'  '01NOV11:00:00:00'
                '15NOV11:00:00:00'  '24JAN12:00:00:00'  '30JUL11:00:00:00'
                '10AUG11:00:00:00'  '13NOV11:00:00:00'  '06AUG12:00:00:00'
                '22DEC11:00:00:00'  '28JUN12:00:00:00'  '15JUL12:00:00:00'
                '11MAY12:00:00:00'  '10SEP11:00:00:00'  '09JAN09:00:00:00'
                '09JAN12:00:00:00'  '08SEP12:00:00:00'  '03JUL11:00:00:00'
                '27DEC11:00:00:00']
        VAR_0158 [nan '31JAN12:00:00:00'  '01MAR12:00:00:00'  '02JAN12:00:00:00'
                '28AUG12:00:00:00'  '21MAY12:00:00:00'  '24AUG12:00:00:00'
                '22FEB12:00:00:00'  '03FEB12:00:00:00'  '29FEB12:00:00:00'
                '28JAN10:00:00:00'  '21MAR12:00:00:00'  '23NOV11:00:00:00'
                '06JAN12:00:00:00'  '09MAR12:00:00:00'  '27APR12:00:00:00'
                '11FEB12:00:00:00'  '10MAR10:00:00:00'  '04MAY12:00:00:00'
                '01APR12:00:00:00'  '01JUN12:00:00:00'  '31MAY12:00:00:00'
                '15MAR12:00:00:00'  '06APR12:00:00:00'  '02MAR12:00:00:00'
                '25MAY12:00:00:00'  '08NOV11:00:00:00'  '27JUN12:00:00:00'
                '26NOV11:00:00:00'  '26APR12:00:00:00'  '07FEB12:00:00:00'
                '03JAN12:00:00:00'  '09APR12:00:00:00'  '07MAY12:00:00:00'
                '02APR12:00:00:00'  '13APR12:00:00:00'  '04NOV11:00:00:00'
                '31JUL12:00:00:00'  '17APR12:00:00:00'  '01FEB12:00:00:00'
                '24FEB12:00:00:00'  '11JAN12:00:00:00'  '05OCT11:00:00:00'
                '29MAY12:00:00:00'  '08FEB12:00:00:00'  '23MAR12:00:00:00'
                '28JAN12:00:00:00'  '06JUN12:00:00:00'  '07DEC11:00:00:00'
                '05MAR12:00:00:00'  '02DEC11:00:00:00'  '16APR12:00:00:00'
                '15MAY12:00:00:00'  '18JAN12:00:00:00'  '16MAR12:00:00:00'
                '30APR12:00:00:00'  '22JAN12:00:00:00'  '18MAY12:00:00:00'
                '27FEB12:00:00:00'  '16AUG12:00:00:00'  '10FEB12:00:00:00'
                '06AUG12:00:00:00'  '02JUL12:00:00:00'  '14OCT11:00:00:00'
                '25JUL12:00:00:00'  '03APR12:00:00:00'  '11MAY12:00:00:00'
                '13DEC11:00:00:00'  '31AUG12:00:00:00'  '10JAN12:00:00:00'
                '15JUL12:00:00:00'  '23APR12:00:00:00'  '01JUL12:00:00:00'
                '06NOV11:00:00:00'  '24NOV11:00:00:00'  '18JUN12:00:00:00'
                '10AUG12:00:00:00'  '12OCT10:00:00:00'  '16DEC11:00:00:00'
                '14MAY12:00:00:00'  '04JUN12:00:00:00'  '10JUL12:00:00:00'
                '22MAR12:00:00:00'  '21FEB12:00:00:00'  '28MAR12:00:00:00'
                '08AUG12:00:00:00'  '07MAR12:00:00:00'  '24JUN12:00:00:00'
                '29MAR12:00:00:00'  '02NOV11:00:00:00'  '13JUL12:00:00:00'
                '25APR12:00:00:00'  '12DEC11:00:00:00'  '01MAY12:00:00:00'
                '26JUL12:00:00:00'  '28OCT11:00:00:00'  '23FEB12:00:00:00'
                '01NOV11:00:00:00'  '30AUG12:00:00:00'  '11NOV11:00:00:00'
                '15OCT11:00:00:00'  '03MAR12:00:00:00'  '20OCT11:00:00:00'
                '01DEC11:00:00:00'  '23JAN12:00:00:00'  '18FEB12:00:00:00'
                '18APR12:00:00:00'  '05JUN12:00:00:00'  '26MAR12:00:00:00'
                '15NOV11:00:00:00'  '03AUG12:00:00:00'  '09FEB12:00:00:00'
                '04FEB12:00:00:00'  '07AUG12:00:00:00'  '30MAR12:00:00:00'
                '04FEB11:00:00:00'  '04MAR10:00:00:00'  '12JAN12:00:00:00'
                '25JAN12:00:00:00'  '02AUG12:00:00:00'  '31MAR12:00:00:00'
                '02MAY12:00:00:00'  '30DEC11:00:00:00'  '19APR12:00:00:00'
                '08MAY12:00:00:00'  '26JUN12:00:00:00'  '09NOV11:00:00:00'
                '19JUL12:00:00:00'  '25OCT11:00:00:00'  '30SEP11:00:00:00'
                '20JAN12:00:00:00'  '13JUN12:00:00:00'  '01AUG12:00:00:00'
                '02FEB12:00:00:00'  '15DEC11:00:00:00'  '23MAY12:00:00:00'
                '14MAR12:00:00:00'  '28SEP12:00:00:00'  '19OCT11:00:00:00'
                '11OCT11:00:00:00'  '25NOV11:00:00:00'  '01OCT12:00:00:00'
```

```
              '23AUG12:00:00:00'  '05APR12:00:00:00'  '25MAR12:00:00:00'
              '22MAY12:00:00:00'  '24JUL12:00:00:00'  '12APR12:00:00:00'
              '27DEC11:00:00:00'  '06MAR12:00:00:00'  '17FEB12:00:00:00'
              '13FEB12:00:00:00'  '08DEC11:00:00:00'  '29DEC11:00:00:00'
              '06SEP12:00:00:00'  '16JAN12:00:00:00'  '23DEC11:00:00:00'
              '04JUL12:00:00:00'  '10MAY12:00:00:00'  '18NOV11:00:00:00'
              '05JAN12:00:00:00'  '11JUL12:00:00:00'  '03JUN12:00:00:00'
              '05FEB12:00:00:00'  '27MAR12:00:00:00'  '13JAN12:00:00:00'
              '10MAR12:00:00:00'  '03DEC11:00:00:00'  '07MAY11:00:00:00'
              '15FEB12:00:00:00'  '17OCT11:00:00:00'  '19JAN12:00:00:00'
              '26AUG11:00:00:00'  '04OCT12:00:00:00'  '30NOV11:00:00:00'
              '08MAR12:00:00:00'  '23JUL12:00:00:00'  '21SEP11:00:00:00'
              '03MAY12:00:00:00'  '05OCT12:00:00:00'  '27JUL12:00:00:00'
              '29SEP12:00:00:00'  '13MAR12:00:00:00'  '31DEC11:00:00:00'
              '20MAR12:00:00:00'  '05JUL12:00:00:00'  '04MAR12:00:00:00'
              '17JUN12:00:00:00'  '14FEB12:00:00:00'  '19OCT12:00:00:00'
              '17JUL12:00:00:00'  '20FEB12:00:00:00'  '27JAN12:00:00:00'
              '26JAN12:00:00:00'  '30JUL12:00:00:00'  '11APR12:00:00:00'
              '04JAN12:00:00:00'  '20SEP12:00:00:00'  '29JUN12:00:00:00'
              '18OCT10:00:00:00'  '08JUL11:00:00:00'  '29NOV11:00:00:00'
              '08JAN12:00:00:00'  '04OCT11:00:00:00'  '04APR12:00:00:00'
              '27OCT11:00:00:00'  '29SEP11:00:00:00'  '15JAN12:00:00:00'
              '24MAY12:00:00:00'  '03NOV11:00:00:00'  '28FEB12:00:00:00'
              '09SEP11:00:00:00'  '22NOV11:00:00:00'  '21JAN11:00:00:00'
              '03OCT12:00:00:00'  '09JAN12:00:00:00'  '16FEB12:00:00:00'
              '20APR12:00:00:00'  '14NOV11:00:00:00'  '21DEC11:00:00:00'
              '16SEP11:00:00:00'  '09FEB09:00:00:00'  '25APR11:00:00:00'
              '26OCT11:00:00:00'  '03JUL12:00:00:00'  '06DEC11:00:00:00'
              '24JUN10:00:00:00'  '22DEC11:00:00:00'  '12OCT11:00:00:00'
              '21APR11:00:00:00'  '24APR12:00:00:00'  '05AUG12:00:00:00'
              '12OCT12:00:00:00'  '29JAN11:00:00:00'  '09MAY12:00:00:00'
              '05NOV10:00:00:00'  '15AUG12:00:00:00'  '12MAR12:00:00:00'
              '31OCT11:00:00:00'  '09JUL12:00:00:00'  '14JAN12:00:00:00'
              '24MAR10:00:00:00'  '10APR12:00:00:00'  '17NOV11:00:00:00'
              '24SEP12:00:00:00']
VAR_0159 [nan '14JUL11:00:00:00'  '21NOV11:00:00:00'  '13APR12:00:00:00'
              '04JUN12:00:00:00'  '10DEC11:00:00:00'  '02FEB12:00:00:00'
              '27DEC11:00:00:00'  '17NOV11:00:00:00'  '13JAN12:00:00:00'
              '31AUG12:00:00:00'  '13SEP12:00:00:00'  '01JUN12:00:00:00'
              '28MAR12:00:00:00'  '21MAY12:00:00:00'  '05DEC11:00:00:00'
              '26MAR12:00:00:00'  '06FEB12:00:00:00'  '25JUN12:00:00:00'
              '23MAY12:00:00:00'  '12APR11:00:00:00'  '27JUN12:00:00:00'
              '05MAR12:00:00:00'  '18MAY12:00:00:00'  '27NOV11:00:00:00'
              '13JUL09:00:00:00'  '25APR12:00:00:00'  '28AUG12:00:00:00'
              '28FEB12:00:00:00'  '11SEP12:00:00:00'  '04APR12:00:00:00'
              '01OCT09:00:00:00'  '27APR12:00:00:00'  '04MAY12:00:00:00'
              '22AUG11:00:00:00'  '25JUL11:00:00:00'  '19JUN12:00:00:00'
              '31JUL12:00:00:00'  '13SEP11:00:00:00'  '24MAY12:00:00:00'
              '30NOV11:00:00:00'  '09OCT12:00:00:00'  '16NOV11:00:00:00'
              '05APR12:00:00:00'  '02JUL12:00:00:00'  '23APR12:00:00:00'
              '14FEB12:00:00:00'  '07MAR12:00:00:00'  '22SEP09:00:00:00'
              '09AUG11:00:00:00'  '23NOV11:00:00:00'  '29MAY12:00:00:00'
              '11MAY12:00:00:00'  '09JAN12:00:00:00'  '01MAR12:00:00:00'
              '18OCT11:00:00:00'  '07SEP12:00:00:00'  '22APR11:00:00:00'
              '04JUL12:00:00:00'  '06JUN12:00:00:00'  '11SEP11:00:00:00'
              '09JUL12:00:00:00'  '09APR12:00:00:00'  '08JUN12:00:00:00'
              '02JAN12:00:00:00'  '20MAR12:00:00:00'  '26MAY12:00:00:00'
              '01JAN12:00:00:00'  '19JAN12:00:00:00'  '28NOV11:00:00:00'
              '13AUG12:00:00:00'  '08OCT12:00:00:00'  '20JUL12:00:00:00'
              '15OCT11:00:00:00'  '08JUL12:00:00:00'  '05JUL12:00:00:00'
              '30AUG12:00:00:00'  '07JUN12:00:00:00'  '08SEP11:00:00:00'
              '01MAY12:00:00:00'  '25SEP12:00:00:00'  '06JUL12:00:00:00'
              '09MAY12:00:00:00'  '09MAY11:00:00:00'  '04AUG11:00:00:00'
              '07JUL12:00:00:00'  '16AUG11:00:00:00'  '10MAY12:00:00:00'
              '03OCT12:00:00:00'  '27AUG12:00:00:00'  '11JAN12:00:00:00'
              '24OCT11:00:00:00'  '16FEB12:00:00:00'  '03MAY12:00:00:00'
              '22MAY12:00:00:00'  '18SEP11:00:00:00'  '03APR12:00:00:00'
              '11JUL11:00:00:00'  '02APR12:00:00:00'  '13DEC11:00:00:00'
              '10OCT12:00:00:00'  '06AUG12:00:00:00'  '17MAY12:00:00:00'
```

```
'20APR12:00:00:00'  '12JAN12:00:00:00'  '05APR11:00:00:00'
'09DEC11:00:00:00'  '03FEB12:00:00:00'  '21DEC11:00:00:00'
'14MAY12:00:00:00'  '08AUG12:00:00:00'  '10OCT11:00:00:00'
'03AUG12:00:00:00'  '25MAR12:00:00:00'  '06APR11:00:00:00'
'11JUN12:00:00:00'  '13JUL12:00:00:00'  '23SEP11:00:00:00'
'24AUG11:00:00:00'  '28JUN12:00:00:00'  '08MAR12:00:00:00'
'27OCT11:00:00:00'  '06MAR12:00:00:00'  '26JUL12:00:00:00'
'28DEC11:00:00:00'  '03JUN11:00:00:00'  '05OCT11:00:00:00'
'02JUN12:00:00:00'  '01OCT11:00:00:00'  '09JUN11:00:00:00'
'23JUN12:00:00:00'  '12MAR12:00:00:00'  '29AUG12:00:00:00'
'15FEB12:00:00:00'  '30MAY12:00:00:00'  '07SEP11:00:00:00'
'16DEC11:00:00:00'  '12APR12:00:00:00'  '10JUN12:00:00:00'
'15JUN12:00:00:00'  '14OCT12:00:00:00'  '17APR12:00:00:00'
'19MAR12:00:00:00'  '15AUG11:00:00:00'  '23JUL11:00:00:00'
'04DEC11:00:00:00'  '18NOV11:00:00:00'  '13MAR12:00:00:00'
'02MAY12:00:00:00'  '15DEC11:00:00:00'  '03SEP12:00:00:00'
'27MAY12:00:00:00'  '28JAN12:00:00:00'  '06JUL11:00:00:00'
'12JUN12:00:00:00'  '24NOV11:00:00:00'  '25MAY12:00:00:00'
'19APR12:00:00:00'  '08DEC08:00:00:00'  '20JUN12:00:00:00'
'05OCT12:00:00:00'  '06JUN11:00:00:00'  '29JUN12:00:00:00'
'12JUL12:00:00:00'  '27SEP11:00:00:00'  '01DEC11:00:00:00'
'09NOV11:00:00:00'  '17OCT12:00:00:00'  '09SEP11:00:00:00'
'03JUL12:00:00:00'  '26MAY11:00:00:00'  '29JUN11:00:00:00'
'02OCT12:00:00:00'  '09FEB12:00:00:00'  '08MAY12:00:00:00'
'21JAN12:00:00:00'  '25JAN12:00:00:00'  '25OCT11:00:00:00'
'07MAY12:00:00:00'  '03DEC11:00:00:00'  '17JUL12:00:00:00'
'14JUN12:00:00:00'  '02MAR12:00:00:00'  '07FEB12:00:00:00'
'18OCT12:00:00:00'  '16APR12:00:00:00'  '16JAN12:00:00:00'
'10APR12:00:00:00'  '05MAR10:00:00:00'  '20JUL11:00:00:00'
'20DEC11:00:00:00'  '31AUG11:00:00:00'  '19JUL12:00:00:00'
'12DEC11:00:00:00'  '14SEP11:00:00:00'  '26APR11:00:00:00'
'04FEB12:00:00:00'  '05FEB12:00:00:00'  '02NOV11:00:00:00'
'05MAY12:00:00:00'  '19DEC11:00:00:00'  '26AUG11:00:00:00'
'26JUN12:00:00:00'  '29SEP12:00:00:00'  '04SEP12:00:00:00'
'22MAR12:00:00:00'  '29AUG11:00:00:00'  '31DEC09:00:00:00'
'16SEP11:00:00:00'  '25NOV11:00:00:00'  '15MAR12:00:00:00'
'01OCT12:00:00:00'  '24JUL12:00:00:00'  '28MAY12:00:00:00'
'19OCT11:00:00:00'  '14OCT11:00:00:00'  '24JUN12:00:00:00'
'03JUN12:00:00:00'  '20SEP12:00:00:00'  '16JUL12:00:00:00'
'17JUN12:00:00:00'  '11JUL12:00:00:00'  '13MAY12:00:00:00'
'24FEB12:00:00:00'  '19MAY12:00:00:00'  '18DEC11:00:00:00'
'10JAN12:00:00:00'  '18FEB12:00:00:00'  '12MAY12:00:00:00'
'26DEC11:00:00:00'  '07JUL11:00:00:00'  '30JUN12:00:00:00'
'20JAN12:00:00:00'  '15JAN12:00:00:00'  '20SEP11:00:00:00'
'17MAR12:00:00:00'  '26APR12:00:00:00'  '29JUL12:00:00:00'
'26AUG12:00:00:00'  '23MAR12:00:00:00'  '05SEP11:00:00:00'
'27JUL12:00:00:00'  '12FEB12:00:00:00'  '16AUG12:00:00:00'
'23JUN11:00:00:00'  '03OCT11:00:00:00'  '04OCT12:00:00:00'
'12AUG11:00:00:00'  '04NOV11:00:00:00'  '16DEC10:00:00:00'
'26OCT11:00:00:00'  '01JUL12:00:00:00'  '30SEP11:00:00:00'
'24JAN12:00:00:00'  '31OCT11:00:00:00'  '23AUG11:00:00:00'
'10MAY11:00:00:00'  '15SEP11:00:00:00'  '31MAY12:00:00:00'
'12JUN11:00:00:00'  '07AUG12:00:00:00'  '30OCT11:00:00:00'
'08JUN11:00:00:00'  '10AUG11:00:00:00'  '18AUG11:00:00:00'
'23JAN12:00:00:00'  '05MAY10:00:00:00'  '19APR11:00:00:00'
'21JUN12:00:00:00'  '11OCT11:00:00:00'  '27FEB12:00:00:00'
'27SEP12:00:00:00'  '11AUG12:00:00:00'  '14MAR12:00:00:00'
'15APR11:00:00:00'  '15AUG12:00:00:00'  '24MAY11:00:00:00'
'22JUL12:00:00:00'  '19JUN11:00:00:00'  '17JAN12:00:00:00'
'17AUG11:00:00:00'  '21AUG11:00:00:00'  '18MAR12:00:00:00'
'31MAY11:00:00:00'  '02SEP11:00:00:00'  '25AUG11:00:00:00'
'02AUG11:00:00:00'  '14APR11:00:00:00'  '23DEC11:00:00:00'
'18MAY11:00:00:00'  '08DEC11:00:00:00'  '21SEP12:00:00:00'
'01APR12:00:00:00'  '30AUG11:00:00:00'  '07FEB11:00:00:00'
'05JUN12:00:00:00'  '16JUN12:00:00:00'  '15NOV11:00:00:00'
'04MAR10:00:00:00'  '02DEC11:00:00:00'  '31JAN12:00:00:00'
'05AUG11:00:00:00'  '20MAY12:00:00:00'  '14DEC11:00:00:00'
'23OCT12:00:00:00'  '24SEP12:00:00:00'  '22SEP12:00:00:00'
'04JAN12:00:00:00'  '22JUN11:00:00:00'  '16OCT11:00:00:00'
```

```
        '26SEP11:00:00:00'  '07DEC11:00:00:00'  '03NOV11:00:00:00'
        '22JAN10:00:00:00'  '30JUL12:00:00:00'  '29OCT11:00:00:00'
        '15MAY12:00:00:00'  '04OCT11:00:00:00'  '13APR11:00:00:00'
        '11NOV11:00:00:00'  '01NOV11:00:00:00'  '21MAR12:00:00:00'
        '22JUN12:00:00:00'  '30APR12:00:00:00'  '22APR12:00:00:00'
        '23AUG12:00:00:00'  '29JUL11:00:00:00'  '10JUL10:00:00:00'
        '28JUL11:00:00:00'  '10MAR12:00:00:00'  '17FEB12:00:00:00'
        '13JUN11:00:00:00'  '11APR12:00:00:00'  '13MAY11:00:00:00'
        '13JUN12:00:00:00'  '29FEB12:00:00:00'  '29MAR12:00:00:00'
        '17SEP12:00:00:00'  '10JUN11:00:00:00'  '14NOV11:00:00:00'
        '10FEB12:00:00:00'  '26JAN12:00:00:00'  '26NOV11:00:00:00'
        '22AUG12:00:00:00'  '07OCT12:00:00:00'  '29NOV11:00:00:00'
        '12SEP11:00:00:00'  '11DEC11:00:00:00'  '19SEP11:00:00:00'
        '02AUG12:00:00:00'  '13FEB12:00:00:00'  '19OCT12:00:00:00'
        '06MAY11:00:00:00'  '24APR12:00:00:00'  '26SEP12:00:00:00'
        '07NOV11:00:00:00'  '03JAN12:00:00:00'  '10SEP12:00:00:00'
        '12SEP12:00:00:00'  '30JUN11:00:00:00'  '08NOV11:00:00:00'
        '10JUL12:00:00:00'  '27MAR12:00:00:00'  '24DEC11:00:00:00'
        '11APR11:00:00:00'  '24SEP11:00:00:00'  '01AUG12:00:00:00'
        '25AUG12:00:00:00'  '17DEC11:00:00:00'  '29DEC11:00:00:00'
        '15JUN11:00:00:00'  '19MAY10:00:00:00'  '05JUL11:00:00:00'
        '21MAR11:00:00:00'  '13OCT11:00:00:00'  '18JUL12:00:00:00'
        '06OCT12:00:00:00'  '08JUL11:00:00:00'  '30SEP12:00:00:00'
        '11MAR12:00:00:00'  '18JAN12:00:00:00'  '16JUN11:00:00:00'
        '05SEP12:00:00:00'  '01FEB12:00:00:00'  '26JAN11:00:00:00'
        '14JUL12:00:00:00'  '21MAY11:00:00:00'  '18SEP12:00:00:00'
        '16NOV10:00:00:00'  '14SEP12:00:00:00'  '31DEC11:00:00:00'
        '28AUG11:00:00:00'  '20OCT11:00:00:00'  '06DEC11:00:00:00'
        '28JUN11:00:00:00'  '24MAR12:00:00:00'  '26JUL11:00:00:00'
        '04SEP11:00:00:00'  '08APR11:00:00:00'  '18JUN12:00:00:00'
        '03SEP11:00:00:00'  '07OCT11:00:00:00'  '19SEP12:00:00:00'
        '09AUG12:00:00:00'  '18APR12:00:00:00'  '14AUG11:00:00:00'
        '17OCT11:00:00:00'  '03MAY11:00:00:00'  '28OCT11:00:00:00'
        '25SEP11:00:00:00'  '10NOV11:00:00:00'  '05JAN12:00:00:00'
        '20AUG12:00:00:00'  '06JAN12:00:00:00'  '06NOV11:00:00:00'
        '07SEP10:00:00:00'  '07DEC10:00:00:00'  '27JAN12:00:00:00'
        '27JUL11:00:00:00'  '07JUN11:00:00:00'  '26FEB12:00:00:00'
        '30DEC11:00:00:00'  '15OCT12:00:00:00'  '14APR12:00:00:00'
        '03NOV09:00:00:00'  '18OCT10:00:00:00'  '19JUL11:00:00:00'
        '12OCT12:00:00:00'  '16MAR12:00:00:00'  '22OCT11:00:00:00'
        '06SEP12:00:00:00'  '10FEB11:00:00:00'  '02SEP10:00:00:00'
        '22FEB12:00:00:00'  '16JUL11:00:00:00'  '09JUN12:00:00:00'
        '23FEB12:00:00:00'  '15SEP12:00:00:00'  '12OCT11:00:00:00'
        '19AUG11:00:00:00'  '30MAY11:00:00:00'  '31MAR12:00:00:00'
        '30JAN12:00:00:00'  '05AUG12:00:00:00'  '22DEC11:00:00:00'
        '07JAN12:00:00:00'  '28APR12:00:00:00'  '23JUL12:00:00:00'
        '14AUG12:00:00:00'  '04MAY11:00:00:00'  '09MAR12:00:00:00'
        '08APR12:00:00:00'  '02MAY11:00:00:00'  '06MAY12:00:00:00'
        '28SEP11:00:00:00'  '12JUL11:00:00:00'  '02MAR11:00:00:00'
        '23MAY11:00:00:00'  '15JAN09:00:00:00'  '21OCT11:00:00:00'
        '20FEB12:00:00:00'  '19JUN09:00:00:00'  '26NOV08:00:00:00'
        '22JUL11:00:00:00'  '15JUL12:00:00:00'  '25MAY11:00:00:00'
        '05NOV11:00:00:00'  '11AUG11:00:00:00'  '08MAY10:00:00:00'
        '21FEB12:00:00:00'  '25OCT12:00:00:00'  '22NOV11:00:00:00'
        '02JUN11:00:00:00'  '21JUN11:00:00:00'  '04MAR12:00:00:00'
        '08AUG11:00:00:00'  '01AUG11:00:00:00'  '06SEP11:00:00:00'
        '08SEP12:00:00:00'  '20MAY11:00:00:00'  '21APR12:00:00:00'
        '09JUL11:00:00:00'  '15APR12:00:00:00'  '23FEB09:00:00:00'
        '25SEP09:00:00:00'  '08JAN12:00:00:00'  '28JUL12:00:00:00'
        '15JUL11:00:00:00'  '17SEP11:00:00:00'  '24APR11:00:00:00'
        '24AUG12:00:00:00'  '18JUL11:00:00:00'  '19NOV11:00:00:00'
        '20NOV09:00:00:00'  '30JUL11:00:00:00'  '22MAY11:00:00:00'
        '11OCT12:00:00:00'  '17OCT08:00:00:00'  '16SEP12:00:00:00'
        '25JUL12:00:00:00'  '29SEP11:00:00:00']
 VAR_0166 [nan '12MAR12:00:00:00' '25FEB12:00:00:00' ... '20OCT09:00:00:00'
  '05JUL08:00:00:00'  '22MAR11:00:00:00']
 VAR_0167 [nan '09JUN12:00:00:00' '21MAY12:00:00:00' '07AUG10:00:00:00'
  '15MAY12:00:00:00'  '06APR11:00:00:00'  '14MAY12:00:00:00'
  '25JAN12:00:00:00'  '02OCT10:00:00:00'  '16FEB12:00:00:00'
```

```
'08JUL10:00:00:00'  '23SEP11:00:00:00'  '04JAN12:00:00:00'
'13APR12:00:00:00'  '04MAR10:00:00:00'  '22NOV10:00:00:00'
'20OCT11:00:00:00'  '18SEP12:00:00:00'  '23NOV10:00:00:00'
'02JUL11:00:00:00'  '19JUN10:00:00:00'  '03AUG12:00:00:00'
'02DEC11:00:00:00'  '22JUL11:00:00:00'  '04NOV09:00:00:00'
'12FEB10:00:00:00'  '13DEC11:00:00:00'  '07DEC11:00:00:00'
'21MAY11:00:00:00'  '06JUN12:00:00:00'  '21SEP12:00:00:00'
'06NOV10:00:00:00'  '16OCT10:00:00:00'  '31MAR12:00:00:00'
'14DEC11:00:00:00'  '05JAN08:00:00:00'  '27JUL12:00:00:00'
'01NOV11:00:00:00'  '16SEP11:00:00:00'  '24JAN11:00:00:00'
'01JUL11:00:00:00'  '23MAY12:00:00:00'  '05JUL11:00:00:00'
'11NOV11:00:00:00'  '03NOV11:00:00:00'  '16SEP12:00:00:00'
'05AUG06:00:00:00'  '29MAY12:00:00:00'  '20AUG11:00:00:00'
'19JUN12:00:00:00'  '03JUL12:00:00:00'  '13MAR12:00:00:00'
'06APR12:00:00:00'  '26OCT11:00:00:00'  '30JUL12:00:00:00'
'06MAY11:00:00:00'  '05NOV11:00:00:00'  '15JUN11:00:00:00'
'01SEP11:00:00:00'  '21OCT11:00:00:00'  '12DEC09:00:00:00'
'17JAN12:00:00:00'  '15APR11:00:00:00'  '26JAN11:00:00:00'
'04MAY12:00:00:00'  '04APR12:00:00:00'  '06MAR12:00:00:00'
'27APR12:00:00:00'  '13JAN12:00:00:00'  '10OCT11:00:00:00'
'23APR10:00:00:00'  '10JAN11:00:00:00'  '15FEB12:00:00:00'
'13AUG11:00:00:00'  '14JAN11:00:00:00'  '23JAN10:00:00:00'
'01MAR12:00:00:00'  '17MAR11:00:00:00'  '26MAR10:00:00:00'
'14MAY11:00:00:00'  '09DEC11:00:00:00'  '05OCT12:00:00:00'
'31OCT09:00:00:00'  '19AUG11:00:00:00'  '29JUL11:00:00:00'
'01JUL10:00:00:00'  '10MAY12:00:00:00'  '23NOV11:00:00:00'
'05OCT11:00:00:00'  '27MAY11:00:00:00'  '26AUG10:00:00:00'
'16JUL11:00:00:00'  '14SEP11:00:00:00'  '28MAR12:00:00:00'
'17AUG11:00:00:00'  '18FEB06:00:00:00'  '28MAR11:00:00:00'
'31OCT11:00:00:00'  '25JUL11:00:00:00'  '12OCT12:00:00:00'
'29APR11:00:00:00'  '08JUN12:00:00:00'  '22OCT11:00:00:00'
'16APR10:00:00:00'  '01MAY12:00:00:00'  '05MAY11:00:00:00'
'08MAR12:00:00:00'  '06OCT11:00:00:00'  '10JAN12:00:00:00'
'15JUL11:00:00:00'  '22JUN12:00:00:00'  '02NOV11:00:00:00'
'13OCT11:00:00:00'  '03JAN11:00:00:00'  '14OCT11:00:00:00'
'20JUN12:00:00:00'  '08JUL11:00:00:00'  '05JAN12:00:00:00'
'28OCT10:00:00:00'  '03JAN09:00:00:00'  '14JUN12:00:00:00'
'30APR11:00:00:00'  '06JAN12:00:00:00'  '05APR12:00:00:00'
'24JUN11:00:00:00'  '16SEP10:00:00:00'  '08MAY10:00:00:00'
'16FEB11:00:00:00'  '29NOV10:00:00:00'  '12NOV11:00:00:00'
'31AUG11:00:00:00'  '02MAR12:00:00:00'  '17NOV10:00:00:00'
'11JUN11:00:00:00'  '26AUG11:00:00:00'  '30DEC11:00:00:00'
'27MAR12:00:00:00'  '16JUN11:00:00:00'  '13APR10:00:00:00'
'03APR12:00:00:00'  '25OCT08:00:00:00'  '01AUG09:00:00:00'
'28JAN12:00:00:00'  '06OCT09:00:00:00'  '07NOV11:00:00:00'
'19JAN12:00:00:00'  '19FEB11:00:00:00'  '27JAN11:00:00:00'
'15NOV11:00:00:00'  '29OCT11:00:00:00'  '09JUL10:00:00:00'
'04NOV11:00:00:00'  '04OCT11:00:00:00'  '31DEC11:00:00:00'
'15AUG11:00:00:00'  '09JUL11:00:00:00'  '05OCT10:00:00:00'
'13FEB12:00:00:00'  '23DEC09:00:00:00'  '23OCT12:00:00:00'
'24SEP11:00:00:00'  '17SEP10:00:00:00'  '12FEB11:00:00:00'
'16FEB07:00:00:00'  '15JAN11:00:00:00'  '16JUL12:00:00:00'
'12JUL11:00:00:00'  '14JUL09:00:00:00'  '30APR12:00:00:00'
'24OCT09:00:00:00'  '18JUL12:00:00:00'  '03APR10:00:00:00'
'07JUN11:00:00:00'  '30JUL11:00:00:00'  '03JAN12:00:00:00'
'11FEB10:00:00:00'  '30JAN10:00:00:00'  '09NOV11:00:00:00'
'26JAN08:00:00:00'  '02SEP11:00:00:00'  '14JAN12:00:00:00'
'23MAR12:00:00:00'  '22AUG12:00:00:00'  '26MAR11:00:00:00'
'14NOV09:00:00:00'  '27SEP11:00:00:00'  '11AUG11:00:00:00'
'17DEC11:00:00:00'  '17NOV11:00:00:00'  '20OCT12:00:00:00'
'07MAR12:00:00:00'  '28JUL10:00:00:00'  '07SEP12:00:00:00'
'16AUG11:00:00:00'  '15FEB11:00:00:00'  '17FEB12:00:00:00'
'01JUN11:00:00:00'  '23JUL11:00:00:00'  '03SEP11:00:00:00'
'14NOV11:00:00:00'  '30MAR12:00:00:00'  '06SEP11:00:00:00'
'30AUG11:00:00:00'  '13JUL12:00:00:00'  '04OCT12:00:00:00'
'12MAR11:00:00:00'  '14MAR12:00:00:00'  '13AUG10:00:00:00'
'15MAR12:00:00:00'  '01JAN10:00:00:00'  '14AUG10:00:00:00'
'07FEB12:00:00:00'  '31JAN11:00:00:00'  '29JUN12:00:00:00'
'04MAY11:00:00:00'  '19MAY11:00:00:00'  '23MAR07:00:00:00'
```

```
'12AUG10:00:00:00'  '05APR11:00:00:00'  '10OCT12:00:00:00'
'20JUN09:00:00:00'  '26NOV10:00:00:00'  '30APR05:00:00:00'
'10JUL12:00:00:00'  '30AUG12:00:00:00'  '07JUL11:00:00:00'
'01JAN11:00:00:00'  '02AUG11:00:00:00'  '28AUG09:00:00:00'
'14APR07:00:00:00'  '18OCT11:00:00:00'  '23AUG11:00:00:00'
'07JUL10:00:00:00'  '16AUG12:00:00:00'  '04AUG11:00:00:00'
'21JAN12:00:00:00'  '14MAR09:00:00:00'  '10SEP11:00:00:00'
'07MAR11:00:00:00'  '09FEB12:00:00:00'  '02OCT12:00:00:00'
'09APR05:00:00:00'  '06JUL12:00:00:00'  '03MAY08:00:00:00'
'11JUL11:00:00:00'  '08AUG11:00:00:00'  '09AUG12:00:00:00'
'02APR09:00:00:00'  '12JUN10:00:00:00'  '26MAY11:00:00:00'
'07MAY10:00:00:00'  '26SEP09:00:00:00'  '22DEC10:00:00:00'
'14FEB11:00:00:00'  '05AUG11:00:00:00'  '09MAR11:00:00:00'
'08JAN11:00:00:00'  '22JUN11:00:00:00'  '25SEP10:00:00:00'
'09SEP11:00:00:00'  '29MAR12:00:00:00'  '16MAY12:00:00:00'
'20FEB11:00:00:00'  '16APR12:00:00:00'  '20JAN11:00:00:00'
'18FEB11:00:00:00'  '23DEC10:00:00:00'  '10JUL10:00:00:00'
'30SEP09:00:00:00'  '10MAY05:00:00:00'  '01JUN12:00:00:00'
'27APR11:00:00:00'  '20SEP10:00:00:00'  '05JUN12:00:00:00'
'22MAY12:00:00:00'  '25AUG11:00:00:00'  '20DEC10:00:00:00'
'07OCT11:00:00:00'  '19DEC11:00:00:00'  '24JAN12:00:00:00'
'26FEB12:00:00:00'  '29SEP11:00:00:00'  '17APR12:00:00:00'
'17JUN12:00:00:00'  '14JUN11:00:00:00'  '28SEP12:00:00:00'
'16NOV11:00:00:00'  '06AUG12:00:00:00'  '04NOV10:00:00:00'
'05SEP12:00:00:00'  '16JAN10:00:00:00'  '07MAY11:00:00:00'
'26NOV11:00:00:00'  '25MAY12:00:00:00'  '03DEC10:00:00:00'
'10SEP12:00:00:00'  '01AUG11:00:00:00'  '28MAY05:00:00:00'
'05FEB11:00:00:00'  '23MAR11:00:00:00'  '01OCT12:00:00:00'
'14SEP12:00:00:00'  '07JUN12:00:00:00'  '16MAY09:00:00:00'
'31MAY12:00:00:00'  '11FEB12:00:00:00'  '15NOV10:00:00:00'
'14AUG09:00:00:00'  '29JAN12:00:00:00'  '30SEP11:00:00:00'
'10NOV11:00:00:00'  '01APR11:00:00:00'  '12APR12:00:00:00'
'19NOV11:00:00:00'  '17MAY08:00:00:00'  '31JUL09:00:00:00'
'11SEP11:00:00:00'  '31AUG12:00:00:00'  '12OCT10:00:00:00'
'08OCT10:00:00:00'  '19APR11:00:00:00'  '10AUG11:00:00:00'
'11JUN10:00:00:00'  '21AUG12:00:00:00'  '06AUG11:00:00:00'
'13NOV10:00:00:00'  '28MAY12:00:00:00'  '20APR12:00:00:00'
'11JAN12:00:00:00'  '20SEP11:00:00:00'  '05MAR12:00:00:00'
'29DEC10:00:00:00'  '21JUN11:00:00:00'  '05DEC11:00:00:00'
'15OCT10:00:00:00'  '25APR12:00:00:00'  '20MAY06:00:00:00'
'18MAY12:00:00:00'  '02APR11:00:00:00'  '26JUL12:00:00:00'
'26APR11:00:00:00'  '27AUG11:00:00:00'  '19FEB10:00:00:00'
'05MAR11:00:00:00'  '28NOV10:00:00:00'  '25AUG10:00:00:00'
'10MAY11:00:00:00'  '15SEP10:00:00:00'  '08JUN11:00:00:00'
'04JAN11:00:00:00'  '24MAR10:00:00:00'  '31DEC10:00:00:00'
'02JUL12:00:00:00'  '06NOV11:00:00:00'  '28OCT11:00:00:00'
'14OCT10:00:00:00'  '18AUG10:00:00:00'  '03DEC11:00:00:00'
'30JUN11:00:00:00'  '08MAY11:00:00:00'  '23FEB12:00:00:00'
'03FEB11:00:00:00'  '15DEC11:00:00:00'  '05SEP09:00:00:00'
'04SEP10:00:00:00'  '12JUL10:00:00:00'  '22SEP11:00:00:00'
'21MAR12:00:00:00'  '07DEC10:00:00:00'  '26JAN12:00:00:00'
'08SEP12:00:00:00'  '05JUN11:00:00:00'  '01DEC11:00:00:00'
'29DEC07:00:00:00'  '07APR11:00:00:00'  '10MAR12:00:00:00'
'17OCT12:00:00:00'  '08DEC10:00:00:00'  '23MAY09:00:00:00'
'08NOV11:00:00:00'  '21AUG08:00:00:00'  '02MAR11:00:00:00'
'01FEB11:00:00:00'  '12AUG11:00:00:00'  '11APR12:00:00:00'
'29MAR11:00:00:00'  '29JAN11:00:00:00'  '19OCT12:00:00:00'
'17JUL12:00:00:00'  '30APR10:00:00:00'  '31JUL10:00:00:00'
'08OCT12:00:00:00'  '24JUL09:00:00:00'  '24FEB12:00:00:00'
'06OCT12:00:00:00'  '15APR06:00:00:00'  '12MAY11:00:00:00'
'05DEC08:00:00:00'  '06DEC11:00:00:00'  '21SEP11:00:00:00'
'18JAN12:00:00:00'  '10AUG12:00:00:00'  '18JUN10:00:00:00'
'01SEP12:00:00:00'  '28JUL11:00:00:00'  '27JAN12:00:00:00'
'21JUN12:00:00:00'  '30NOV11:00:00:00'  '22DEC11:00:00:00'
'27FEB10:00:00:00'  '08MAY12:00:00:00'  '23JUN11:00:00:00'
'15SEP11:00:00:00'  '02MAY12:00:00:00'  '23DEC11:00:00:00'
'20AUG12:00:00:00'  '28NOV11:00:00:00'  '16MAR11:00:00:00'
'19MAY10:00:00:00'  '01FEB12:00:00:00'  '01OCT11:00:00:00'
'25OCT10:00:00:00'  '12JUL08:00:00:00'  '02FEB11:00:00:00'
```

```
                '30DEC10:00:00:00' '31JAN12:00:00:00' '28MAY10:00:00:00'
                '13JUN12:00:00:00' '04DEC09:00:00:00' '28FEB11:00:00:00'
                '03OCT12:00:00:00' '02JUL10:00:00:00' '11FEB11:00:00:00'
                '11MAY11:00:00:00' '22NOV11:00:00:00' '17MAY11:00:00:00'
                '08FEB12:00:00:00' '26APR08:00:00:00' '14APR12:00:00:00'
                '14MAY05:00:00:00' '01JUL06:00:00:00' '24DEC10:00:00:00'
                '05JUL12:00:00:00' '30NOV10:00:00:00' '13SEP11:00:00:00'
                '28SEP10:00:00:00' '15OCT09:00:00:00' '21DEC10:00:00:00'
                '28APR11:00:00:00' '05NOV10:00:00:00' '15AUG09:00:00:00'
                '01APR08:00:00:00' '29JUN11:00:00:00']
        VAR_0168 [nan '22MAR12:00:00:00' '26JAN12:00:00:00' ... '05JUN08:00:00:00'
                '03MAR10:00:00:00' '18NOV08:00:00:00']
        VAR_0169 [nan '12MAR12:00:00:00' '25FEB12:00:00:00' ... '07MAR10:00:00:00'
                '05JUL08:00:00:00' '22MAR11:00:00:00']
        VAR_0176 [nan '12MAR12:00:00:00' '25FEB12:00:00:00' ... '20OCT09:00:00:00'
                '05JUL08:00:00:00' '22MAR11:00:00:00']
        VAR_0177 [nan '09JUN12:00:00:00' '05JUL12:00:00:00' '21MAY12:00:00:00'
                '07AUG10:00:00:00' '15MAY12:00:00:00' '06APR11:00:00:00'
                '26MAY12:00:00:00' '14MAY12:00:00:00' '25JAN12:00:00:00'
                '02OCT10:00:00:00' '11AUG11:00:00:00' '16JUN12:00:00:00'
                '27JAN12:00:00:00' '16FEB12:00:00:00' '08JUL10:00:00:00'
                '23SEP11:00:00:00' '29APR12:00:00:00' '20APR12:00:00:00'
                '23MAY11:00:00:00' '04JAN12:00:00:00' '13DEC11:00:00:00'
                '13APR12:00:00:00' '04MAR10:00:00:00' '22NOV10:00:00:00'
                '20OCT11:00:00:00' '13JUN12:00:00:00' '18SEP12:00:00:00'
                '16APR12:00:00:00' '23NOV10:00:00:00' '02JUL11:00:00:00'
                '21AUG11:00:00:00' '19JUN10:00:00:00' '03AUG12:00:00:00'
                '02DEC11:00:00:00' '22JUL11:00:00:00' '09AUG12:00:00:00'
                '04NOV09:00:00:00' '12FEB10:00:00:00' '09MAR12:00:00:00'
                '07DEC11:00:00:00' '21MAY11:00:00:00' '06JUN12:00:00:00'
                '21SEP12:00:00:00' '06NOV10:00:00:00' '16OCT10:00:00:00'
                '31MAR12:00:00:00' '14DEC11:00:00:00' '05JAN08:00:00:00'
                '23JUL12:00:00:00' '27JUL12:00:00:00' '01NOV11:00:00:00'
                '16SEP11:00:00:00' '24JAN11:00:00:00' '01JUL11:00:00:00'
                '20JUL12:00:00:00' '23MAY12:00:00:00' '05JUL11:00:00:00'
                '11NOV11:00:00:00' '07JUN12:00:00:00' '23NOV11:00:00:00'
                '19MAY12:00:00:00' '03NOV11:00:00:00' '12FEB12:00:00:00'
                '16SEP12:00:00:00' '05AUG06:00:00:00' '29MAY12:00:00:00'
                '20AUG11:00:00:00' '19JUN12:00:00:00' '31JUL12:00:00:00'
                '03JUL12:00:00:00' '13MAR12:00:00:00' '06APR12:00:00:00'
                '26OCT11:00:00:00' '30JUL12:00:00:00' '06MAY11:00:00:00'
                '31AUG11:00:00:00' '05NOV11:00:00:00' '27FEB12:00:00:00'
                '15JUN11:00:00:00' '13OCT11:00:00:00' '01SEP11:00:00:00'
                '21OCT11:00:00:00' '12DEC09:00:00:00' '17JAN12:00:00:00'
                '25OCT11:00:00:00' '15APR11:00:00:00' '26JAN11:00:00:00'
                '04MAY12:00:00:00' '04APR12:00:00:00' '06MAR12:00:00:00'
                '27APR12:00:00:00' '13JAN12:00:00:00' '01JAN09:00:00:00'
                '10OCT11:00:00:00' '23APR10:00:00:00' '10JAN11:00:00:00'
                '15FEB12:00:00:00' '13AUG11:00:00:00' '14JAN11:00:00:00'
                '23JAN10:00:00:00' '02SEP11:00:00:00' '01MAR12:00:00:00'
                '11MAR12:00:00:00' '17MAR11:00:00:00' '26MAR10:00:00:00'
                '14MAY11:00:00:00' '16NOV11:00:00:00' '09DEC11:00:00:00'
                '05OCT12:00:00:00' '31OCT09:00:00:00' '01JUL12:00:00:00'
                '19AUG11:00:00:00' '29JUL11:00:00:00' '01JUL10:00:00:00'
                '13JUN10:00:00:00' '12MAR12:00:00:00' '10MAY12:00:00:00'
                '05OCT11:00:00:00' '27MAY11:00:00:00' '26AUG10:00:00:00'
                '16JUL11:00:00:00' '14SEP11:00:00:00' '19MAR12:00:00:00'
                '28MAR12:00:00:00' '17AUG11:00:00:00' '18FEB06:00:00:00'
                '14FEB12:00:00:00' '28MAR11:00:00:00' '31OCT11:00:00:00'
                '25JUL11:00:00:00' '12OCT12:00:00:00' '29APR11:00:00:00'
                '07MAR12:00:00:00' '08JUN12:00:00:00' '22OCT11:00:00:00'
                '16APR10:00:00:00' '01MAY12:00:00:00' '11SEP11:00:00:00'
                '05MAY11:00:00:00' '08MAR12:00:00:00' '06OCT11:00:00:00'
                '10JAN12:00:00:00' '15JUL11:00:00:00' '22JUN12:00:00:00'
                '02NOV11:00:00:00' '12OCT11:00:00:00' '03JAN11:00:00:00'
                '23DEC11:00:00:00' '07FEB12:00:00:00' '14OCT11:00:00:00'
                '20JUN12:00:00:00' '08JUL11:00:00:00' '05JAN12:00:00:00'
                '28OCT10:00:00:00' '03JAN09:00:00:00' '14JUN12:00:00:00'
                '30APR11:00:00:00' '25DEC11:00:00:00' '06JAN12:00:00:00'
```

```
          '05APR12:00:00:00'  '24JUN11:00:00:00'  '16SEP10:00:00:00'
          '31MAY12:00:00:00'  '21MAR12:00:00:00'  '08MAY10:00:00:00'
          '15JUN12:00:00:00'  '16FEB11:00:00:00'  '29NOV10:00:00:00'
          '12NOV11:00:00:00'  '02MAR12:00:00:00'  '01APR11:00:00:00'
          '17NOV10:00:00:00'  '11JUN11:00:00:00'  '26AUG11:00:00:00'
          '27MAR12:00:00:00'  '16JUN11:00:00:00'  '13APR10:00:00:00'
          '01JUN12:00:00:00'  '03APR12:00:00:00'  '25OCT08:00:00:00'
          '01AUG09:00:00:00'  '11OCT11:00:00:00'  '28JAN12:00:00:00'
          '07SEP12:00:00:00'  '06OCT09:00:00:00'  '07NOV11:00:00:00'
          '21JUN12:00:00:00'  '19JAN12:00:00:00'  '14NOV11:00:00:00'
          '19FEB11:00:00:00'  '27JAN11:00:00:00'  '15NOV11:00:00:00'
          '29OCT11:00:00:00'  '04OCT10:00:00:00'  '09JUL10:00:00:00'
          '04NOV11:00:00:00'  '04OCT11:00:00:00'  '31DEC11:00:00:00'
          '15AUG11:00:00:00'  '09JUL11:00:00:00'  '30MAR12:00:00:00'
          '05OCT10:00:00:00'  '13FEB12:00:00:00'  '30AUG12:00:00:00'
          '07OCT11:00:00:00'  '23OCT12:00:00:00'  '27OCT11:00:00:00'
          '17SEP10:00:00:00'  '12FEB11:00:00:00'  '16FEB07:00:00:00'
          '15JAN11:00:00:00'  '16JUL12:00:00:00'  '12JUL11:00:00:00'
          '07MAY10:00:00:00'  '14JUL09:00:00:00'  '14JAN12:00:00:00'
          '30APR12:00:00:00'  '24OCT09:00:00:00'  '02MAY12:00:00:00'
          '08MAY12:00:00:00'  '18JUL12:00:00:00'  '03APR10:00:00:00'
          '19NOV11:00:00:00'  '07JUN11:00:00:00'  '03MAR12:00:00:00'
          '30JUL11:00:00:00'  '03JAN12:00:00:00'  '05MAR12:00:00:00'
          '11FEB10:00:00:00'  '06NOV11:00:00:00'  '30JAN10:00:00:00'
          '09NOV11:00:00:00'  '09MAY12:00:00:00'  '26JAN08:00:00:00'
          '17DEC11:00:00:00'  '23MAR12:00:00:00'  '17APR12:00:00:00'
          '22AUG12:00:00:00'  '29DEC11:00:00:00'  '26MAR11:00:00:00'
          '19APR12:00:00:00'  '14NOV09:00:00:00'  '11AUG12:00:00:00'
          '27SEP11:00:00:00'  '31OCT12:00:00:00'  '17NOV11:00:00:00'
          '20OCT12:00:00:00'  '20AUG10:00:00:00'  '24JUN12:00:00:00'
          '28JUL10:00:00:00'  '16AUG11:00:00:00'  '15FEB11:00:00:00'
          '17FEB12:00:00:00'  '01JUN11:00:00:00'  '04JUL12:00:00:00'
          '23JUL11:00:00:00'  '03SEP11:00:00:00'  '12AUG12:00:00:00'
          '01APR12:00:00:00'  '06SEP11:00:00:00'  '30AUG11:00:00:00'
          '13JUL12:00:00:00'  '04OCT12:00:00:00'  '12MAR11:00:00:00'
          '03JUN12:00:00:00'  '12APR12:00:00:00'  '14MAR12:00:00:00'
          '13AUG10:00:00:00'  '15MAR12:00:00:00'  '01JAN10:00:00:00'
          '14AUG10:00:00:00'  '31JAN11:00:00:00'  '02OCT12:00:00:00'
          '29JUN12:00:00:00'  '11FEB12:00:00:00'  '04MAY11:00:00:00'
          '15APR12:00:00:00'  '19MAY11:00:00:00'  '23MAR07:00:00:00'
          '12AUG10:00:00:00'  '05APR11:00:00:00'  '10OCT12:00:00:00'
          '20JUN09:00:00:00'  '26NOV10:00:00:00'  '30APR05:00:00:00'
          '05SEP12:00:00:00'  '24JUL12:00:00:00'  '10JUL12:00:00:00'
          '07JUL11:00:00:00'  '01JAN11:00:00:00'  '02AUG11:00:00:00'
          '28AUG09:00:00:00'  '14APR07:00:00:00'  '26JUN12:00:00:00'
          '18OCT11:00:00:00'  '02AUG12:00:00:00'  '16DEC11:00:00:00'
          '23AUG11:00:00:00'  '07JUL10:00:00:00'  '18JAN12:00:00:00'
          '16AUG12:00:00:00'  '04AUG11:00:00:00'  '21JAN12:00:00:00'
          '14MAR09:00:00:00'  '28SEP12:00:00:00'  '10SEP11:00:00:00'
          '10AUG12:00:00:00'  '07MAR11:00:00:00'  '09FEB12:00:00:00'
          '09APR05:00:00:00'  '06JUL12:00:00:00'  '03MAY08:00:00:00'
          '11JUL11:00:00:00'  '08AUG11:00:00:00'  '02APR09:00:00:00'
          '12JUN10:00:00:00'  '23AUG12:00:00:00'  '26SEP09:00:00:00'
          '22DEC10:00:00:00'  '14FEB11:00:00:00'  '30DEC11:00:00:00'
          '05JUN10:00:00:00'  '05AUG11:00:00:00'  '09MAR11:00:00:00'
          '08JAN11:00:00:00'  '22JUN11:00:00:00'  '25SEP10:00:00:00'
          '14JUL11:00:00:00'  '09SEP11:00:00:00'  '29MAR12:00:00:00'
          '16MAY12:00:00:00'  '20FEB11:00:00:00'  '30JUN12:00:00:00'
          '20JAN11:00:00:00'  '18FEB11:00:00:00'  '23DEC10:00:00:00'
          '10JUL10:00:00:00'  '30SEP09:00:00:00'  '10MAY05:00:00:00'
          '27APR11:00:00:00'  '20SEP10:00:00:00'  '05AUG12:00:00:00'
          '29SEP12:00:00:00'  '05JUN12:00:00:00'  '22MAY12:00:00:00'
          '25AUG11:00:00:00'  '20DEC10:00:00:00'  '24FEB10:00:00:00'
          '19DEC11:00:00:00'  '25MAR12:00:00:00'  '29SEP11:00:00:00'
          '26FEB12:00:00:00'  '17JUN12:00:00:00'  '14JUN11:00:00:00'
          '09APR12:00:00:00'  '06AUG12:00:00:00'  '04NOV10:00:00:00'
          '15JUL09:00:00:00'  '16JAN10:00:00:00'  '07JUL12:00:00:00'
          '07MAY11:00:00:00'  '26NOV11:00:00:00'  '25MAY12:00:00:00'
          '03DEC10:00:00:00'  '26APR12:00:00:00'  '10SEP12:00:00:00'
```

```
              '01AUG11:00:00:00' '01JAN12:00:00:00' '18JUN12:00:00:00'
              '28MAY05:00:00:00' '20SEP11:00:00:00' '05FEB11:00:00:00'
              '23MAR11:00:00:00' '01OCT12:00:00:00' '14SEP12:00:00:00'
              '16MAY09:00:00:00' '15NOV10:00:00:00' '14AUG09:00:00:00'
              '29JAN12:00:00:00' '07AUG12:00:00:00' '30SEP11:00:00:00'
              '17AUG12:00:00:00' '10NOV11:00:00:00' '19FEB12:00:00:00'
              '17MAY08:00:00:00' '31JUL09:00:00:00' '09JAN11:00:00:00'
              '31AUG12:00:00:00' '12OCT10:00:00:00' '08OCT10:00:00:00'
              '17OCT11:00:00:00' '19APR11:00:00:00' '10AUG11:00:00:00'
              '11JUN10:00:00:00' '21AUG12:00:00:00' '10NOV10:00:00:00'
              '06AUG11:00:00:00' '23FEB12:00:00:00' '12JAN12:00:00:00'
              '13NOV10:00:00:00' '28MAY12:00:00:00' '11JAN12:00:00:00'
              '29DEC10:00:00:00' '21JUN11:00:00:00' '05DEC11:00:00:00'
              '15OCT10:00:00:00' '18MAY12:00:00:00' '25APR12:00:00:00'
              '24SEP11:00:00:00' '20MAY06:00:00:00' '02APR11:00:00:00'
              '26JUL12:00:00:00' '13MAY12:00:00:00' '26APR11:00:00:00'
              '27AUG11:00:00:00' '19FEB10:00:00:00' '05MAR11:00:00:00'
              '28NOV10:00:00:00' '25AUG10:00:00:00' '10MAY11:00:00:00'
              '15SEP10:00:00:00' '24AUG12:00:00:00' '08JUN11:00:00:00'
              '29NOV11:00:00:00' '24MAR10:00:00:00' '31DEC10:00:00:00'
              '02JUL12:00:00:00' '25JUL12:00:00:00' '25JUN12:00:00:00'
              '28OCT11:00:00:00' '14OCT10:00:00:00' '18AUG10:00:00:00'
              '15DEC11:00:00:00' '03DEC11:00:00:00' '20SEP12:00:00:00'
              '30JUN11:00:00:00' '08MAY11:00:00:00' '03FEB11:00:00:00'
              '08DEC11:00:00:00' '05SEP09:00:00:00' '04SEP10:00:00:00'
              '12JUL10:00:00:00' '22SEP11:00:00:00' '08JUL12:00:00:00'
              '07DEC10:00:00:00' '26JAN12:00:00:00' '08SEP12:00:00:00'
              '05JUN11:00:00:00' '01DEC11:00:00:00' '06SEP12:00:00:00'
              '29DEC07:00:00:00' '07APR11:00:00:00' '10MAR12:00:00:00'
              '17OCT12:00:00:00' '08DEC10:00:00:00' '23MAY09:00:00:00'
              '08NOV11:00:00:00' '21AUG08:00:00:00' '29AUG12:00:00:00'
              '02MAR11:00:00:00' '01FEB11:00:00:00' '12AUG11:00:00:00'
              '11APR12:00:00:00' '29MAR11:00:00:00' '29JAN11:00:00:00'
              '19OCT12:00:00:00' '17JUL12:00:00:00' '30APR10:00:00:00'
              '31JUL10:00:00:00' '08OCT12:00:00:00' '24JUL09:00:00:00'
              '30OCT09:00:00:00' '24SEP12:00:00:00' '24FEB12:00:00:00'
              '16JAN09:00:00:00' '06OCT12:00:00:00' '15APR06:00:00:00'
              '14JUL12:00:00:00' '12MAY11:00:00:00' '05DEC08:00:00:00'
              '06DEC11:00:00:00' '21JUL12:00:00:00' '28JUL12:00:00:00'
              '21SEP11:00:00:00' '24AUG11:00:00:00' '18JUN10:00:00:00'
              '01SEP12:00:00:00' '28JUL11:00:00:00' '30NOV11:00:00:00'
              '27FEB10:00:00:00' '23JUN11:00:00:00' '15SEP11:00:00:00'
              '20AUG12:00:00:00' '28NOV11:00:00:00' '16MAR11:00:00:00'
              '19MAY10:00:00:00' '01FEB12:00:00:00' '01OCT11:00:00:00'
              '25OCT10:00:00:00' '12JUL08:00:00:00' '02FEB11:00:00:00'
              '13NOV11:00:00:00' '30DEC10:00:00:00' '31JAN12:00:00:00'
              '28MAY10:00:00:00' '04DEC09:00:00:00' '28FEB11:00:00:00'
              '03OCT12:00:00:00' '02JUL10:00:00:00' '22DEC11:00:00:00'
              '11FEB11:00:00:00' '11MAY11:00:00:00' '22NOV11:00:00:00'
              '17MAY11:00:00:00' '28JUN12:00:00:00' '08FEB12:00:00:00'
              '15JUL12:00:00:00' '11MAY12:00:00:00' '26APR08:00:00:00'
              '14APR12:00:00:00' '14MAY05:00:00:00' '01JUL06:00:00:00'
              '24DEC10:00:00:00' '30NOV10:00:00:00' '13SEP11:00:00:00'
              '28SEP10:00:00:00' '09JAN09:00:00:00' '15OCT09:00:00:00'
              '21DEC10:00:00:00' '09JAN12:00:00:00' '28APR11:00:00:00'
              '03JUL11:00:00:00' '05NOV10:00:00:00' '15AUG09:00:00:00'
              '01APR08:00:00:00' '27DEC11:00:00:00' '29JUN11:00:00:00']
         VAR_0178 [nan '22MAR12:00:00:00' '26JAN12:00:00:00' ... '05JUN08:00:00:00'
              '03MAR10:00:00:00' '18NOV08:00:00:00']
         VAR_0179 [nan '12MAR12:00:00:00' '25FEB12:00:00:00' ... '05JUL08:00:00:00'
              '22MAR11:00:00:00' '08APR12:00:00:00']
         VAR_0196 [False nan]
         VAR_0200 ['FT LAUDERDALE' 'SANTEE' 'REEDSVILLE' ... 'HAMSTEAD' 'JARVISBURG'
              'CURTIS']
         VAR_0202 ['BatchInquiry' nan]
         VAR_0204 ['29JAN14:21:16:00' '01FEB14:00:11:00' '30JAN14:15:11:00' ... nan
              '30JAN14:20:09:00' '31JAN14:22:28:00']
         VAR_0214 [nan 'HRE-Home Phone-0621']
         VAR_0216 ['DS' nan]
```

```
VAR_0217 ['08NOV11:02:00:00' '02OCT12:02:00:00' '13DEC11:02:00:00'
 '01NOV12:02:00:00' '15OCT11:02:00:00' '06JUN12:02:00:00'
 '11OCT11:02:00:00' '18JAN12:02:00:00' '23APR12:02:00:00'
 '28JUL12:02:00:00' '03OCT12:02:00:00' '18NOV11:02:00:00'
 '03MAY12:02:00:00' '15DEC11:02:00:00' '24JAN12:02:00:00'
 '20SEP12:02:00:00' '19SEP12:02:00:00' '23NOV11:02:00:00'
 '06SEP12:02:00:00' '05JUN12:02:00:00' '11SEP12:02:00:00'
 '12SEP12:02:00:00' '25FEB12:02:00:00' '28APR12:02:00:00'
 '15AUG12:02:00:00' '25NOV11:02:00:00' '27JUN12:02:00:00'
 '18MAY12:02:00:00' '23OCT12:02:00:00' '25JAN12:02:00:00'
 '06JUL12:02:00:00' '24MAR12:02:00:00' '08JUN12:02:00:00'
 '28OCT11:02:00:00' '11DEC11:02:00:00' '01DEC11:02:00:00'
 '24APR12:02:00:00' '31OCT11:02:00:00' '17APR12:02:00:00'
 '17NOV11:02:00:00' '15SEP12:02:00:00' '07AUG12:02:00:00'
 '16JUN12:02:00:00' '10JAN12:02:00:00' '27MAR12:02:00:00'
 '02JUN12:02:00:00' '05NOV11:02:00:00' '10APR12:02:00:00'
 '25OCT12:02:00:00' '11JUL12:02:00:00' '27OCT11:02:00:00'
 '26AUG12:02:00:00' '16OCT12:02:00:00' '26MAY12:02:00:00'
 '10MAY12:02:00:00' '13SEP12:02:00:00' '30JUL12:02:00:00'
 '06JAN12:02:00:00' '11AUG12:02:00:00' '14JAN12:02:00:00'
 '07MAR12:02:00:00' '22MAY12:02:00:00' '12DEC11:02:00:00'
 '25OCT11:02:00:00' '31JUL12:02:00:00' '18APR12:02:00:00'
 '22OCT12:02:00:00' '14OCT11:02:00:00' '28JUN12:02:00:00'
 '24JUL12:02:00:00' '10DEC11:02:00:00' '14SEP12:02:00:00'
 '20OCT11:02:00:00' '03NOV11:02:00:00' '19MAY12:02:00:00'
 '12APR12:02:00:00' '25SEP12:02:00:00' '10NOV11:02:00:00'
 '25JUL12:02:00:00' '23SEP12:02:00:00' '05OCT12:02:00:00'
 '23OCT11:02:00:00' '15NOV11:02:00:00' '21NOV11:02:00:00'
 '12OCT11:02:00:00' '13MAR12:02:00:00' '26SEP12:02:00:00'
 '26JUL12:02:00:00' '04JUL12:02:00:00' '21JUN12:02:00:00'
 '17MAR12:02:00:00' '11APR12:02:00:00' '12OCT12:02:00:00'
 '27OCT12:02:00:00' '19NOV11:02:00:00' '02DEC11:02:00:00'
 '24OCT12:02:00:00' '24NOV11:02:00:00' '09NOV11:02:00:00'
 '09JUN12:02:00:00' '08AUG12:02:00:00' '02NOV11:02:00:00'
 '22FEB12:02:00:00' '17MAY12:02:00:00' '09OCT12:02:00:00'
 '04NOV11:02:00:00' '15JUN12:02:00:00' '24MAY12:02:00:00'
 '07OCT11:02:00:00' '21APR12:02:00:00' '11MAY12:02:00:00'
 '08MAY12:02:00:00' '10MAR12:02:00:00' '24AUG12:02:00:00'
 '14DEC11:02:00:00' '16DEC11:02:00:00' '04APR12:02:00:00'
 '26JUN12:02:00:00' '20APR12:02:00:00' '05SEP12:02:00:00'
 '08OCT11:02:00:00' '22OCT11:02:00:00' '16APR12:02:00:00'
 '13OCT12:02:00:00' '28AUG12:02:00:00' '16MAR12:02:00:00'
 '09MAR12:02:00:00' '17DEC11:02:00:00' '21JAN12:02:00:00'
 '18JUL12:02:00:00' '21SEP12:02:00:00' '28DEC11:02:00:00'
 '07JUN12:02:00:00' '05APR12:02:00:00' '05DEC11:02:00:00'
 '19OCT11:02:00:00' '04OCT12:02:00:00' '28SEP12:02:00:00'
 '17JUN12:02:00:00' '18AUG12:02:00:00' '07JAN12:02:00:00'
 '29MAY12:02:00:00' '07DEC11:02:00:00' '08DEC11:02:00:00'
 '20JUL12:02:00:00' '15JUL12:02:00:00' '30SEP12:02:00:00'
 '26APR12:02:00:00' '03DEC11:02:00:00' '01MAY12:02:00:00'
 '19JUL12:02:00:00' '08FEB12:02:00:00' '19DEC11:02:00:00'
 '28FEB12:02:00:00' '29DEC11:02:00:00' '30AUG12:02:00:00'
 '19JAN12:02:00:00' '24DEC11:02:00:00' '15MAY12:02:00:00'
 '30MAY12:02:00:00' '07SEP12:02:00:00' '22AUG12:02:00:00'
 '14JUL12:02:00:00' '29OCT11:02:00:00' '09MAY12:02:00:00'
 '08SEP12:02:00:00' '13JUN12:02:00:00' '03JUL12:02:00:00'
 '03AUG12:02:00:00' '22APR12:02:00:00' '12NOV11:02:00:00'
 '16AUG12:02:00:00' '14MAY12:02:00:00' '01JUL12:02:00:00'
 '29NOV11:02:00:00' '11JAN12:02:00:00' '28MAR12:02:00:00'
 '30OCT12:02:00:00' '02AUG12:02:00:00' '10OCT11:02:00:00'
 '27DEC11:02:00:00' '11NOV11:02:00:00' '27AUG12:02:00:00'
 '13JAN12:02:00:00' '15OCT12:02:00:00' '20OCT12:02:00:00'
 '01FEB12:02:00:00' '31JAN12:02:00:00' '16MAY12:02:00:00'
 '29AUG12:02:00:00' '31OCT12:02:00:00' '12JUN12:02:00:00'
 '06OCT11:02:00:00' '23JUN12:02:00:00' '23MAY12:02:00:00'
 '23MAR12:02:00:00' '06DEC11:02:00:00' '09AUG12:02:00:00'
 '27APR12:02:00:00' '24OCT11:02:00:00' '23DEC11:02:00:00'
 '29JUN12:02:00:00' '13APR12:02:00:00' '17JUL12:02:00:00'
 '18JUN12:02:00:00' '19APR12:02:00:00' '22NOV11:02:00:00'
```

```
            '04AUG12:02:00:00' '21JUL12:02:00:00' '05JAN12:02:00:00'
            '25MAY12:02:00:00' '30APR12:02:00:00' '13OCT11:02:00:00'
            '15APR12:02:00:00' '10OCT12:02:00:00' '30JUN12:02:00:00'
            '16FEB12:02:00:00' '01JUN12:02:00:00' '30DEC11:02:00:00'
            '15MAR12:02:00:00' '12AUG12:02:00:00' '20DEC11:02:00:00'
            '24FEB12:02:00:00' '07JUL12:02:00:00' '16SEP12:02:00:00'
            '01OCT12:02:00:00' '08OCT12:02:00:00' '10JUN12:02:00:00'
            '23AUG12:02:00:00' '14AUG12:02:00:00' '17JAN12:02:00:00'
            '01NOV11:02:00:00' '26OCT12:02:00:00' '18OCT12:02:00:00'
            '20JUN12:02:00:00' '11FEB12:02:00:00' '22JUN12:02:00:00'
            '04MAY12:02:00:00' '18SEP12:02:00:00' '16OCT11:02:00:00'
            '03OCT11:02:00:00' '31DEC11:02:00:00' '21FEB12:02:00:00'
            '21MAR12:02:00:00' '12JUL12:02:00:00' '25AUG12:02:00:00'
            '20MAY12:02:00:00' '14NOV11:02:00:00' '02OCT11:02:00:00'
            '14MAR12:02:00:00' '04OCT11:02:00:00' '31MAY12:02:00:00'
            '14JUN12:02:00:00' '29MAR12:02:00:00' '21AUG12:02:00:00'
            '05OCT11:02:00:00' '07OCT12:02:00:00' '12MAY12:02:00:00'
            '05AUG12:02:00:00' '28NOV11:02:00:00' '28JAN12:02:00:00'
            '11JUN12:02:00:00' '09DEC11:02:00:00' '22JUL12:02:00:00'
            '01AUG12:02:00:00' '19AUG12:02:00:00' '04DEC11:02:00:00'
            '03FEB12:02:00:00' '19JUN12:02:00:00' '21DEC11:02:00:00'
            '28MAY12:02:00:00' '14APR12:02:00:00' '13AUG12:02:00:00'
            '17OCT12:02:00:00' '04FEB12:02:00:00' '19OCT12:02:00:00'
            '10FEB12:02:00:00' '07MAY12:02:00:00' '13JUL12:02:00:00'
            '12JAN12:02:00:00' '08JUL12:02:00:00' '09SEP12:02:00:00'
            '17AUG12:02:00:00' '13MAY12:02:00:00' '16NOV11:02:00:00'
            '13NOV11:02:00:00' '05MAY12:02:00:00' '04JAN12:02:00:00'
            '10AUG12:02:00:00' '27SEP12:02:00:00' '17FEB12:02:00:00'
            '22MAR12:02:00:00' '26OCT11:02:00:00' '20MAR12:02:00:00'
            '06OCT12:02:00:00' '09OCT11:02:00:00' '06MAY12:02:00:00'
            '05FEB12:02:00:00' '09FEB12:02:00:00' '27MAY12:02:00:00'
            '06MAR12:02:00:00' '22DEC11:02:00:00' '03MAR12:02:00:00'
            '26NOV11:02:00:00' '29FEB12:02:00:00' '01SEP12:02:00:00'
            '09APR12:02:00:00' '15JAN12:02:00:00' '25MAR12:02:00:00'
            '03SEP12:02:00:00' '27JUL12:02:00:00' '02SEP12:02:00:00'
            '10JUL12:02:00:00' '08MAR12:02:00:00' '25APR12:02:00:00'
            '20JAN12:02:00:00' '01MAR12:02:00:00' '22JAN12:02:00:00'
            '07NOV11:02:00:00' '16JUL12:02:00:00' '21OCT11:02:00:00'
            '31AUG12:02:00:00' '02APR12:02:00:00' '06AUG12:02:00:00'
            '10SEP12:02:00:00' '30OCT11:02:00:00' '23JUL12:02:00:00'
            '15FEB12:02:00:00' '29OCT12:02:00:00' '27FEB12:02:00:00'
            '02MAY12:02:00:00' '07FEB12:02:00:00' '26MAR12:02:00:00'
            '04SEP12:02:00:00' '13FEB12:02:00:00' '12FEB12:02:00:00'
            '27JAN12:02:00:00' '29SEP12:02:00:00' '21MAY12:02:00:00'
            '11OCT12:02:00:00' '17OCT11:02:00:00' '26JAN12:02:00:00'
            '03APR12:02:00:00' '07APR12:02:00:00' '30NOV11:02:00:00'
            '02MAR12:02:00:00' '14FEB12:02:00:00' '20NOV11:02:00:00'
            '24JUN12:02:00:00' '29JUL12:02:00:00' '26FEB12:02:00:00'
            '30MAR12:02:00:00' '12MAR12:02:00:00' '29APR12:02:00:00'
            '28OCT12:02:00:00' '21OCT12:02:00:00' '23FEB12:02:00:00'
            '18OCT11:02:00:00' '04JUN12:02:00:00' '18FEB12:02:00:00'
            '08JAN12:02:00:00' '27NOV11:02:00:00' '25DEC11:02:00:00'
            '06APR12:02:00:00' '02FEB12:02:00:00' '22SEP12:02:00:00'
            '08APR12:02:00:00' '06NOV11:02:00:00' '05JUL12:02:00:00'
            '17SEP12:02:00:00' '31MAR12:02:00:00' '03JUN12:02:00:00'
            '25JUN12:02:00:00' '11MAR12:02:00:00' '20AUG12:02:00:00'
            '04MAR12:02:00:00' '06FEB12:02:00:00' '01APR12:02:00:00'
            '19MAR12:02:00:00' '18MAR12:02:00:00' '01JAN12:02:00:00'
            '24SEP12:02:00:00' '14OCT12:02:00:00' '29JAN12:02:00:00'
            '02JAN12:02:00:00' '09JAN12:02:00:00' '05MAR12:02:00:00'
            '09JUL12:02:00:00' '18DEC11:02:00:00' '02JUL12:02:00:00'
            '19FEB12:02:00:00' '20FEB12:02:00:00' '16JAN12:02:00:00'
            '03JAN12:02:00:00' '30JAN12:02:00:00' nan '26DEC11:02:00:00'
            '23JAN12:02:00:00']
        VAR_0222 ['C6' nan]
        VAR_0226 [False True nan]
        VAR_0229 [False nan]
        VAR_0230 [False True nan]
        VAR_0232 [True False nan]
```

```
VAR_0236 [True False nan]
VAR_0237 ['FL' 'CA' 'WV' 'TX' 'IL' 'OR' 'GA' 'PA' 'TN' 'WA' 'VA' 'KY' 'IN' 'MO'
 'AL' 'OH' 'SC' 'LA' 'NV' 'NC' 'CO' 'NY' 'OK' 'WI' 'MD' 'HI' 'NM' 'MS'
 'AZ' 'WY' 'ID' 'MI' 'NJ' 'KS' 'IA' 'UT' 'NE' 'MT' 'SD' 'DE' 'DC' 'AR' nan
 'MN']
VAR_0239 [False nan]
VAR_0274 ['FL' 'MI' 'WV' 'TX' 'IL' 'ME' 'CA' 'SC' 'PA' 'TN' 'GA' 'VA' 'KY' 'AL'
 'NC' 'IN' 'MO' 'MN' 'NY' 'LA' 'OH' 'NV' 'CO' 'MA' 'OK' 'WI' 'OR' 'NH'
 'WA' 'MD' 'NJ' 'PR' 'AZ' nan 'UT' 'NM' 'WY' 'MS' 'HI' 'DC' 'ID' 'AR' 'DE'
 'KS' 'ND' 'RN' 'EE' 'CT' 'NE' 'VT' 'GS' '-1' 'IA' 'AK' 'SD' 'RI' 'MT']
VAR_0283 ['S' 'H' '-1' 'P' nan 'R' 'F' 'U']
VAR_0305 ['S' 'P' 'H' '-1' nan 'R' 'U' 'M' 'F']
VAR_0325 ['-1' 'H' 'R' 'S' 'P' nan 'F' 'M' 'G' 'U']
VAR_0342 ['CF' 'EC' 'UU' '-1' 'FE' 'DC' 'FF' 'EE' 'BC' 'EF' 'FD' 'ED' 'DD' 'DF'
 'CD' 'CC' 'DE' 'UF' 'DU' 'CE' 'AD' 'FU' nan 'BE' 'FC' 'DA' 'BA' 'UE' 'DB'
 'CA' 'EU' 'EA' 'UD' 'AF' 'UC' 'AB' 'AA' 'CB' 'AE' 'BB' 'AC' 'EB' 'UA'
 'BF' 'BD' 'FB' 'FA' 'CU' 'BU' 'UB' 'AU']
VAR_0352 ['O' 'R' 'U' '-1' nan]
VAR_0353 ['U' 'R' 'O' '-1' nan]
VAR_0354 ['O' 'R' '-1' 'U' nan]
VAR_0404 ['CHIEF EXECUTIVE OFFICER' '-1' 'CONTA' 'CONTACT' 'PRESIDENT'
 'RECEPTIONIST/SECRETARY' 'AGENT' 'OWNER/MANAGER' 'REGISTRANT' nan
 'LIFE MEMBER' 'OFFICE MANAGER' 'OWNER' 'DIRECTOR OF SOCIAL SERVICES'
 'ASSISTANT, ADMIN AND LAW' 'MEMBER' 'DIRECTOR' 'MANAG'
 'INDIVIDUAL - SOLE OWNER' 'HUMAN RESOURCES DIRECTOR'
 'PROFESSIONAL DEVELOPMENT ADVISORY C' 'MANAGER' 'REAL ESTATE BROKERS'
 'INCORPORATOR' 'SUPPORTING MEMBER' 'HEAD' 'SECRETARY'
 'WEB DEVELOPMENT DIRECTOR' 'ORGAN' 'CEO' 'FACULTY MEMBER'
 'CHIEF FINANCIAL OFFICER' 'MINIMUM DATA SET COORDINATOR'
 'PROGRAM COORDINATOR' 'S/T' 'OFFICE SUPPORT OF CHARACTER DEVELOP'
 'PSYCHIATRIST' 'MEDICAL ASSISTANT' 'CLERK AND DATA ENTRY'
 'SERVICE DIRECTOR' 'KINDERGARTEN TEACHER' 'CP' 'LABORATORY TECHNICIAN'
 'SALES MANAGER' 'SENIOR FINANCIAL CLERK' 'TREASURER' 'TEACHER'
 'BOARD OF TRUSTEES MEMBER' 'VICE PRESIDENT' 'MARKETING MANAGER' 'PARTNER'
 'CO-EXECUTIVE PRODUCER, UNIT CINEMAT' 'SENIOR BUYER'
 'REGIONAL SALES MANAGER NORTH WEST' 'BUSINESS ACCOUNT EXECUTIVE'
 'ADMINISTRATIVE ASSISTANT' 'CERTIFIED PHARMACY TECHNICIAN'
 'TAX RESPONSIBLE PARTY' 'UNDERWRITING DEPARTMENT'
 'ACCOUNTS PAYABLE CLERK' 'ORGANIZER' 'GENERAL MANAGER' 'GENERAL PARTNER'
 'DIRECTOR OF NURSING SERVICES' 'BUSINESS OFFICE MANAGER' 'BOARD MEMBER'
 'APPLICANT' 'PS' 'HUMAN RESOURCE DIRECTOR' 'PROGRAM MANAGER'
 'DIRECTOR OF FOOD SERVICES' 'ACCOUNT EXECUTIVE'
 'CENTRAL SUPPLY COORDINATOR' 'GOVERNING PERSON' 'MEMBER MANAGER'
 'MEMBER OF THE ENERGY PRACTICE GROUP' 'PARALEGAL' 'CFO'
 'SYSTEMS ENGINEER' 'BOOKKEEPER' 'CUSTODIAN' 'VS' 'PC'
 'EXECUTIVE ASSISTANT AND ECONOMIC DE' 'NURSE PRACTITIONER'
 'UP-COMING EVENTS' 'REALTOR ASSOCIATE' 'POSITION IN OPERATIONS' 'STUDENT'
 'TITLE NOT SPECIFIED' 'MEMBER, SLPOWERS CARRIER SERVICES T'
 'PHARMACY TECHNICIAN' 'EDUCATIONAL PROGRAM DIRECTOR' 'PTR' 'FILER' 'VPST'
 'ARTISTIC DIRECTOR' 'GYNECOLOGIST' 'ALLERGIST/IMMUNOLOGIST' 'DV'
 'MANAGING MEMBER' 'DEPUTY EXECUTIVE DIRECTOR' 'DIRECTOR OF NURSING'
 'FIFTH GRADE TEACHER' 'OWNER AND DIRECTOR' 'SPORTS INFORMATION ASSISTANT'
 'OPERATIONS MANAGER' 'ATHLETIC DIRECTOR' 'ELITE MEMBER' 'CASHIER'
 'COMMUNITY PLANNER' 'EXECUTIVE DIRECTOR' 'SENIOR NEWS EDITOR'
 'TECHNICAL DIRECTOR' 'HUMAN RESOURCES MANAGER' 'OFFICER'
 'CHURCH ADMINISTRATOR , OFFICE ADMIN' 'TRADE NAME OWNER' 'TRUSTEE'
 'COUNCIL MEMBER' 'PROCESS ADDRESS CONTACT' 'DP' 'EXECUTIVE' 'CONSULTANT'
 'M' 'FIREFIGHTER' 'INTERNIST/PULMONOLOGIST' 'SITE MANAGER'
 'PRESIDENT AND CONSULTANT' 'ASSOCIATE PASTOR' 'SENIOR SECRETARY' 'STD'
 'BM' 'APPRAISAL SUBCOMMITTEE APPR' 'DEAN' 'DIRECTOR OF MEDICAL RECORDS'
 'ADVOCACY DIRECTOR' 'STAFF PHARMACIST' 'PEDIATRICIAN' 'INC'
 'ATTORNEY AT LAW' 'ASSISTANT' 'HUMAN RESOURCES' 'PTD'
 'OTHER FULL-TIME INSTRUCTOR' 'CALENDAR CLERK' 'CENTER MANAGER' 'DELIVERY'
 'COMMUNITY OUTREACH LIAISON' 'ACCOUNT MANAGER' 'CEO;SECRETARY;CFO' 'P/T'
 'TRAFFIC DEPARTMENT' 'REGIONAL DIRECTOR'
 'PERFORMANCE INDICATOR PROGRAM OWNER' 'DIRECTOR SYSTEMS ENGINEERING'
 'PRINCIPAL' 'MAINTENANCE AND CLEANING' 'REGISTERED NURSE' 'SUPERVISOR'
 'VENTAS MEXICO' 'ADJUNCT PROFESSOR OF ALGEBRA' 'POSITION IN MARKETING'
 'DIRECTOR OF ENVIRONMENTAL SVS' 'ADMINISTRATOR, CPE PROGRAM SERVICES'
```

'CEO;SECRETARY' 'DIRECTOR OF MAINTENANCE' 'DIRECTOR OF PERSONNEL'
'CONTRIBUTOR' 'NEWS ANCHOR, REPORTER AND HOST' 'OTHER' 'SECRETARY;CFO'
'PRESI' 'GRANTS MANAGER' 'ARP SIGNATURE' 'OUTSIDE SALES REPRESENTATIVE'
'MEMBER/MANAGER' 'SENIOR VICE PRESIDENT' 'FRESHMAN WIDE RECEIVER'
'HUMAN RESOURCES GENERALIST' 'ADMINISTRATOR'
'OFFICE ASSISTANT AND MUSIC AND ARTS' 'THERAPIST' 'CO-OWNER'
'LIBRARY MEDIA ASSISTANT' 'MANAGER OF REIMBURSEMENT SVS'
'MINISTER OF EDUCATION' 'MEMBER, GIVS GROUP' 'DIRECTOR OF PURCHASING'
'EDITOR' 'OFFICE OPERATIONS SUPERVISOR' 'MANAGER OF CANTEEN' 'PASTOR'
'VCFO' 'REALTOR' 'ESALES MANAGER' "CHILDREN'S LIBRARIAN" 'PRES'
'SCHOOL NURSE' 'RESIDENT SERVICE COORDINATOR' 'ALL OFFICERS'
'SENIOR PURCHASING AGENT' 'RECORDING SECRETARY, ASSISTANT RECO'
'COLLEGE EVENTS COORDINATOR' 'ADJ SYSTEM ACCESS' 'PASTOR EMERITUS'
'ADMINISTRATIVE ANALYST' 'DIRECTOR OF LITIGATION SERVICES'
'SENIOR CONSULTANT' 'CUSTOMER SERVICE REPRESENTATIVE'
'CHAIRMAN OR CHIEF EXECUTIVE OFFICER'
'DIRECTOR OF ENVIRONMENTAL SERVICES' 'DIRECTOR;PRESIDENT;TREASURER'
'SUPERINTENDENT' 'TRAINEE MANAGER' 'CONCIERGE, CONCIERGE AND CUSTOMER S'
'BROKER AND OWNER' 'POSITION IN TREATMENT COORDINATOR..'
'RADIATION SAFETY OFFICER' 'OWNER/CHIEF PHARMACIST'
'ASSISTANT GENERAL MANAGER' 'ASSISTANT PASTOR' 'OFFICE ASSISTANT'
'UNINCORPORATED ACCOUNT OWNER' 'STUDENT SUPERVISOR' 'MANAGER, MEMBER'
'# 2 MEMBER' 'OBSTETRICS & GYNECOLOGY' 'PSD' 'ASSISTANT PROFESSOR'
'PRESIDENT;SECRETARY' 'CARE ASSOCIATE' 'BUYER' 'PRESIDENT - SOUTHEAST'
'HEAD COACH' 'DIRECTOR OF HUMAN RESOURCES' 'SOFTWARE ENGINEER'
'DIRECTOR OF RADIOLOGY' 'RESIDENT SERVICES ADMINISTRATOR'
'POLITICAL AND FIELD DIRECTOR' 'MID ATLANTIC ACCOUNT MANAGER'
'POSITION IN PROGRAM' 'RECRUITING MANAGER'
'SUPERVISOR, HUMAN RESOURCE MANAGEME'
'POSITION IN JUDAIC STUDIES AND MATH' 'SUBSCRIBER'
'ADVISORY BOARD MEMBER' 'SECRETARY, TREASURER'
'INFORMATION SYSTEM SECTOR , CIVIL S' 'ANOTHER MEMBER' 'CHAIR'
'TITLE MANAGER' 'HONORARY MEMBER' 'DIRECTOR IN-SERVICE EDUCATION'
'CO-FOUNDER AND CO-OWNER' 'CONTRACT TECHNICAL WRITER' 'SALES CONSULTANT'
'AMERICAN HISTORY TEACHER' 'CHIEF JUSTICE' 'FIELD SALES REPRESENTATIVE'
'CHIEF OPERATING OFFICER AND VICE P' 'ALL-PRO LINEBACKER'
'MEDICAL DIRECTOR' 'VICE PRESIDENT OF OPERATIONS' 'VP OF OPERATIONS'
'GLOBAL PUBLIC RELATIONS MANAGER' 'SENIOR WORD PROCESSING SYSTEMS OPER'
'COORDINATOR' 'INFORMATION TECHNOLOGY PROCESSING E' 'ADM'
'GENERAL SURGEON' 'TECHNICAL SUPPORT' 'DST'
'SUPVR OF PATIENT TRANSPORTATION' 'ONCOLOGIST/HEMATOLOGIST' 'TRES'
'FIRST BASEMAN AND CATCHER' 'ED' 'VOLUNTEER SERVICES'
'REFEREE DIRECTOR AND ASSIGNOR' 'DIRECTOR OF ADMISSIONS'
'PHARMACY MANAGER' 'HONORARY BOARD MEMBER' 'HEAD PROFESSIONAL'
'MEMBER OF EXECUTIVE BOARD' 'OWNER AND ENGINEER'
'SENIOR CHARGE CAPTURE TECHNICIAN' 'CHIEF EXECUTIVE OFFICER TEACHER'
'DIRECTOR;PRESIDENT' 'IMAGING COORDINATOR' 'DIRECTOR OF REHAB SERVICES'
'CO-PRESIDENT' 'DIRECTOR OF EMERGENCY ROOM' 'WAREHOUSE MANAGER'
'ALCOHOL TESTING PROGRAM MANAGER' 'CHIEF COUNSEL'
'ORGANIST AND COORDINATOR OF INSTRUM' 'OPHTHALMOLOGIST'
'REAL ESTATE AGENT' 'RECEPTIONIST' 'SUPER DJ' 'PRESIDENT;TREASURER'
'YOUTH LEADER' 'ATTORNEY' 'DIRECTOR OF CHURCH AND COMMUNITY MI'
'CLINICAL ASSISTANT PROFESSOR IN THE'
'ENGLISH TEACHER AND ASSISTANT DEAN' 'ACCOUNTS PAYABLE' 'MANAGER/MEMBER'
'FOUNDER' 'ARTIST, ILLUSTRATOR, DESIGNER' 'PROJECT UNIT MANAGER'
'TREASURER;SECRETARY' 'DIRECTOR OF LAUNDRY' 'TERRITORY MANAGER'
'ANY OTHER OFFICER' 'P' 'PROJECT COORDINATOR' 'ACCOUNTING CLERK' 'VP'
'F&B DIRECTOR' 'SENIOR VICE PRESIDENT AND DIRECTOR' 'DIREC'
'FOUNDER AND CHIEF ARCHITECT' 'EXECUTIVE BOARD MEMBER'
'DIRECTOR OF COMMUNITY MARKETING' 'SENIOR DIRECTOR' 'VD'
'PRESIDENT AND CHIEF EXECUTIVE OFFIC' 'CFAC MEMBER' 'TECHNICIAN'
'AUTHORIZED REPRESENTATIVE' 'NON-STUDENT , LIFE GROUP LEADER'
'NATURAL NAIL TECHNICIAN' 'DIRECTOR OF PRIVATE DUTY SVS'
"PARTNER-BASED IN THE FIRM'S NEW YOR" 'COORDINATOR, OR MATERIALS'
'DIRECTOR OF COUNSELING' 'MAINTENANCE' 'ASSISTANT DIRECTOR OF NURSING'
'NIN\\ETHER CHIEF EXECUTIVE OFFICER A' 'CONSTRUCTION ADMINISTRATOR'
'CEO;CFO' 'EXECUTIVE VICE PRESIDENT' 'DIRECTOR OF RESPIRATORY THERAPY'
'SCHEDULER , CHARTER SALES' 'SENIOR PRODUCTION UNDERWRITER'
'SENIOR CUSTOMER SERVICE ASSOCIATE' 'FOOD AND BEVERAGE MANAGER'

'DIRECTOR OF INFORMATION TECHNOLOGY' 'DEFENSIVE LINE'
'CLIENT BOARD DIVISION' 'NEW ACCOUNTS OFFICER' 'TEACHER , ENGLISH'
'DIRECTOR OF PHYSICAL THERAPY' 'SECRETARY/TREASURER, DIRECTOR'
'DIRECTOR OF FINANCIAL AID' 'SECRETARY/TREASURER'
'BUSINESS DEVELOPMENT MANAGER' 'HIGH SCHOOL TEACHER' 'PRE-OWNED MANAGER'
'DIRECTOR;SECRETARY' 'REALTOR - ASSOCIATE' 'MEMBERSHIP CHAIR'
'CREDIT ANALYST' 'MEM' 'ASSISTANT PRINCIPAL' 'STUDENTS'
'SENIOR ACCOUNTANT' 'CERTIFIED DRUG/ALCOHOL CNSLR' 'PC ANALYST'
'LENDING CONSULTANT' 'NATIONAL ACCOUNTS MANAGER, RETAIL D'
'VICE PRESIDENT OF PRODUCTION, DIREC' 'DIRECTOR; PRESIDENT'
'RESOURCE ADMINISTRATOR' 'VICE-PRESIDENT' 'VPD' 'PRESCHOOL INSTRUCTOR'
'INDEPENDANT DISTRIBUTOR' 'VOLUNTEER COORDINATOR'
'COMMUNICATIONS MANAGER' 'ACTIVITIES DIRECTOR'
'ADMIN ASSISTANT OF NURSING SVS' 'DEPOSIT OPERATIONS SPECIALIST'
'MANAGER OF THE SAUL KLEINFELD BRANC' 'RECORDING SECRETARY'
'MEDICAL PROGRAM PROJECT MANAGER' 'WELCOME NEW MEMBER'
'CHAIRMAN;SECRETARY' 'INFORMATION TECHNOLOGY MANAGER'
'PRESIDENT AND THE BROKER OF RECORD' 'SQL SERVER DBA' 'PROJECT ENGINEER'
'CHIEF OPERATING OFFICER' 'DIRECTOR, SECRETARY' 'PARTN'
'DIRECTOR OF SCHOOL IMPROVEMENT AND' 'CORRESPONDENT' 'CHEF'
'VICE PRESIDENT , MARKETING AND E-CO' 'DIRECTOR PATIENT CARE/NURSING'
'SALES ASSOCIATE' 'CORPORATE PARTNER' 'VP/SEC' 'DIVORCE MEDIATOR'
'DRUG FREE COMMUNITIES PROGRAM COORD'
'FOUNDERS AND ADMINISTRATOR, COMMUNI' 'ADMINISTRATIVE COORDINATOR II'
'ADVERTISING SALES EXECUTIVES' 'NO TITLE SPECIFIED'
'PRINCIPAL SHAREHOLDER' 'D,P' 'SAFETY AND HUMAN RESOURCE DIRECTOR'
'FOODSERVICE SUPERVISOR' 'IST EDUCATOR AND TRAINER'
'FINANCIAL CONSULTANT' 'RN SURGERY WOW' 'CTPD'
'ASSISTANT ATHLETIC TRAINER' 'LIMITED LIABILITY COMPANY INDIVIDUA'
'ADMINISTRATIVE ASSOCIATE' 'FAMILY PRACTITIONER' 'SCHOOL PRINCIPAL'
'SENIOR PROJECT MANAGER' 'PSTD' 'STORE MANAGER'
'PATIENT SERVICES ADMINISTRATOR' 'PRESIDENT, DIRECTOR'
'OCCUPATIONAL MEDICINE' 'SENIOR PAYROLL CLERK' 'RECEPTIONIST SECRETARY'
'CONSTRUCTION LOAN PROCESSOR' 'PODIATRIST' 'SALES REPRESENTATIVE'
'EDUCATION CENTER COORDINATOR' 'HOUSE MANAGER'
'SPECIALIST, INFORMATION TECHNOLOGY' 'ST' 'ELECTRICAL INSPECTOR'
'DIRECTOR OF FINANCE' 'LEASING ADMINISTRATOR' 'INSTRUCTOR'
'PURCHASING SUPERVISOR' 'DIRECTOR OF DEVELOPMENT' 'BUSIN'
'TRANSPORTATION MANAGER' 'SEO/PRES' 'PRES/DIR' 'COACH'
'DIRECTOR OF INSTRUCTION' 'ASSOCIATE PROFESSOR OF DERMATOLOGIC'
'DIRECTOR OF QUALITY IMPROVEMENT' 'COMMUNICATIONS DIRECTOR'
'PHYSICIAN ASSISTANT' 'CPP ACCOUNTANT'
'INFORMATION TECHNOLOGY, TELECOMM SP' 'SCIENCE TEACHER' 'INCOR'
'SENIOR MEDIA SOLUTIONS CONSULTANT' 'PREACHER' 'MRS'
'POSITION IN PRODUCTION' 'PRIVATE OR SHAREHOLDER' 'CIO' 'PST' 'MEMBE'
'FAMILY ADVOCATE' 'INVESTMENT MANAGER' 'CAPTAIN'
'OWN ASSOCIATE MINISTERS, MINISTER' 'ACTING SECRETARY' 'NEWS EDITOR'
'SYSTEMS ANALYST' 'ASSISTANT SOCCER COACH' 'APPRAISER'
'DENTIST/ORAL SURGEON' 'SPECIAL PROJECTS MANAGER FOR THE AN'
'GIRLS BASKETBALL COACH' 'BOARD OF GOVERNORS MEMBER' 'TEACHER AIDE'
'LEAD ARTICLES EDITOR' 'BUSINESS MANAGER'
'INTERNATIONAL ASSIGNMENT ANALYST' 'FAMILY SERVICES COORDINATOR'
'STAFF WRITER' 'AGENCY SUPPORT REPRESENTATIVE' 'FACULTY INSTRUCTOR'
'MANAGER, DELAWARE OPERATIONS' 'CHAIRPERSON' 'GRANT OFFICER'
'DIRECTOR OF GOLF AT THE HUMMINGBIRD'
'INFORMATION TECHNOLOGY SECURITY ASS' 'SENIOR ADMINISTRATIVE ASSISTANT'
'QUALITY CONTROL CLERK LD' 'PRESIDENT,DIRECTOR'
'COMMUNITY ACTION DIRECTOR' 'PROJECT DIRECTOR FOR AFTER-SCHOOL P'
'ASSISTANT DIRECTOR , FACILITIES' 'MEMBER, MANAGER' 'NEUROLOGIST'
'CHAIRWOMAN' 'VCEO' 'CUSTOMER SERVICE SUPERVISOR'
'CREDIT AND COLLECTION ADMIN' 'EVENT PLANNER' 'CLINICAL SYSTEMS EDUCATOR'
'SALES SPECIALIST' 'CLIENT SERVICE MANAGER' 'HOSPITAL POLICE OFFICER'
'MAIN OFFICE BRANCH MANAGER' 'MEDIA CENTER ASSISTANT' 'LODGE ADVISOR'
'PROJECT MANAGER' 'HEALTH SERVICES SPECIALIST' 'FIRST-YEAR COACH' 'TS'
'ASSOCIATE ARTISTIC DIRECTOR' 'OWNER OF RECORDING STUDIO PROFESSIO'
'VICE PRESIDENT;SECRETARY' 'ORCHESTRA DIRECTOR'
'ASSISTANT TO THE SUPERINTENDENT' 'AGENCY DIRECTOR'
'DIRECTOR OF OPERATIONS' "DIRECTOR OF CHILDREN'S MINISTRIES"
'COMMUNITY SERVICE OFFICER' 'POSITION IN ACCOUNTING TECH'

```
                'MAAA PRINCIPAL AND CONSULTING ACTUA' 'DIRECTOR;VICE PRESIDENT'
                'OFFICE ASSOCIATE' 'FIRST COMMUNITY SERVICES OFFICER'
                'MANAGER , LEGAL AND INVESTOR SERVIC' 'DPT' 'ORTHOPEDIC SURGEON'
                'ASSISTANT PHARMACY MANAGER' 'COLORGUARD ADVISOR' 'POSITION IN SALES'
                'CHIEF' 'OFFICER AND ACCOUNT EXECUTIVE AND P' 'MEMBER;MANAGER'
                'DIRECTOR OF SALES' 'JAVA SPECIALTY RECRUITER'
                'HUMAN RESOURCE CONTRACT SECRETARY' 'ESCROW OFFICER'
                'PRESIDENT AND OWNER' 'VICE PRESIDENT , CORPORATE RELATION'
                'MANAGER-OLYMPIC GARDENS' 'EXCECUTIVE ASSISTANT'
                'LICENSED PRACTICAL NURSE' 'HELP ME GROW SERVICE COORDINATOR'
                'GENERAL SALES MANAGER' 'PURCHASING ASSISTANT' 'ACCOUNT DIRECTOR'
                'FOOD AND BEVERAGE DIRECTOR' 'A AND R RESEARCH REPRESENTATIVE'
                'SENIOR PASTOR' 'ACCESS TO CLUBHOUSE MEMBER' 'BUSINESS ASSOCIATE'
                'OFFICE MANAGER AND EXECTUTIVE ASSIS' 'FISCAL MANAGER'
                'PROJECT ENGINEER IN THE CIVIL ENGIN' 'ASSOCIATE MEMBER'
                'DIRECTOR OF MEMBERSHIP SERVICES' "COUNSELOR'S SECRETARY" 'OFFICE STAFF'
                'ASSISTANT TO MEDICAL STAFF' 'FACTORY SERVICE TECHNICIAN'
                'IMPLEMENTATION SPECIALIST' 'VPAS' 'DISTRICT SALES MANAGER'
                'VICE PRESIDENT;DIRECTOR' 'DIRECTOR, PRESIDENT, TREASURER' 'MM'
                'MSS - ACCOUNT EXECUTIVE' 'PRESIDENT OF THE CLUB ROLLER HOCKEY'
                'TITLE III PROGRAM SPECIALIST' 'EXECUTIVE ASSISTANT'
                'SENIOR CONTRACT COORDINATOR' 'SYSTEMS PROCEDURE ANALYST' 'TD'
                'TITLE 1 COORDINATOR' 'OFFENSIVE LINE' 'WINE SPECIALIST'
                'DIR OF ENGINEERING/MAINTENANCE' 'SECT' 'RELIEVER' 'PHOTOGRAPHY TEACHER'
                'VP OF BUSINESS DEVELOPMENT' 'PARTNER, FINANCIAL MANAGEMENT' 'PDTS'
                'EXECUTIVE VICE PRESIDENT AND CHIEF' 'DIRECTOR OF HOUSEKEEPING'
                'COMMUNITY REPRESENTATIVE' 'DIRECTOR,TREASURER' 'CREW TEAM MEMBER'
                'CITY ADMINISTRATOR AND CITY CLERK' 'COORDINATOR, CONTRACTS AND COMPLIAN'
                'COURT ADVOCATE COORDINATOR' 'CHIEF OF EMERGENCY ROOM' 'T/S'
                'SERVICE MANAGER' 'FIRE CHIEF' 'POSITION IN FUNERAL SERVICE PROFESS'
                'MANUFACTURING ENGINEER' 'DENTAL OFFICE MANAGER'
                'HUMANE OFFICER, VERNA PAINTER, SHEL' 'CLIENT SERVICE EVENT COORDINATOR'
                'INSURANCE/BILLING SUPERVISOR' 'AUTHORIZED PERSON ACCOUNTANT' 'SD'
                'GRADUATE STUDENT IN THE WRITING PRO' 'POSITION IN SALES PROFESSIONAL'
                'MANAGER OF TECHNOLOGY AND INFORMATI' 'LEGAL ASSISTANT'
                'BENEFIT SPECIALIST' 'SALES EXECUTIVE' 'ASSOCIATE' 'RGT'
                'SALES ASSISTANT' 'EAST CENTRAL REGION VICE PRESIDENT,' 'METEOROLOGIST'
                'NONFILEABLE CORRESPONDENT' 'ASSISTANT VICE PRESIDENT'
                'OBSTETRIC GYNECOLOGIST' 'SUPPLIES MANAGER'
                'SCHOLARSHIP FUND COORDINATOR' 'P/D' 'COMMUNITY MANAGER'
                'DIRECTOR ACTIVITIES/RECREATION' 'VP SALES - AMERICAS'
                'INFORMATION TECHNOLOGY SYSTEMS TECH' 'ASST DIRECTOR OF RADIOLOGY SVS'
                'EXECUTIVE SUITES SALES REPRESENTATI' 'DEPARTMENT SECRETARY'
                'BEHAVIOR SPECIALIST' 'MANAGER OF SUPPORT STAFF'
                'VICE-PRESIDENT;DIRECTOR' 'PRES.CO.FOUNDER' 'RIA REPRESENTATIVE'
                'CHIEF LEGAL SECRETARY' 'EXECUTIVE ASSISTANT TO THE PRINCIPA'
                'GENERAL PRACTITIONER' 'TELECOMMUNICATIONS DIRECTOR' 'SOLE OFFICER'
                'MANAGER OF VENDOR RELATIONS AND ACC' 'PROGRAM AIDE'
                'PROJECT MANAGER AND PD']
VAR_0466 ['-1' 'I' nan]
VAR_0467 ['-1' 'Discharged' 'Dismissed' nan 'Discharge NA']
VAR_0493 ['COMMUNITY ASSOCIATION MANAGER' '-1' 'LICENSED PRACTICAL NURSE'
 'LICENSED VOCATIONAL NURSE' 'EMERGENCY MEDICAL TECHNICIAN' 'ELECTRICIANS'
 'STAFF NURSE/GENERAL DUTY' nan 'COUNSELOR' 'REGISTERED NURSE'
 'COSMETOLOGIST' 'LICENSED SOCIAL WORKER' 'COSMETOLOGISTS' 'GUARD'
 'REGISTERED VETERINARY TECHNICIAN' 'EMT' 'REAL ESTATE SALESPERSON'
 'REGISTERED ASSOCIATE SOCIAL WORKER' 'RN'
 'PERMANENT EMPLOYEE REGISTRATION CARD' 'LICENSED REAL ESTATE SALESPERSON'
 'MENTAL HEALTH COUNSELOR' 'COSMETOLOGIST/MANICURING'
 'PHARMACY TECHNICIAN' 'PRACTICAL NURSE' 'NURSE, LICENSED PRACTICAL'
 'CERTIFIED RESIDENTIAL' 'BROKER' 'SOCIAL WORKER'
 'REGISTERED PROFESSIONAL NURSE' 'NURSE AIDE' 'MASTER COSMETOLOGIST'
 'PROFESSIONAL COUNSELOR' 'CERTIFIED NURSING ASSISTANT'
 'HEALTH FACILITY ADMINISTRATOR' 'REAL ESTATE SALES PERSON'
 'SECURITY GUARD/OFFICER' 'DOCTOR OF MEDICINE' 'NURSING ASSISTANT'
 'PHARMACY INTERN' 'MASTER PLUMBER' 'REAL ESTATE' 'RESPIRATORY THERAPIST'
 'EMBALMERS & FUNERAL DIRECTORS' 'ELECTRICIAN' 'FIREARM PERMIT'
 'BATON CERT - USED FOR HISTORY ONLY' 'CONTRACTOR CONTROLLING INDIVIDUALS'
 'VETERINARIAN' 'MANICURISTS' 'RESIDENT PRODUCER INDIVIDUAL'
```

'AUTHORIZED EMPLOYEE' 'LPN - TEMPORARY' 'NAIL TECHNICIAN' 'COSMETICIAN'
'LICENSED MASTER SOCIAL WORKER' 'DISPENSING OPTICIAN'
'PROFESSIONAL NURSE' 'COSMETOLOGIST/ALL' 'CERTIFIED GENERAL CONTRACTOR'
'DOCTOR OF OSTEOPATHY' 'RADIOLOGIC TECHNOLOGY' 'HEAD NURSE/ASSISTANT'
'PSYCHIATRIC TECHNICIAN' 'CERTIFIED NURSE AIDE'
'REAL ESTATE BROKER OR SALES' 'SOCIAL WORKER (LCSW)'
'ARMED SECURITY GUARDS' 'PRIVATE SECURITY PERSONS' 'LEGAL SERVICES'
'ADVANCED PRACTICE REGISTERED NURSE' 'MASTER BARBER' 'TECH'
'EXPLOSIVES USER HANDLER' 'MEDICAL-SURGICAL CNS' 'PUBLIC ACCOUNTANT'
'LPN' 'OCCUPATIONAL THERAPIST ASSISTANT' 'ADVISOR AGENT'
'MANICURISTS MANAGER' 'COMMUNITY HEALTH' 'SALESPERSONS'
'WATER OPERATOR CLASS 4' 'PHYSICAL THERAPIST' 'PHYSICIAN'
'PHYSICIAN ASSISTANT' 'FUNERAL DIRECTOR & EMBLAMER TRAINEE'
'PHYSICAL THERAPIST ASSISTANT' 'BEAUTICIAN' 'REGISTERED PROF. NURSE'
'TEMPORARY SALESPERSON'
'RESPIRATORY CARE PRACTITIONER REGULAR CERTIFICATE' 'BARBER'
'INSURANCE AGENTS' 'MEDICAL PHYSICIAN ASSISTANT'
'INSURANCE EDUCATION PROVIDERS' 'PERMANENT M.D.' 'PARAMEDIC'
'DENTAL HYGIENIST' 'NURSE PRACTITIONER' 'LICENSED' 'INTERNAL MEDICINE'
'PHARMACIST' 'GENERAL CERTIFICATE' 'NAIL TECHNICIAN APPRENTICE'
'PHYSICIAN ASSISTANT SUPERVISOR' 'NAIL TECHNICIANS' 'COS MANAGER'
'COSMETOLOGY MANICURIST' 'WASTEWATER WORKS OPERATORS CLASS IV' 'NURSING'
'PSYCHOLOGIST\\CLINICAL PSYCHOLOGIST' 'JOURNEYMAN PLUMBER'
'CERTIFIED MASSAGE THERAPIST' 'NURSE, REGISTERED'
'LICENSE PRACTICAL NURSE' 'TRADESMEN' 'CLINICAL LABORATORY PERSONNEL'
'OCCUPATIONAL THERAPY ASSISTANT' 'CERTIFIED POD X-RAY ASSISTANT'
'FIRST GRADE ENGINEER' 'REGISTERED PROFESSIONAL GEOLOGIST'
'OTHER SPECIALTY' 'EXPANDED FUNCTION DENTAL ASSISTANT' 'ATTORNEYS'
'MENTAL HEALTH NURSE' 'RESPIRATORY CARE' 'MASSAGE THERAPIST'
'NONRES PRODUCER INDIVIDUAL' 'CERTIFIED PUBLIC ACCOUNTANT'
'WASTEWATER OPERATOR CLASS 3' 'ATTORNEY' 'SMOG CHECK ADVANCED TECHNICIAN'
'GERIATRICS' 'SALESPERSON' 'TEMPORARY LIMITED CERTIFICATE' 'COS OPERATOR'
'CLINICAL NURSE ASSISTANT' 'CERTIFIED GENERAL' 'ATHLETIC TRAINER'
'CERTIFIED SOCIAL WORKER' 'LICENSED MASSAGE THERAPIST' 'VOCATIONAL NURSE'
'MANICURIST' 'BATON CERTIFICATE - SIDE HANDLE' 'MEDICATION AIDE'
'WATER DISTRIBUTION OPERATOR' 'ESTHETICIAN' 'JOURNEYMAN ELECTRICIAN'
'RESPIRATORY CARE PRACTITIONER' 'REGISTERED DENTAL ASSISTANT'
'HEATING & AIR' 'NON-RESIDENT PRODUCER AGENT' 'BARBER/COSMETOLOGIST'
'ASSOCIATE BROKER' 'STUDENT TEMP RCP' 'FIREARM AUTHORIZATION CARD'
'REGISTERED ACCESSABILITY SPECIALISTS' 'MORTGAGE BROKER - INDIVIDUAL'
'RESPONSIBLE BROKER' 'PHYSICAL THERAPIST - TEMPORARY'
'REGISTERED PHARMACIST' 'CLINICAL SOCIAL WORKER' 'OCCUPATIONAL THERAPIST'
'LICENSED REAL ESTATE BROKER' 'BARBER/COSMETOLOGY'
'RESIDENTIAL BUILDING CONTRACTOR' 'TRAINEE'
'RESPRITORY CARE PROFESSIONAL'
'PSYCHIATRIC/MENTAL HEALTH CLINICAL NURSE SPECIALIST'
'DENTAL RADIOGRAPHER' 'BUREAU OF SECURITY AND INVESTIGATIVE SERVICES'
'CIVIL ENGINEER' 'MEDICAL & SURGICAL' 'DENTAL ASSISITANT' 'NURSE'
'EMERGENCY MEDICINE' 'COSMETOLOGY MANAGER' 'PROFESSINAL ENGINEER'
'NAIL SPECIALIST' 'APPRENTICE OPTICIAN' 'COSMETOLOGY LTD INSTRUCTOR'
'TRAINEE PERMIT' 'FIREARM TRAINING CERTIFICATE' 'PHYSICIAN AND SURGEON'
'ELECTRICAL CONTRACTOR' 'BROKER ASSOCIATE' 'RN - TEMPORARY'
'CERTIFIED SHORTHAND REPORTER' 'HAIRDRESSER / COSMETICIAN'
'RESPIRATORY CARE PRACTITIONERS' 'REGISTERED RESIDENTIAL CONTRACTOR'
'EMBALMER' 'REG SPECTACLE LENS DISPENSER'
'LICENSED BACHELOR SOCIAL WORKER' 'LAND SURVEYOR' 'AUDIOLOGIST'
'PROPERTY MANAGER' 'CRITICAL CARE' 'BUILDER - INDIVIDUAL'
'PHYS THER ASSISTANT' 'PROF ENGINEER' 'SALESMAN PROVISIONAL'
'DO CLASS 1-GRANDFATHERED' 'CHIROPRACTOR' 'PERIODONTIST' 'ENGINEERS'
'PROFESSIONAL BOXING' 'BARBERS AND HAIR DRESSERS'
'LIMITED REAL ESTATE APPRAISER' 'DIETETICS & NUTRITION'
'MEDICATION AIDE - 40 HOUR' 'REGISTERED MANICURIST'
'COSMETOLOGY INSTRUCTORS' 'CERTIFIED DENTAL RADIOGRAPHERS'
'PROFESSIONAL ENGINEERS' 'PHYSICIAN AND SURGEON OR OSTEOPATH'
'PHYSICIAN:PEDIATRICS' 'MEDICAL FIRST RESPONDER' 'SECOND GRADE ENGINEER'
'LICENSED INDEPENDENT SOCIAL WORKER' 'PHARMACIST INTERN'
'BURGLAR ALARM LICENSE' 'LICENSED PROFESSIONAL COUNSELOR'
'REGISTERED CERTIFIED PUBLIC ACCOUNTANT' 'CARDIAC TECHNICIAN'
'SPEECH-LANGUAGE PATHOLOGY' 'LICENSED HOME INSPECTOR' 'DENTAL HYGIENE'

```
'SECOND (BOXING)' 'ELECTRICAL APPRENTICE' 'AESTHETICIAN'
'PHYSICAL THERAPY ASSISTANT' 'OPTICIAN' 'AGENT' 'ENGINEER, PROFESSIONAL'
'FAIR HOUSING INACTIVE' 'DENTISTS' 'ACCOUNTANT' 'OTHER'
'LICENSED CLINICAL SOCIAL WORKER' 'REAL ESTATE BROKER' 'SALESMAN'
'CERT. RESPIRATORY THERAPIST' 'FUNERAL DIRECTOR/EMBALMER'
'CONDITONED AIR NON-RESTRICTED' 'MECHANICAL ENGINEER'
'CRITICAL CARE MEDICINE' 'DENTAL ASSISTANT' 'RADIOLOGIC TECHNOLOGIST'
'OPERATOR' 'LICENSED APPRAISERS' 'NUCLEAR MEDICAL TECHNOLOGIST'
'ARCHITECT' 'GAS MANAGER' 'TRAINING INSTRUCTOR - BATON'
'VEHICLE SALESPERSON' 'INTERN PHARMACIST' 'OPTICIANS'
'NURSE CANDIDATE - NG' 'DENTIST' 'MEDICAL RADIOGRAPHER'
'PRIVATE PRACTICE' 'ASBESTOS SUPERVISORS' 'AGENCY MANAGER' 'MD'
'FAMILY NURSE PRACTITIONER' 'PODIATRIST' 'OPTOMETRY'
'CERTIFIED FOOD SAFETY MGR' 'SUPERVISOR/ASSISTANT'
'CERTIFIED RESIDENTIAL RE APPRAISER' 'LICENSED MASTERS SOCIAL WORK'
'TREATMENT - CLASS I' 'HOMEMAKER - HHA'
'MARRIAGE AND FAMILY THERAPIST - INTERN' 'HOME IMPROV. CONTRACT.'
'REGISTERED PHYSICIAN ASSISTANT' 'COSMETOLOGIST-HAIRSTYLIST'
'MEDICAL DOCTOR' 'NURSES' 'SPEECH LANGUAGE PATHOLOGIST'
'STATE LICENSED REAL ESTATE APPRAISER' 'HOME HEALTH AIDE' 'WRESTLERS'
'FIELD REPRESENTATIVE' 'INACTIVE SALESMAN' 'WATER OPERATOR CLASS 1'
'MEDICAL RADIATION TECHNOLOGIST' 'MEDICAL PHYSICIAN AND SURGEON'
'ASSOCIATE REAL ESTATE APPRAISER' 'CONDITIONED AIR RESTRICTED'
'LICENSED PROFESSIONAL COUNSELOR INTERN' 'PHYSICAL THERAPY'
'LICENSED GRADUATE SOCIAL WORKER' 'REHABILITATION PROVIDER'
'BOXING SECOND' 'BROKER DEALER BRANCH' 'AR' 'FULL' 'ENGINEER IN TRAINING'
'ACUPUNCTURIST'
'PROVISIONAL BROKER TRANSITION -24HR BROKER TRANSITION COURSE'
'WRESTLING REFEREE' 'FUNERAL DIRECTOR & EMBALMER' 'MASSAGE THERAPISTS'
'AUTO SALESMAN' 'BAIL BONDING AGENT' 'OCC THERAPY ASSISTANT'
'PHARMACY TECH IN-TRAINING' 'RESTRICTED BARBERS' 'GRADUATE SOCIAL WORKER'
'BARBERS' 'BARBER/COSMETOLOGY MANAGER' 'CERTIFIED TO PURCHASE FREON'
'PROFESSIONAL ENGINEER' 'WATERWORKS OPERATORS CLASS II'
'PUBLIC HEALTH NURSE' 'APPLIED PSYCHOLOGIST' 'KEY PERSONNEL-INDIVIDUAL'
'REGISTERED RESPIRATORY THERAPY' 'CLINICAL PROFESSIONAL COUNSELORS (CPC)'
'RESIDENT & NON-RESIDENT INSURANCE PRODUCERS' 'MEDICAL DOCTORS'
'LICENSED AUCTIONEER' 'AUCTIONEER' 'NURSING HOME ADMINISTRATOR'
'DENTAL RADIOLOGIC\\RADIATION TECHNOLOGIST' 'TEMPORARY LPN PERMIT'
'TECHNOLOGIST, RADIOGRAPHY, RADIOLOGIC' 'PROPERTY LAND SURVEYOR'
'WATER OPERATOR CLASS 3' 'STUDENT HEARING AID DEALER'
'TEMPORARY PROFESSIONAL COUNSELOR' 'DENTISTRY'
'SPEECH-LANGUAGE PATHOLOGIST' 'INTERN' 'ASBESTOS WORKERS'
'LOCKSMITH PERMIT' 'FACULTY/EDUCATOR' 'ADMINISTRATOR/ASSISTANT'
'SUBSTANCE ABUSE COUNSELING ASSISTANT' 'ENGINEER INTERN'
'UNLICENSED PSYCHOTHERAPIST' 'ANIMAL HEALTH TECHNICIAN']
VAR_1934 ['IAPS' 'RCC' 'BRANCH' 'MOBILE' 'CSC']
```

Обработа категориальных фич (сбрасываем даты остальное Target кодируем)

In [11]:
```python
def process_column(col_name, column, target_column, encoders_dict):
    """
    return values:
        -1 - means to drop this column
        pd.Series - means nan were filled and column was target encoded
    """
    unique_values = column.unique()
    len_unique_vals = len(unique_values)
    if len_unique_vals <= 1:
        return -1
    elif len_unique_vals < 60:
        if column.isna().sum() != 0:
            mode = column.mode(dropna=True)
            column = column.fillna(mode[0])
        tmp_encoder = TargetEncoder()
        res_column = tmp_encoder.fit_transform(column, target_column)
```

```python
        encoders_dict[col_name] = tmp_encoder
        return res_column
    else:
        # TODO: process date
        return -1


ENCODERS_DICTIONARY = {}

chunk_df = chunk.copy()

for col in obj_columns:
    try:
        tmp_res = process_column(col, chunk_df[col], chunk_df.target, ENCODERS_DICTIONAR
        if isinstance(tmp_res, pd.DataFrame):
            chunk_df[col] = tmp_res
            print(col, 'processed')
        else:
            chunk_df.drop(columns=[col], inplace=True)
            print(col, 'dropped')
    except Exception as e:
        print(col, e)
```

```
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
VAR_0001 processed
VAR_0005 processed
VAR_0008 processed
VAR_0009 processed
VAR_0010 processed
VAR_0011 processed
VAR_0012 processed
VAR_0043 processed
VAR_0044 processed
VAR_0073 dropped
VAR_0075 dropped
VAR_0156 dropped
VAR_0157 dropped
VAR_0158 dropped
VAR_0159 dropped
VAR_0166 dropped
VAR_0167 dropped
VAR_0168 dropped
VAR_0169 dropped
VAR_0176 dropped
VAR_0177 dropped
VAR_0178 dropped
VAR_0179 dropped
VAR_0196 processed
VAR_0200 dropped

/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
VAR_0202 processed
VAR_0204 dropped
```

```
VAR_0214 processed
VAR_0216 processed
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
VAR_0217 dropped
VAR_0222 processed
VAR_0226 processed
VAR_0229 processed
VAR_0230 processed
VAR_0232 processed
VAR_0236 processed
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
VAR_0237 processed
VAR_0239 processed
VAR_0274 processed
VAR_0283 processed
VAR_0305 processed
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
VAR_0325 processed
VAR_0342 processed
VAR_0352 processed
VAR_0353 processed
VAR_0354 processed
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version.  Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
VAR_0404 dropped
```

```
VAR_0466 processed
VAR_0467 processed
```

/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version. Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):
/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version. Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):

```
VAR_0493 dropped
VAR_1934 processed
```

/usr/local/lib/python3.7/dist-packages/category_encoders/utils.py:21: FutureWarning:
is_categorical is deprecated and will be removed in a future version. Use is_catego
rical_dtype instead
  elif pd.api.types.is_categorical(cols):

In [12]:
```python
obj_columns = [i for i in chunk_df.columns if chunk_df[i].dtype == 'O']
obj_columns
```

Out[12]: []

In [13]:
```python
chunk_df.shape
```

Out[13]: (40000, 1915)

Обрабатываем bool колонки

In [14]:
```python
bool_cols = [i for i in chunk_df.columns if chunk_df[i].dtype == 'bool']
```

In [15]:
```python
bool_cols
```

Out[15]:
```
['VAR_0008',
 'VAR_0009',
 'VAR_0010',
 'VAR_0011',
 'VAR_0012',
 'VAR_0043',
 'VAR_0196',
 'VAR_0226',
 'VAR_0229',
 'VAR_0230',
 'VAR_0232',
 'VAR_0236',
 'VAR_0239']
```

In [16]:
```python
def encode_bool_column(column):
    return column.apply(lambda x: 1 if x is True else 0)

for col in bool_cols:
    res = encode_bool_column(chunk_df[col])
    print(col, 'processed')
    chunk_df[col] = res
```

```
VAR_0008 processed
VAR_0009 processed
VAR_0010 processed
VAR_0011 processed
VAR_0012 processed
VAR_0043 processed
```

```
VAR_0196 processed
VAR_0226 processed
VAR_0229 processed
VAR_0230 processed
VAR_0232 processed
VAR_0236 processed
VAR_0239 processed
```

Очищаем численные данные от пропусков

In [17]:

```python
sum = 0

# переписать со сбором трех  списков и по одной операции dropna fillna drop
drop_col_list = []
drop_row_list = []
fill_na_list = []

for col, flag in zip(chunk_df.columns, list(chunk_df.isna().sum() != 0)):
  if flag:
    nulls_count = chunk_df[col].isna().sum()
    if nulls_count < chunk_df.shape[0]*0.01:
      #drop rows
      drop_row_list.append(col)
      # chunk_df.dropna(subset=[col,], inplace=True)
    elif nulls_count > chunk_df.shape[0]*0.6:
      # drop column
      drop_col_list.append(col)
      # chunk_df.drop(columns=[col,], inplace=True)
    else:
      # fill values
      # TODO: think about using not median in some columns!
      median = chunk_df[col].median()
      if median is np.nan:
        # drop col
        drop_col_list.append(col)
        # chunk_df.drop(columns=[col], inplace=True)
      else:
        chunk_df[col].fillna(median, inplace=True)
    # print(col, 'processed')

chunk_df.dropna(subset=drop_row_list, inplace=True)
chunk_df.drop(columns=drop_col_list, inplace=True)

chunk_df.isna().sum().sum()
```

Out[17]: 0

Попробуем нормализовать данные

In [18]:

```python
from sklearn.preprocessing import StandardScaler, RobustScaler

# scaler = StandardScaler()
scaler = RobustScaler()
chunk_df.iloc[:, 1:-1] = scaler.fit_transform(chunk_df.iloc[:, 1:-1])

chunk_df
```

Out[18]:

	ID	VAR_0001	VAR_0002	VAR_0003	VAR_0004	VAR_0005	VAR_0006	VAR_0007	VAR_
0	2	-1.0	1.518519	-0.523364	0.991131	0.00000	0.0	0.0	
1	4	-1.0	-0.490741	-0.028037	1.073171	-1.00000	1.0	0.0	

	ID	VAR_0001	VAR_0002	VAR_0003	VAR_0004	VAR_0005	VAR_0006	VAR_0007	VAR_
2	5	-1.0	0.518519	-0.495327	0.527716	0.00000	0.0	0.0	
3	7	-1.0	1.666667	2.280374	0.381375	0.00000	0.0	0.0	
4	8	0.0	0.111111	1.915888	-0.283814	0.94807	0.0	0.0	
...	...	...	...	...	...	...	...	...	
39995	79722	0.0	-0.277778	0.719626	-0.172949	0.00000	0.0	0.0	
39996	79725	-1.0	8.694444	-0.523364	-0.124169	0.00000	0.0	0.0	
39997	79726	0.0	1.000000	0.728972	0.206763	-1.00000	1.0	1.0	
39998	79727	0.0	-0.194444	0.532710	1.033259	-1.00000	0.0	0.0	
39999	79728	0.0	1.222222	-0.411215	-0.838137	-1.00000	0.0	0.0	

39743 rows × 1905 columns
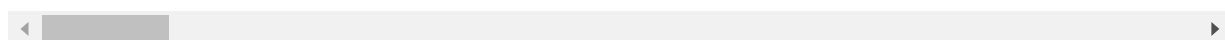
5)Выбор метрик для последующей оценки качества моделей

По-моему мнению следует использовать метрики F1-score и recall для оценки точности бинарной классификации

F1-score как общую метрику recall - как наиболее полезную

Полезность recall исходит из поставленной задачи: "Присылать ли покупателю рассылки по почте" для выявления клиентов нам важнее отправить письмо клиенту которому оно не нужно нежели не отправить письмо с рассылкой клиенту которому оно было нужно

6) Выбор наиболее подходящих моделей

Стоит опробовать простые модели классификации:

- Решающее дерево
- KNeigborhsClassifier

Попробовать ансамбль без сложной реализации:

- Случайный лес

Попробовать библиотеки бустинга:

- catboost

Попробовать стэкинг

7)Формирование обучающей и тестовой выборок на основе исходного набора данных. Построение базового решения

Разделим данные на обучающую валидационную и тестовую выборки

In [20]:
```python
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report
from sklearn.linear_model import LogisticRegressionCV
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from catboost import CatBoostClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import GridSearchCV

X = chunk_df.iloc[:, 1:-1] # убираем ID из выборок
y = chunk_df.target

x_train, x_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_stat
x_train, x_val, y_train, y_val = train_test_split(x_train, y_train, test_size=0.02,

x_train.shape, x_val.shape, x_test.shape
```

Out[20]: ((31158, 1903), (636, 1903), (7949, 1903))

Попробуем обучить Дерево решений

In [24]:
```python
tree_clf = DecisionTreeClassifier(random_state=42)
tree_clf.fit(x_train, y_train)

baseline_tree_report = classification_report(y_test, tree_clf.predict(x_test))
print(base_line_tree_report)
```

```
              precision    recall  f1-score   support

           0       0.80      0.79      0.80      6104
           1       0.34      0.37      0.35      1845

    accuracy                           0.69      7949
   macro avg       0.57      0.58      0.57      7949
weighted avg       0.70      0.69      0.69      7949
```

Пробуем обучить ансамбль Случайный лес

In [25]:
```python
forest_clf = RandomForestClassifier(max_depth=8, n_jobs=-1, random_state=42)

forest_clf.fit(x_train, y_train)

baseline_forest_report = classification_report(y_test, forest_clf.predict(x_test))
print(baseline_forest_report)
```

```
              precision    recall  f1-score   support

           0       0.79      0.98      0.87      6104
           1       0.61      0.13      0.21      1845

    accuracy                           0.78      7949
   macro avg       0.70      0.55      0.54      7949
weighted avg       0.75      0.78      0.72      7949
```

Пробуем обучить бустинг CatBoost

In [26]:
```python
cat_clf = CatBoostClassifier(eval_metric='Recall', random_state=42, loss_function='L

cat_clf.fit(x_train, y_train, eval_set=(x_val, y_val), early_stopping_rounds=20, ver

baseline_catboost_report = classification_report(y_test, cat_clf.predict(x_test))
print(baseline_catboost_report)
```

```
Learning rate set to 0.0741
0:      learn: 0.1014934      test: 0.1283784 best: 0.1283784 (0)      total: 458ms
remaining: 7m 37s
1:      learn: 0.0660951      test: 0.0472973 best: 0.1283784 (0)      total: 887ms
remaining: 7m 22s
2:      learn: 0.0618086      test: 0.0337838 best: 0.1283784 (0)      total: 1.27s
remaining: 7m 1s
3:      learn: 0.0595962      test: 0.0337838 best: 0.1283784 (0)      total: 1.68s
remaining: 6m 58s
4:      learn: 0.0613938      test: 0.0337838 best: 0.1283784 (0)      total: 2.04s
remaining: 6m 45s
5:      learn: 0.0530973      test: 0.0405405 best: 0.1283784 (0)      total: 2.45s
remaining: 6m 46s
6:      learn: 0.0569690      test: 0.0202703 best: 0.1283784 (0)      total: 2.87s
remaining: 6m 47s
7:      learn: 0.0611173      test: 0.0270270 best: 0.1283784 (0)      total: 3.25s
remaining: 6m 43s
8:      learn: 0.0659569      test: 0.0270270 best: 0.1283784 (0)      total: 3.62s
remaining: 6m 38s
9:      learn: 0.0710730      test: 0.0270270 best: 0.1283784 (0)      total: 3.97s
remaining: 6m 32s
10:     learn: 0.0745299      test: 0.0337838 best: 0.1283784 (0)      total: 4.4s
remaining: 6m 35s
11:     learn: 0.0807522      test: 0.0405405 best: 0.1283784 (0)      total: 4.78s
remaining: 6m 33s
12:     learn: 0.0813053      test: 0.0405405 best: 0.1283784 (0)      total: 5.17s
remaining: 6m 32s
13:     learn: 0.0861449      test: 0.0405405 best: 0.1283784 (0)      total: 5.56s
remaining: 6m 31s
14:     learn: 0.0891869      test: 0.0608108 best: 0.1283784 (0)      total: 5.97s
remaining: 6m 31s
15:     learn: 0.0904314      test: 0.0405405 best: 0.1283784 (0)      total: 6.33s
remaining: 6m 29s
16:     learn: 0.0920907      test: 0.0405405 best: 0.1283784 (0)      total: 6.74s
remaining: 6m 29s
17:     learn: 0.0972069      test: 0.0472973 best: 0.1283784 (0)      total: 7.17s
remaining: 6m 31s
18:     learn: 0.1003872      test: 0.0608108 best: 0.1283784 (0)      total: 7.59s
remaining: 6m 31s
19:     learn: 0.1032909      test: 0.0472973 best: 0.1283784 (0)      total: 7.98s
remaining: 6m 31s
20:     learn: 0.1078540      test: 0.0608108 best: 0.1283784 (0)      total: 8.36s
remaining: 6m 29s
Stopped by overfitting detector  (20 iterations wait)

bestTest = 0.1283783784
bestIteration = 0

Shrink model to first 1 iterations.
              precision    recall  f1-score   support

           0       0.78      0.97      0.87      6104
           1       0.54      0.11      0.18      1845

    accuracy                           0.77      7949
   macro avg       0.66      0.54      0.52      7949
weighted avg       0.73      0.77      0.71      7949
```

Пробуем обучить KneighborsClassifier

In [27]:
```python
knn_clf = KNeighborsClassifier(n_neighbors=5, n_jobs=-1)  # default value

knn_clf.fit(x_train, y_train)

baseline_knn_report = classification_report(y_test, knn_clf.predict(x_test))
print(baseline_knn_report)
```

```
              precision    recall  f1-score   support

           0       0.78      0.91      0.84      6104
           1       0.36      0.17      0.23      1845

    accuracy                           0.74      7949
   macro avg       0.57      0.54      0.54      7949
weighted avg       0.69      0.74      0.70      7949
```

8) Попробуем сделать Oversampling с помощью SMOTE

In [28]:
```python
from imblearn.over_sampling import KMeansSMOTE

smote = KMeansSMOTE(cluster_balance_threshold=y_train.sum()/y_train.count()-0.01, sa

x_train, y_train = smote.fit_resample(x_train, y_train)
```

In [29]:
```python
y_train.value_counts()
```

Out[29]:
```
1    23929
0    23926
Name: target, dtype: int64
```

Еще раз обучим Дерево решений, Случайный лес, CatBoost, KNClassifier

In [30]:
```python
tree_clf = DecisionTreeClassifier(random_state=42)
tree_clf.fit(x_train, y_train)
print('Дерево решений')
smote_tree_report = classification_report(y_test, tree_clf.predict(x_test))
print(smote_tree_report)

forest_clf = RandomForestClassifier(max_depth=8, n_jobs=-1, random_state=42)
forest_clf.fit(x_train, y_train)
print('Случайный лес')
smote_forest_report = classification_report(y_test, forest_clf.predict(x_test))
print(smote_forest_report)


cat_clf = CatBoostClassifier(eval_metric='Recall', random_state=42, loss_function='L
cat_clf.fit(x_train, y_train, eval_set=(x_val, y_val), early_stopping_rounds=20, ver
print('CatBoost')
smote_catboost_report = classification_report(y_test, cat_clf.predict(x_test))
print(smote_catboost_report)


knn_clf = KNeighborsClassifier(n_neighbors=5, n_jobs=-1)
knn_clf.fit(x_train, y_train)
print('KNeighborsClassifier')
```

```
smote_knn_report = classification_report(y_test, knn_clf.predict(x_test))
print(smote_knn_report)
```

Дерево решений
```
              precision    recall  f1-score   support

           0       0.81      0.80      0.80      6104
           1       0.36      0.37      0.36      1845

    accuracy                           0.70      7949
   macro avg       0.58      0.58      0.58      7949
weighted avg       0.70      0.70      0.70      7949
```

Случайный лес
```
              precision    recall  f1-score   support

           0       0.81      0.92      0.86      6104
           1       0.51      0.26      0.34      1845

    accuracy                           0.77      7949
   macro avg       0.66      0.59      0.60      7949
weighted avg       0.74      0.77      0.74      7949
```

CatBoost
```
              precision    recall  f1-score   support

           0       0.80      0.90      0.85      6104
           1       0.44      0.25      0.32      1845

    accuracy                           0.75      7949
   macro avg       0.62      0.58      0.58      7949
weighted avg       0.72      0.75      0.73      7949
```

KNeighborsClassifier
```
              precision    recall  f1-score   support

           0       0.79      0.85      0.82      6104
           1       0.35      0.27      0.30      1845

    accuracy                           0.72      7949
   macro avg       0.57      0.56      0.56      7949
weighted avg       0.69      0.72      0.70      7949
```

9) Подберем гиперпараметры для моделей

In [38]:
```python
param_grid = {
    'max_depth': [3, 5, 7, 9, 12],
    # '': [],
}

estimator = DecisionTreeClassifier(random_state=42)

grid = GridSearchCV(estimator, param_grid, n_jobs=-1, cv=5, verbose=3, pre_dispatch=

grid.fit(x_train, y_train)

print(grid.best_params_)
```

```
Fitting 5 folds for each of 5 candidates, totalling 25 fits
```
Out[38]:
```
GridSearchCV(cv=5, estimator=DecisionTreeClassifier(random_state=42), n_jobs=-1,
             param_grid={'max_depth': [3, 5, 7, 9, 12]},
             pre_dispatch='n_jobs//2', verbose=3)
```

In [39]:
```python
print(grid.best_params_)
```

{'max_depth': 7}

In [40]:
```python
forest_param_grid = {
    'max_depth': [3, 5, 7, 9, 12],
    'n_estimators': [100, 150, 200],
}

forest_estimator = RandomForestClassifier(random_state=42)

forest_grid = GridSearchCV(forest_estimator, forest_param_grid, n_jobs=-1, cv=5, ver

forest_grid.fit(x_train, y_train)

print(forest_grid.best_params_)
```

Fitting 5 folds for each of 15 candidates, totalling 75 fits
{'max_depth': 12, 'n_estimators': 200}

In [27]:
```python
catboost_estimator = CatBoostClassifier(eval_metric='Recall', random_state=42, loss_

cat_param_grid = {
    'max_depth': [3, 7, 12],
    'n_estimators': [100, 150],
}


cat_grid = catboost_estimator.grid_search(cat_param_grid, x_train, y_train, cv=3)

# print(cat_grid.params)
```

```
0:      learn: 0.0227591        test: 0.0116279 best: 0.0116279 (0)     total: 153ms
remaining: 15.1s
99:     learn: 0.1144958        test: 0.0959302 best: 0.0988372 (97)    total: 9.36s
remaining: 0us

bestTest = 0.0988372093
bestIteration = 97

0:      loss: 0.0988372 best: 0.0988372 (0)     total: 10.5s    remaining: 52.7s
0:      learn: 0.0227591        test: 0.0116279 best: 0.0116279 (0)     total: 85ms
remaining: 12.7s
100:    learn: 0.1151961        test: 0.0988372 best: 0.0988372 (97)    total: 9.25s
remaining: 4.49s
149:    learn: 0.1586134        test: 0.1351744 best: 0.1366279 (145)   total: 13.9s
remaining: 0us

bestTest = 0.136627907
bestIteration = 145

1:      loss: 0.1366279 best: 0.1366279 (1)     total: 24.4s    remaining: 48.8s
0:      learn: 0.0360644        test: 0.0247093 best: 0.0247093 (0)     total: 447ms
remaining: 44.3s
99:     learn: 0.2202381        test: 0.1351744 best: 0.1380814 (95)    total: 37.4s
remaining: 0us

bestTest = 0.1380813953
bestIteration = 95

2:      loss: 0.1380814 best: 0.1380814 (2)     total: 1m 1s    remaining: 1m 1s
0:      learn: 0.0360644        test: 0.0247093 best: 0.0247093 (0)     total: 347ms
remaining: 51.6s
100:    learn: 0.2247899        test: 0.1351744 best: 0.1380814 (95)    total: 37.4s
remaining: 18.1s
```

```
149:      learn: 0.2881653          test: 0.1715116 best: 0.1729651 (144)   total: 55.4s
remaining: 0us


bestTest = 0.1729651163
bestIteration = 144

3:      loss: 0.1729651 best: 0.1729651 (3)     total: 1m 57s   remaining: 58.6s
0:      learn: 0.1204482          test: 0.0726744 best: 0.0726744 (0)      total: 8.14s
remaining: 13m 25s
99:      learn: 0.5367647          test: 0.1337209 best: 0.1351744 (92)    total: 12m 3
s        remaining: 0us


bestTest = 0.1351744186
bestIteration = 92

4:      loss: 0.1351744 best: 0.1729651 (3)     total: 14m      remaining: 2m 48s
0:      learn: 0.1204482          test: 0.0726744 best: 0.0726744 (0)      total: 7.27s
remaining: 18m 3s
100:      learn: 0.5409664          test: 0.1293605 best: 0.1351744 (92)    total: 12m 6
s        remaining: 5m 52s
149:      learn: 0.6708683          test: 0.1482558 best: 0.1497093 (143)   total: 18m 1
s        remaining: 0us


bestTest = 0.1497093023
bestIteration = 143

5:      loss: 0.1497093 best: 0.1729651 (3)     total: 32m 2s   remaining: 0us
Estimating final quality...
0:      learn: 0.0970656          test: 0.0854964 best: 0.0854964 (0)      total: 1.91s
remaining: 4m 44s
100:      learn: 0.2147281          test: 0.1343115 best: 0.1343115 (100)   total: 2m 4s
remaining: 1m
149:      learn: 0.2772282          test: 0.1687365 best: 0.1687365 (149)   total: 3m 2s
remaining: 0us
```

In [31]:
```python
print(cat_grid['params'])
```

```
{'depth': 7, 'iterations': 150}
```

In [38]:
```python
knn_estimator = KNeighborsClassifier(n_neighbors=5, n_jobs=-1)  # default value

knn_grid_dict = {'n_neighbors': [3, 5, 7, 9]}

knn_grid = GridSearchCV(knn_estimator, knn_grid_dict, n_jobs=-1, cv=5, verbose=3)

knn_grid.fit(x_train, y_train)

print(knn_grid.best_params_)
```

```
Fitting 5 folds for each of 4 candidates, totalling 20 fits
{'n_neighbors': 3}
```

10) Обучим модели с подобранными гиперпараметрами, плюс попоробуем собрать из них стекинг

In [31]:
```python
# best params: max_depth = 7
tree_clf = DecisionTreeClassifier(random_state=42, max_depth=7)
tree_clf.fit(x_train, y_train)
print('Дерево решений')
best_params_tree_report = classification_report(y_test, tree_clf.predict(x_test))
print(best_params_tree_report)
```

```python
# best params : 'max_depth': 12, 'n_estimators': 200
forest_clf = RandomForestClassifier(max_depth=12, n_estimators=200, n_jobs=-1, rando
forest_clf.fit(x_train, y_train)
print('Случайный лес')
best_params_forest_report = classification_report(y_test, forest_clf.predict(x_test)
print(best_params_forest_report)

# {'depth': 7, 'iterations': 150}
cat_clf = CatBoostClassifier(eval_metric='F1', random_state=42, loss_function='Loglo
                             max_depth=7, n_estimators=150)
cat_clf.fit(x_train, y_train, eval_set=(x_val, y_val), early_stopping_rounds=20, ver
print('CatBoost')
best_params_catboost_report = classification_report(y_test, cat_clf.predict(x_test))
print(best_params_catboost_report)

# n_neighbors = 3
knn_clf = KNeighborsClassifier(n_neighbors=3, n_jobs=-1)
knn_clf.fit(x_train, y_train)
print('KNeighborsClassifier')
best_params_knn_report = classification_report(y_test, knn_clf.predict(x_test))
print(best_params_knn_report)
```

```
Дерево решений
              precision    recall  f1-score   support

           0       0.81      0.90      0.85      6104
           1       0.46      0.28      0.35      1845

    accuracy                           0.76      7949
   macro avg       0.63      0.59      0.60      7949
weighted avg       0.73      0.76      0.73      7949

Случайный лес
              precision    recall  f1-score   support

           0       0.81      0.94      0.87      6104
           1       0.55      0.25      0.35      1845

    accuracy                           0.78      7949
   macro avg       0.68      0.59      0.61      7949
weighted avg       0.75      0.78      0.75      7949

CatBoost
              precision    recall  f1-score   support

           0       0.82      0.93      0.87      6104
           1       0.57      0.31      0.40      1845

    accuracy                           0.79      7949
   macro avg       0.69      0.62      0.64      7949
weighted avg       0.76      0.79      0.76      7949

KNeighborsClassifier
              precision    recall  f1-score   support

           0       0.79      0.83      0.81      6104
           1       0.32      0.27      0.30      1845

    accuracy                           0.70      7949
   macro avg       0.56      0.55      0.55      7949
weighted avg       0.68      0.70      0.69      7949
```

Попробуем стекинг

In [32]:
```python
from sklearn.ensemble import StackingClassifier

cat_clf = CatBoostClassifier(eval_metric='F1', random_state=42, loss_function='Loglo
                             max_depth=7, n_estimators=150)
knn_clf = KNeighborsClassifier(n_neighbors=3, n_jobs=-1)

estimators = [('cat', cat_clf), ('knn', knn_clf)]
stacked_clf = StackingClassifier(estimators=estimators, cv=5)

stacked_clf.fit(x_train, y_train)
```

```
Learning rate set to 0.306046
0:      learn: 0.8030151        total: 1.45s    remaining: 3m 35s
1:      learn: 0.8121265        total: 2.79s    remaining: 3m 26s
2:      learn: 0.8179326        total: 4.11s    remaining: 3m 21s
3:      learn: 0.8263335        total: 5.47s    remaining: 3m 19s
4:      learn: 0.8288051        total: 6.76s    remaining: 3m 16s
5:      learn: 0.8325041        total: 8.05s    remaining: 3m 13s
6:      learn: 0.8371629        total: 9.38s    remaining: 3m 11s
7:      learn: 0.8389705        total: 10.7s    remaining: 3m 10s
8:      learn: 0.8403591        total: 12s      remaining: 3m 7s
9:      learn: 0.8411994        total: 13.3s    remaining: 3m 5s
10:     learn: 0.8438878        total: 14.6s    remaining: 3m 3s
11:     learn: 0.8450346        total: 15.8s    remaining: 3m 1s
12:     learn: 0.8463863        total: 17s      remaining: 2m 59s
13:     learn: 0.8485041        total: 18.4s    remaining: 2m 58s
14:     learn: 0.8502133        total: 19.7s    remaining: 2m 57s
15:     learn: 0.8510224        total: 20.9s    remaining: 2m 54s
16:     learn: 0.8521968        total: 22.1s    remaining: 2m 52s
17:     learn: 0.8538404        total: 23.4s    remaining: 2m 51s
18:     learn: 0.8544397        total: 24.6s    remaining: 2m 49s
19:     learn: 0.8559939        total: 25.8s    remaining: 2m 47s
20:     learn: 0.8566132        total: 27.1s    remaining: 2m 46s
21:     learn: 0.8579373        total: 28.4s    remaining: 2m 45s
22:     learn: 0.8590604        total: 29.6s    remaining: 2m 43s
23:     learn: 0.8595572        total: 30.8s    remaining: 2m 41s
24:     learn: 0.8599968        total: 32.1s    remaining: 2m 40s
25:     learn: 0.8612423        total: 33.3s    remaining: 2m 38s
26:     learn: 0.8622216        total: 34.5s    remaining: 2m 37s
27:     learn: 0.8632206        total: 35.8s    remaining: 2m 35s
28:     learn: 0.8639328        total: 36.9s    remaining: 2m 34s
29:     learn: 0.8641502        total: 38.3s    remaining: 2m 33s
30:     learn: 0.8650382        total: 39.5s    remaining: 2m 31s
31:     learn: 0.8657747        total: 40.7s    remaining: 2m 30s
32:     learn: 0.8665990        total: 42s      remaining: 2m 28s
33:     learn: 0.8674346        total: 43.2s    remaining: 2m 27s
34:     learn: 0.8685663        total: 44.5s    remaining: 2m 26s
35:     learn: 0.8696553        total: 45.7s    remaining: 2m 24s
36:     learn: 0.8704162        total: 46.9s    remaining: 2m 23s
37:     learn: 0.8714858        total: 48.2s    remaining: 2m 22s
38:     learn: 0.8720081        total: 49.3s    remaining: 2m 20s
39:     learn: 0.8731197        total: 50.5s    remaining: 2m 18s
40:     learn: 0.8741606        total: 51.8s    remaining: 2m 17s
41:     learn: 0.8748316        total: 53s      remaining: 2m 16s
42:     learn: 0.8749074        total: 54.2s    remaining: 2m 14s
43:     learn: 0.8756985        total: 55.4s    remaining: 2m 13s
44:     learn: 0.8768033        total: 56.6s    remaining: 2m 12s
45:     learn: 0.8781111        total: 57.8s    remaining: 2m 10s
46:     learn: 0.8784850        total: 59s      remaining: 2m 9s
47:     learn: 0.8791662        total: 1m       remaining: 2m 7s
48:     learn: 0.8799570        total: 1m 1s    remaining: 2m 6s
49:     learn: 0.8805184        total: 1m 2s    remaining: 2m 5s
50:     learn: 0.8808174        total: 1m 3s    remaining: 2m 3s
51:     learn: 0.8821225        total: 1m 4s    remaining: 2m 2s
52:     learn: 0.8822384        total: 1m 6s    remaining: 2m 1s
53:     learn: 0.8826255        total: 1m 7s    remaining: 1m 59s
54:     learn: 0.8830623        total: 1m 8s    remaining: 1m 58s
55:     learn: 0.8838603        total: 1m 9s    remaining: 1m 57s
```

```
56:     learn: 0.8838239    total: 1m 11s    remaining: 1m 55s
57:     learn: 0.8848520    total: 1m 12s    remaining: 1m 54s
58:     learn: 0.8852166    total: 1m 13s    remaining: 1m 53s
59:     learn: 0.8858892    total: 1m 14s    remaining: 1m 51s
60:     learn: 0.8864855    total: 1m 15s    remaining: 1m 50s
61:     learn: 0.8871022    total: 1m 16s    remaining: 1m 49s
62:     learn: 0.8876638    total: 1m 18s    remaining: 1m 48s
63:     learn: 0.8887897    total: 1m 19s    remaining: 1m 46s
64:     learn: 0.8894095    total: 1m 20s    remaining: 1m 45s
65:     learn: 0.8904751    total: 1m 21s    remaining: 1m 44s
66:     learn: 0.8906386    total: 1m 23s    remaining: 1m 42s
67:     learn: 0.8914367    total: 1m 24s    remaining: 1m 41s
68:     learn: 0.8916109    total: 1m 25s    remaining: 1m 40s
69:     learn: 0.8921945    total: 1m 26s    remaining: 1m 38s
70:     learn: 0.8929264    total: 1m 27s    remaining: 1m 37s
71:     learn: 0.8933571    total: 1m 28s    remaining: 1m 36s
72:     learn: 0.8935753    total: 1m 29s    remaining: 1m 34s
73:     learn: 0.8941260    total: 1m 31s    remaining: 1m 33s
74:     learn: 0.8950476    total: 1m 32s    remaining: 1m 32s
75:     learn: 0.8955815    total: 1m 33s    remaining: 1m 31s
76:     learn: 0.8961479    total: 1m 34s    remaining: 1m 29s
77:     learn: 0.8962783    total: 1m 35s    remaining: 1m 28s
78:     learn: 0.8969511    total: 1m 37s    remaining: 1m 27s
79:     learn: 0.8971093    total: 1m 38s    remaining: 1m 26s
80:     learn: 0.8976602    total: 1m 39s    remaining: 1m 24s
81:     learn: 0.8979528    total: 1m 40s    remaining: 1m 23s
82:     learn: 0.8986068    total: 1m 41s    remaining: 1m 22s
83:     learn: 0.8989744    total: 1m 43s    remaining: 1m 21s
84:     learn: 0.8990479    total: 1m 44s    remaining: 1m 19s
85:     learn: 0.8999510    total: 1m 45s    remaining: 1m 18s
86:     learn: 0.9005361    total: 1m 46s    remaining: 1m 17s
87:     learn: 0.9015256    total: 1m 47s    remaining: 1m 16s
88:     learn: 0.9022643    total: 1m 49s    remaining: 1m 14s
89:     learn: 0.9025730    total: 1m 50s    remaining: 1m 13s
90:     learn: 0.9029705    total: 1m 51s    remaining: 1m 12s
91:     learn: 0.9038812    total: 1m 52s    remaining: 1m 10s
92:     learn: 0.9043270    total: 1m 53s    remaining: 1m 9s
93:     learn: 0.9050972    total: 1m 55s    remaining: 1m 8s
94:     learn: 0.9055531    total: 1m 56s    remaining: 1m 7s
95:     learn: 0.9057559    total: 1m 57s    remaining: 1m 6s
96:     learn: 0.9063624    total: 1m 58s    remaining: 1m 4s
97:     learn: 0.9066613    total: 1m 59s    remaining: 1m 3s
98:     learn: 0.9076711    total: 2m 1s     remaining: 1m 2s
99:     learn: 0.9081472    total: 2m 2s     remaining: 1m 1s
100:    learn: 0.9088249    total: 2m 3s     remaining: 59.9s
101:    learn: 0.9091352    total: 2m 4s     remaining: 58.7s
102:    learn: 0.9091554    total: 2m 5s     remaining: 57.4s
103:    learn: 0.9093326    total: 2m 6s     remaining: 56.1s
104:    learn: 0.9097798    total: 2m 8s     remaining: 54.9s
105:    learn: 0.9101101    total: 2m 9s     remaining: 53.7s
106:    learn: 0.9104441    total: 2m 10s    remaining: 52.4s
107:    learn: 0.9108907    total: 2m 11s    remaining: 51.2s
108:    learn: 0.9113134    total: 2m 12s    remaining: 50s
109:    learn: 0.9119047    total: 2m 14s    remaining: 48.7s
110:    learn: 0.9123506    total: 2m 15s    remaining: 47.5s
111:    learn: 0.9123824    total: 2m 16s    remaining: 46.2s
112:    learn: 0.9126471    total: 2m 17s    remaining: 45s
113:    learn: 0.9134050    total: 2m 18s    remaining: 43.7s
114:    learn: 0.9137653    total: 2m 19s    remaining: 42.5s
115:    learn: 0.9143729    total: 2m 20s    remaining: 41.3s
116:    learn: 0.9147934    total: 2m 22s    remaining: 40.1s
117:    learn: 0.9157260    total: 2m 23s    remaining: 38.9s
118:    learn: 0.9161604    total: 2m 24s    remaining: 37.7s
119:    learn: 0.9168525    total: 2m 25s    remaining: 36.5s
120:    learn: 0.9173988    total: 2m 26s    remaining: 35.2s
121:    learn: 0.9176377    total: 2m 28s    remaining: 34s
122:    learn: 0.9180494    total: 2m 29s    remaining: 32.8s
123:    learn: 0.9189952    total: 2m 30s    remaining: 31.6s
124:    learn: 0.9194267    total: 2m 31s    remaining: 30.4s
```

```
125:     learn: 0.9199356      total: 2m 33s    remaining: 29.2s
126:     learn: 0.9205432      total: 2m 34s    remaining: 27.9s
127:     learn: 0.9207672      total: 2m 35s    remaining: 26.7s
128:     learn: 0.9207910      total: 2m 36s    remaining: 25.5s
129:     learn: 0.9207938      total: 2m 37s    remaining: 24.3s
130:     learn: 0.9213741      total: 2m 38s    remaining: 23s
131:     learn: 0.9216594      total: 2m 40s    remaining: 21.8s
132:     learn: 0.9223752      total: 2m 41s    remaining: 20.6s
133:     learn: 0.9226601      total: 2m 42s    remaining: 19.4s
134:     learn: 0.9227957      total: 2m 43s    remaining: 18.2s
135:     learn: 0.9234801      total: 2m 44s    remaining: 16.9s
136:     learn: 0.9238424      total: 2m 45s    remaining: 15.7s
137:     learn: 0.9241744      total: 2m 46s    remaining: 14.5s
138:     learn: 0.9248954      total: 2m 48s    remaining: 13.3s
139:     learn: 0.9252267      total: 2m 49s    remaining: 12.1s
140:     learn: 0.9255071      total: 2m 50s    remaining: 10.9s
141:     learn: 0.9257500      total: 2m 51s    remaining: 9.67s
142:     learn: 0.9259838      total: 2m 52s    remaining: 8.46s
143:     learn: 0.9263227      total: 2m 54s    remaining: 7.25s
144:     learn: 0.9266812      total: 2m 55s    remaining: 6.04s
145:     learn: 0.9273259      total: 2m 56s    remaining: 4.83s
146:     learn: 0.9276057      total: 2m 57s    remaining: 3.62s
147:     learn: 0.9281758      total: 2m 58s    remaining: 2.42s
148:     learn: 0.9281790      total: 2m 59s    remaining: 1.21s
149:     learn: 0.9285620      total: 3m        remaining: 0us
Learning rate set to 0.278232
0:       learn: 0.8827449      total: 1.35s     remaining: 3m 21s
1:       learn: 0.8968610      total: 2.63s     remaining: 3m 14s
2:       learn: 0.9072844      total: 3.88s     remaining: 3m 9s
3:       learn: 0.9102981      total: 5.15s     remaining: 3m 7s
4:       learn: 0.9124946      total: 6.43s     remaining: 3m 6s
5:       learn: 0.9149120      total: 7.65s     remaining: 3m 3s
6:       learn: 0.9187047      total: 8.88s     remaining: 3m 1s
7:       learn: 0.9217997      total: 10.2s     remaining: 3m
8:       learn: 0.9239214      total: 11.4s     remaining: 2m 57s
9:       learn: 0.9252155      total: 12.5s     remaining: 2m 55s
10:      learn: 0.9270191      total: 13.7s     remaining: 2m 52s
11:      learn: 0.9275474      total: 14.8s     remaining: 2m 50s
12:      learn: 0.9287379      total: 16.1s     remaining: 2m 49s
13:      learn: 0.9295921      total: 17.2s     remaining: 2m 46s
14:      learn: 0.9299073      total: 18.3s     remaining: 2m 45s
15:      learn: 0.9306572      total: 19.5s     remaining: 2m 43s
16:      learn: 0.9314024      total: 20.7s     remaining: 2m 42s
17:      learn: 0.9319398      total: 21.9s     remaining: 2m 40s
18:      learn: 0.9320639      total: 23.1s     remaining: 2m 39s
19:      learn: 0.9328467      total: 24.3s     remaining: 2m 37s
20:      learn: 0.9336735      total: 25.4s     remaining: 2m 36s
21:      learn: 0.9339951      total: 26.6s     remaining: 2m 34s
22:      learn: 0.9344631      total: 27.8s     remaining: 2m 33s
23:      learn: 0.9348178      total: 29s       remaining: 2m 32s
24:      learn: 0.9351867      total: 30.2s     remaining: 2m 30s
25:      learn: 0.9355891      total: 31.3s     remaining: 2m 29s
26:      learn: 0.9363265      total: 32.5s     remaining: 2m 27s
27:      learn: 0.9367581      total: 33.6s     remaining: 2m 26s
28:      learn: 0.9373031      total: 34.8s     remaining: 2m 25s
29:      learn: 0.9376729      total: 35.9s     remaining: 2m 23s
30:      learn: 0.9384055      total: 37.1s     remaining: 2m 22s
31:      learn: 0.9387319      total: 38.2s     remaining: 2m 20s
32:      learn: 0.9392413      total: 39.4s     remaining: 2m 19s
33:      learn: 0.9393284      total: 40.5s     remaining: 2m 18s
34:      learn: 0.9399847      total: 41.7s     remaining: 2m 17s
35:      learn: 0.9403970      total: 42.9s     remaining: 2m 15s
36:      learn: 0.9407738      total: 44.1s     remaining: 2m 14s
37:      learn: 0.9410831      total: 45.2s     remaining: 2m 13s
38:      learn: 0.9415081      total: 46.3s     remaining: 2m 11s
39:      learn: 0.9419524      total: 47.4s     remaining: 2m 10s
40:      learn: 0.9420425      total: 48.4s     remaining: 2m 8s
41:      learn: 0.9424155      total: 49.5s     remaining: 2m 7s
42:      learn: 0.9430783      total: 50.7s     remaining: 2m 6s
```

```
43:     learn: 0.9434416     total: 51.8s     remaining: 2m 4s
44:     learn: 0.9437502     total: 53s       remaining: 2m 3s
45:     learn: 0.9440831     total: 54.1s     remaining: 2m 2s
46:     learn: 0.9443655     total: 55.2s     remaining: 2m
47:     learn: 0.9446388     total: 56.3s     remaining: 1m 59s
48:     learn: 0.9450561     total: 57.5s     remaining: 1m 58s
49:     learn: 0.9454277     total: 58.7s     remaining: 1m 57s
50:     learn: 0.9457762     total: 59.8s     remaining: 1m 56s
51:     learn: 0.9461297     total: 1m        remaining: 1m 54s
52:     learn: 0.9464866     total: 1m 2s     remaining: 1m 53s
53:     learn: 0.9470352     total: 1m 3s     remaining: 1m 52s
54:     learn: 0.9470640     total: 1m 4s     remaining: 1m 50s
55:     learn: 0.9475436     total: 1m 5s     remaining: 1m 49s
56:     learn: 0.9476268     total: 1m 6s     remaining: 1m 48s
57:     learn: 0.9481663     total: 1m 7s     remaining: 1m 46s
58:     learn: 0.9482552     total: 1m 8s     remaining: 1m 45s
59:     learn: 0.9483182     total: 1m 9s     remaining: 1m 44s
60:     learn: 0.9483957     total: 1m 10s    remaining: 1m 43s
61:     learn: 0.9486767     total: 1m 12s    remaining: 1m 42s
62:     learn: 0.9494113     total: 1m 13s    remaining: 1m 41s
63:     learn: 0.9499837     total: 1m 14s    remaining: 1m 39s
64:     learn: 0.9500953     total: 1m 15s    remaining: 1m 38s
65:     learn: 0.9506590     total: 1m 16s    remaining: 1m 37s
66:     learn: 0.9506438     total: 1m 17s    remaining: 1m 36s
67:     learn: 0.9511418     total: 1m 18s    remaining: 1m 35s
68:     learn: 0.9513390     total: 1m 19s    remaining: 1m 33s
69:     learn: 0.9513675     total: 1m 20s    remaining: 1m 32s
70:     learn: 0.9514272     total: 1m 22s    remaining: 1m 31s
71:     learn: 0.9517125     total: 1m 23s    remaining: 1m 30s
72:     learn: 0.9520960     total: 1m 24s    remaining: 1m 28s
73:     learn: 0.9522592     total: 1m 25s    remaining: 1m 27s
74:     learn: 0.9527202     total: 1m 26s    remaining: 1m 26s
75:     learn: 0.9527486     total: 1m 27s    remaining: 1m 25s
76:     learn: 0.9531186     total: 1m 28s    remaining: 1m 24s
77:     learn: 0.9535686     total: 1m 29s    remaining: 1m 22s
78:     learn: 0.9536823     total: 1m 31s    remaining: 1m 21s
79:     learn: 0.9537107     total: 1m 32s    remaining: 1m 20s
80:     learn: 0.9542739     total: 1m 33s    remaining: 1m 19s
81:     learn: 0.9542690     total: 1m 34s    remaining: 1m 18s
82:     learn: 0.9549638     total: 1m 35s    remaining: 1m 17s
83:     learn: 0.9555730     total: 1m 36s    remaining: 1m 15s
84:     learn: 0.9555966     total: 1m 37s    remaining: 1m 14s
85:     learn: 0.9557431     total: 1m 38s    remaining: 1m 13s
86:     learn: 0.9559155     total: 1m 39s    remaining: 1m 12s
87:     learn: 0.9559414     total: 1m 41s    remaining: 1m 11s
88:     learn: 0.9563590     total: 1m 42s    remaining: 1m 10s
89:     learn: 0.9567198     total: 1m 43s    remaining: 1m 8s
90:     learn: 0.9570805     total: 1m 44s    remaining: 1m 7s
91:     learn: 0.9572668     total: 1m 45s    remaining: 1m 6s
92:     learn: 0.9576625     total: 1m 46s    remaining: 1m 5s
93:     learn: 0.9578862     total: 1m 47s    remaining: 1m 4s
94:     learn: 0.9580579     total: 1m 49s    remaining: 1m 3s
95:     learn: 0.9581143     total: 1m 50s    remaining: 1m 1s
96:     learn: 0.9582859     total: 1m 51s    remaining: 1m
97:     learn: 0.9583401     total: 1m 52s    remaining: 59.6s
98:     learn: 0.9587914     total: 1m 53s    remaining: 58.4s
99:     learn: 0.9591014     total: 1m 54s    remaining: 57.3s
100:    learn: 0.9591318     total: 1m 55s    remaining: 56.1s
101:    learn: 0.9591859     total: 1m 56s    remaining: 55s
102:    learn: 0.9596342     total: 1m 57s    remaining: 53.8s
103:    learn: 0.9598593     total: 1m 59s    remaining: 52.6s
104:    learn: 0.9602833     total: 2m        remaining: 51.5s
105:    learn: 0.9603157     total: 2m 1s     remaining: 50.3s
106:    learn: 0.9604520     total: 2m 2s     remaining: 49.2s
107:    learn: 0.9607870     total: 2m 3s     remaining: 48.1s
108:    learn: 0.9610635     total: 2m 4s     remaining: 46.9s
109:    learn: 0.9612600     total: 2m 5s     remaining: 45.7s
110:    learn: 0.9620431     total: 2m 6s     remaining: 44.6s
111:    learn: 0.9623171     total: 2m 8s     remaining: 43.4s
```

```
112:      learn: 0.9628730      total: 2m 9s       remaining: 42.3s
113:      learn: 0.9627291      total: 2m 10s      remaining: 41.1s
114:      learn: 0.9629010      total: 2m 11s      remaining: 40s
115:      learn: 0.9632666      total: 2m 12s      remaining: 38.8s
116:      learn: 0.9635363      total: 2m 13s      remaining: 37.7s
117:      learn: 0.9638099      total: 2m 14s      remaining: 36.6s
118:      learn: 0.9643367      total: 2m 15s      remaining: 35.4s
119:      learn: 0.9647496      total: 2m 17s      remaining: 34.3s
120:      learn: 0.9650527      total: 2m 18s      remaining: 33.1s
121:      learn: 0.9650843      total: 2m 19s      remaining: 32s
122:      learn: 0.9651680      total: 2m 20s      remaining: 30.8s
123:      learn: 0.9652553      total: 2m 21s      remaining: 29.7s
124:      learn: 0.9652200      total: 2m 22s      remaining: 28.6s
125:      learn: 0.9653371      total: 2m 23s      remaining: 27.4s
126:      learn: 0.9656380      total: 2m 25s      remaining: 26.3s
127:      learn: 0.9656658      total: 2m 26s      remaining: 25.1s
128:      learn: 0.9656918      total: 2m 27s      remaining: 24s
129:      learn: 0.9658571      total: 2m 28s      remaining: 22.8s
130:      learn: 0.9661615      total: 2m 29s      remaining: 21.7s
131:      learn: 0.9661615      total: 2m 30s      remaining: 20.5s
132:      learn: 0.9662171      total: 2m 31s      remaining: 19.4s
133:      learn: 0.9666586      total: 2m 32s      remaining: 18.2s
134:      learn: 0.9668012      total: 2m 33s      remaining: 17.1s
135:      learn: 0.9668425      total: 2m 34s      remaining: 15.9s
136:      learn: 0.9671761      total: 2m 36s      remaining: 14.8s
137:      learn: 0.9673097      total: 2m 37s      remaining: 13.7s
138:      learn: 0.9675875      total: 2m 38s      remaining: 12.5s
139:      learn: 0.9676430      total: 2m 39s      remaining: 11.4s
140:      learn: 0.9678651      total: 2m 40s      remaining: 10.2s
141:      learn: 0.9681686      total: 2m 41s      remaining: 9.1s
142:      learn: 0.9681652      total: 2m 42s      remaining: 7.96s
143:      learn: 0.9682779      total: 2m 43s      remaining: 6.83s
144:      learn: 0.9684426      total: 2m 44s      remaining: 5.69s
145:      learn: 0.9687718      total: 2m 46s      remaining: 4.55s
146:      learn: 0.9689675      total: 2m 47s      remaining: 3.41s
147:      learn: 0.9689398      total: 2m 48s      remaining: 2.27s
148:      learn: 0.9690229      total: 2m 49s      remaining: 1.14s
149:      learn: 0.9692151      total: 2m 50s      remaining: 0us
Learning rate set to 0.278232
0:        learn: 0.8264630      total: 1.32s      remaining: 3m 16s
1:        learn: 0.8366115      total: 2.58s      remaining: 3m 11s
2:        learn: 0.8419047      total: 3.84s      remaining: 3m 8s
3:        learn: 0.8483918      total: 5.13s      remaining: 3m 7s
4:        learn: 0.8512188      total: 6.37s      remaining: 3m 4s
5:        learn: 0.8540121      total: 7.62s      remaining: 3m 2s
6:        learn: 0.8561692      total: 8.89s      remaining: 3m 1s
7:        learn: 0.8593697      total: 10.2s      remaining: 3m
8:        learn: 0.8617597      total: 11.3s      remaining: 2m 57s
9:        learn: 0.8633016      total: 12.6s      remaining: 2m 56s
10:       learn: 0.8647505      total: 13.8s      remaining: 2m 54s
11:       learn: 0.8661089      total: 15s        remaining: 2m 52s
12:       learn: 0.8678724      total: 16.3s      remaining: 2m 51s
13:       learn: 0.8690040      total: 17.5s      remaining: 2m 49s
14:       learn: 0.8696583      total: 18.7s      remaining: 2m 48s
15:       learn: 0.8707460      total: 19.9s      remaining: 2m 46s
16:       learn: 0.8720924      total: 21.1s      remaining: 2m 45s
17:       learn: 0.8730816      total: 22.3s      remaining: 2m 43s
18:       learn: 0.8740182      total: 23.5s      remaining: 2m 41s
19:       learn: 0.8750035      total: 24.7s      remaining: 2m 40s
20:       learn: 0.8766321      total: 25.9s      remaining: 2m 39s
21:       learn: 0.8775728      total: 27s        remaining: 2m 37s
22:       learn: 0.8785273      total: 28.2s      remaining: 2m 35s
23:       learn: 0.8790597      total: 29.4s      remaining: 2m 34s
24:       learn: 0.8804360      total: 30.5s      remaining: 2m 32s
25:       learn: 0.8809912      total: 31.7s      remaining: 2m 30s
26:       learn: 0.8826718      total: 32.8s      remaining: 2m 29s
27:       learn: 0.8836099      total: 34s        remaining: 2m 28s
28:       learn: 0.8839652      total: 35.2s      remaining: 2m 26s
29:       learn: 0.8842590      total: 36.3s      remaining: 2m 25s
```

```
30:     learn: 0.8843961     total: 37.4s     remaining: 2m 23s
31:     learn: 0.8857287     total: 38.6s     remaining: 2m 22s
32:     learn: 0.8865198     total: 39.7s     remaining: 2m 20s
33:     learn: 0.8870755     total: 40.9s     remaining: 2m 19s
34:     learn: 0.8878489     total: 42.1s     remaining: 2m 18s
35:     learn: 0.8885588     total: 43.2s     remaining: 2m 16s
36:     learn: 0.8891816     total: 44.4s     remaining: 2m 15s
37:     learn: 0.8900591     total: 45.6s     remaining: 2m 14s
38:     learn: 0.8907243     total: 46.9s     remaining: 2m 13s
39:     learn: 0.8917105     total: 48s       remaining: 2m 12s
40:     learn: 0.8921889     total: 49.1s     remaining: 2m 10s
41:     learn: 0.8928601     total: 50.3s     remaining: 2m 9s
42:     learn: 0.8929281     total: 51.4s     remaining: 2m 7s
43:     learn: 0.8936598     total: 52.6s     remaining: 2m 6s
44:     learn: 0.8947207     total: 53.7s     remaining: 2m 5s
45:     learn: 0.8955883     total: 54.9s     remaining: 2m 4s
46:     learn: 0.8961645     total: 56s       remaining: 2m 2s
47:     learn: 0.8971796     total: 57.1s     remaining: 2m 1s
48:     learn: 0.8977108     total: 58.2s     remaining: 2m
49:     learn: 0.8977415     total: 59.3s     remaining: 1m 58s
50:     learn: 0.8982497     total: 1m        remaining: 1m 57s
51:     learn: 0.8988915     total: 1m 1s     remaining: 1m 56s
52:     learn: 0.8995506     total: 1m 2s     remaining: 1m 54s
53:     learn: 0.9003153     total: 1m 3s     remaining: 1m 53s
54:     learn: 0.9011326     total: 1m 4s     remaining: 1m 52s
55:     learn: 0.9019488     total: 1m 6s     remaining: 1m 50s
56:     learn: 0.9028049     total: 1m 7s     remaining: 1m 49s
57:     learn: 0.9039888     total: 1m 8s     remaining: 1m 48s
58:     learn: 0.9044764     total: 1m 9s     remaining: 1m 47s
59:     learn: 0.9043900     total: 1m 10s    remaining: 1m 45s
60:     learn: 0.9053248     total: 1m 11s    remaining: 1m 44s
61:     learn: 0.9054416     total: 1m 12s    remaining: 1m 43s
62:     learn: 0.9054016     total: 1m 13s    remaining: 1m 42s
63:     learn: 0.9062596     total: 1m 15s    remaining: 1m 40s
64:     learn: 0.9065085     total: 1m 16s    remaining: 1m 39s
65:     learn: 0.9069139     total: 1m 17s    remaining: 1m 38s
66:     learn: 0.9072791     total: 1m 18s    remaining: 1m 37s
67:     learn: 0.9081547     total: 1m 19s    remaining: 1m 35s
68:     learn: 0.9087419     total: 1m 20s    remaining: 1m 34s
69:     learn: 0.9092325     total: 1m 21s    remaining: 1m 33s
70:     learn: 0.9095106     total: 1m 22s    remaining: 1m 32s
71:     learn: 0.9095612     total: 1m 24s    remaining: 1m 31s
72:     learn: 0.9102179     total: 1m 25s    remaining: 1m 29s
73:     learn: 0.9108839     total: 1m 26s    remaining: 1m 28s
74:     learn: 0.9114796     total: 1m 27s    remaining: 1m 27s
75:     learn: 0.9120595     total: 1m 28s    remaining: 1m 26s
76:     learn: 0.9128456     total: 1m 29s    remaining: 1m 25s
77:     learn: 0.9130471     total: 1m 30s    remaining: 1m 23s
78:     learn: 0.9141542     total: 1m 31s    remaining: 1m 22s
79:     learn: 0.9150841     total: 1m 33s    remaining: 1m 21s
80:     learn: 0.9157842     total: 1m 34s    remaining: 1m 20s
81:     learn: 0.9166343     total: 1m 35s    remaining: 1m 19s
82:     learn: 0.9170986     total: 1m 36s    remaining: 1m 17s
83:     learn: 0.9178302     total: 1m 37s    remaining: 1m 16s
84:     learn: 0.9185776     total: 1m 38s    remaining: 1m 15s
85:     learn: 0.9189324     total: 1m 39s    remaining: 1m 14s
86:     learn: 0.9189922     total: 1m 40s    remaining: 1m 13s
87:     learn: 0.9193888     total: 1m 42s    remaining: 1m 11s
88:     learn: 0.9193932     total: 1m 43s    remaining: 1m 10s
89:     learn: 0.9198705     total: 1m 44s    remaining: 1m 9s
90:     learn: 0.9201860     total: 1m 45s    remaining: 1m 8s
91:     learn: 0.9208334     total: 1m 46s    remaining: 1m 7s
92:     learn: 0.9213060     total: 1m 47s    remaining: 1m 5s
93:     learn: 0.9219066     total: 1m 48s    remaining: 1m 4s
94:     learn: 0.9225621     total: 1m 49s    remaining: 1m 3s
95:     learn: 0.9227792     total: 1m 50s    remaining: 1m 2s
96:     learn: 0.9230557     total: 1m 51s    remaining: 1m 1s
97:     learn: 0.9232555     total: 1m 53s    remaining: 1m
98:     learn: 0.9238377     total: 1m 54s    remaining: 58.9s
```

```
99:     learn: 0.9246659     total: 1m 55s    remaining: 57.7s
100:    learn: 0.9250994     total: 1m 56s    remaining: 56.5s
101:    learn: 0.9253369     total: 1m 57s    remaining: 55.3s
102:    learn: 0.9254514     total: 1m 58s    remaining: 54.1s
103:    learn: 0.9255322     total: 1m 59s    remaining: 52.9s
104:    learn: 0.9259096     total: 2m        remaining: 51.8s
105:    learn: 0.9262234     total: 2m 1s     remaining: 50.6s
106:    learn: 0.9266637     total: 2m 2s     remaining: 49.4s
107:    learn: 0.9270460     total: 2m 4s     remaining: 48.3s
108:    learn: 0.9273755     total: 2m 5s     remaining: 47.1s
109:    learn: 0.9275530     total: 2m 6s     remaining: 45.9s
110:    learn: 0.9282840     total: 2m 7s     remaining: 44.8s
111:    learn: 0.9282840     total: 2m 8s     remaining: 43.6s
112:    learn: 0.9292579     total: 2m 9s     remaining: 42.4s
113:    learn: 0.9296946     total: 2m 10s    remaining: 41.3s
114:    learn: 0.9298714     total: 2m 11s    remaining: 40.1s
115:    learn: 0.9306920     total: 2m 12s    remaining: 39s
116:    learn: 0.9306511     total: 2m 14s    remaining: 37.8s
117:    learn: 0.9312792     total: 2m 15s    remaining: 36.7s
118:    learn: 0.9313086     total: 2m 16s    remaining: 35.5s
119:    learn: 0.9322150     total: 2m 17s    remaining: 34.3s
120:    learn: 0.9324904     total: 2m 18s    remaining: 33.2s
121:    learn: 0.9329265     total: 2m 19s    remaining: 32s
122:    learn: 0.9337839     total: 2m 20s    remaining: 30.9s
123:    learn: 0.9344501     total: 2m 21s    remaining: 29.7s
124:    learn: 0.9347904     total: 2m 22s    remaining: 28.6s
125:    learn: 0.9349073     total: 2m 23s    remaining: 27.4s
126:    learn: 0.9354121     total: 2m 25s    remaining: 26.3s
127:    learn: 0.9360114     total: 2m 26s    remaining: 25.1s
128:    learn: 0.9360990     total: 2m 27s    remaining: 24s
129:    learn: 0.9363547     total: 2m 28s    remaining: 22.8s
130:    learn: 0.9368317     total: 2m 29s    remaining: 21.7s
131:    learn: 0.9368317     total: 2m 30s    remaining: 20.5s
132:    learn: 0.9370649     total: 2m 31s    remaining: 19.4s
133:    learn: 0.9373236     total: 2m 32s    remaining: 18.2s
134:    learn: 0.9378048     total: 2m 33s    remaining: 17.1s
135:    learn: 0.9380701     total: 2m 35s    remaining: 16s
136:    learn: 0.9385665     total: 2m 36s    remaining: 14.8s
137:    learn: 0.9389443     total: 2m 37s    remaining: 13.7s
138:    learn: 0.9393732     total: 2m 38s    remaining: 12.5s
139:    learn: 0.9394213     total: 2m 39s    remaining: 11.4s
140:    learn: 0.9398144     total: 2m 40s    remaining: 10.2s
141:    learn: 0.9399081     total: 2m 41s    remaining: 9.11s
142:    learn: 0.9402013     total: 2m 42s    remaining: 7.97s
143:    learn: 0.9403785     total: 2m 43s    remaining: 6.83s
144:    learn: 0.9407454     total: 2m 45s    remaining: 5.69s
145:    learn: 0.9411443     total: 2m 46s    remaining: 4.55s
146:    learn: 0.9415815     total: 2m 47s    remaining: 3.41s
147:    learn: 0.9421921     total: 2m 48s    remaining: 2.28s
148:    learn: 0.9424967     total: 2m 49s    remaining: 1.14s
149:    learn: 0.9424967     total: 2m 50s    remaining: 0us
Learning rate set to 0.278232
0:      learn: 0.7809534     total: 1.3s      remaining: 3m 14s
1:      learn: 0.7899032     total: 2.58s     remaining: 3m 11s
2:      learn: 0.7983278     total: 3.83s     remaining: 3m 7s
3:      learn: 0.8002022     total: 5.08s     remaining: 3m 5s
4:      learn: 0.8035161     total: 6.29s     remaining: 3m 2s
5:      learn: 0.8057086     total: 7.54s     remaining: 3m
6:      learn: 0.8065449     total: 8.75s     remaining: 2m 58s
7:      learn: 0.8094820     total: 10s       remaining: 2m 57s
8:      learn: 0.8107142     total: 11.2s     remaining: 2m 55s
9:      learn: 0.8126458     total: 12.5s     remaining: 2m 54s
10:     learn: 0.8153257     total: 13.7s     remaining: 2m 52s
11:     learn: 0.8184854     total: 14.9s     remaining: 2m 51s
12:     learn: 0.8188326     total: 16.2s     remaining: 2m 50s
13:     learn: 0.8200176     total: 17.3s     remaining: 2m 48s
14:     learn: 0.8228342     total: 18.5s     remaining: 2m 46s
15:     learn: 0.8243480     total: 19.7s     remaining: 2m 44s
16:     learn: 0.8256538     total: 20.9s     remaining: 2m 43s
```

```
17:     learn: 0.8268637     total: 22.1s     remaining: 2m 41s
18:     learn: 0.8278106     total: 23.3s     remaining: 2m 40s
19:     learn: 0.8286749     total: 24.5s     remaining: 2m 39s
20:     learn: 0.8292573     total: 25.7s     remaining: 2m 37s
21:     learn: 0.8300299     total: 26.8s     remaining: 2m 35s
22:     learn: 0.8307362     total: 28s       remaining: 2m 34s
23:     learn: 0.8314778     total: 29.2s     remaining: 2m 33s
24:     learn: 0.8329566     total: 30.3s     remaining: 2m 31s
25:     learn: 0.8339356     total: 31.4s     remaining: 2m 29s
26:     learn: 0.8358116     total: 32.6s     remaining: 2m 28s
27:     learn: 0.8368498     total: 33.8s     remaining: 2m 27s
28:     learn: 0.8377212     total: 34.9s     remaining: 2m 25s
29:     learn: 0.8390390     total: 36.1s     remaining: 2m 24s
30:     learn: 0.8400271     total: 37.3s     remaining: 2m 23s
31:     learn: 0.8407431     total: 38.6s     remaining: 2m 22s
32:     learn: 0.8422327     total: 39.7s     remaining: 2m 20s
33:     learn: 0.8436787     total: 40.9s     remaining: 2m 19s
34:     learn: 0.8445258     total: 42.1s     remaining: 2m 18s
35:     learn: 0.8452947     total: 43.3s     remaining: 2m 17s
36:     learn: 0.8454125     total: 44.5s     remaining: 2m 15s
37:     learn: 0.8469707     total: 45.6s     remaining: 2m 14s
38:     learn: 0.8480171     total: 46.8s     remaining: 2m 13s
39:     learn: 0.8487835     total: 47.9s     remaining: 2m 11s
40:     learn: 0.8501548     total: 49.1s     remaining: 2m 10s
41:     learn: 0.8508962     total: 50.3s     remaining: 2m 9s
42:     learn: 0.8517904     total: 51.4s     remaining: 2m 7s
43:     learn: 0.8522791     total: 52.5s     remaining: 2m 6s
44:     learn: 0.8539541     total: 53.6s     remaining: 2m 5s
45:     learn: 0.8551899     total: 54.8s     remaining: 2m 3s
46:     learn: 0.8556646     total: 55.9s     remaining: 2m 2s
47:     learn: 0.8573115     total: 57.1s     remaining: 2m 1s
48:     learn: 0.8581790     total: 58.2s     remaining: 1m 59s
49:     learn: 0.8589654     total: 59.3s     remaining: 1m 58s
50:     learn: 0.8600006     total: 1m        remaining: 1m 57s
51:     learn: 0.8605233     total: 1m 1s     remaining: 1m 56s
52:     learn: 0.8611259     total: 1m 2s     remaining: 1m 54s
53:     learn: 0.8627153     total: 1m 3s     remaining: 1m 53s
54:     learn: 0.8642939     total: 1m 5s     remaining: 1m 52s
55:     learn: 0.8646372     total: 1m 6s     remaining: 1m 51s
56:     learn: 0.8657914     total: 1m 7s     remaining: 1m 49s
57:     learn: 0.8667284     total: 1m 8s     remaining: 1m 48s
58:     learn: 0.8672502     total: 1m 9s     remaining: 1m 47s
59:     learn: 0.8679288     total: 1m 10s    remaining: 1m 46s
60:     learn: 0.8685141     total: 1m 11s    remaining: 1m 44s
61:     learn: 0.8696018     total: 1m 13s    remaining: 1m 43s
62:     learn: 0.8702936     total: 1m 14s    remaining: 1m 42s
63:     learn: 0.8707155     total: 1m 15s    remaining: 1m 41s
64:     learn: 0.8716843     total: 1m 16s    remaining: 1m 39s
65:     learn: 0.8722558     total: 1m 17s    remaining: 1m 38s
66:     learn: 0.8727252     total: 1m 18s    remaining: 1m 37s
67:     learn: 0.8730714     total: 1m 19s    remaining: 1m 36s
68:     learn: 0.8743601     total: 1m 20s    remaining: 1m 34s
69:     learn: 0.8753112     total: 1m 21s    remaining: 1m 33s
70:     learn: 0.8760834     total: 1m 23s    remaining: 1m 32s
71:     learn: 0.8768242     total: 1m 24s    remaining: 1m 31s
72:     learn: 0.8775687     total: 1m 25s    remaining: 1m 30s
73:     learn: 0.8780501     total: 1m 26s    remaining: 1m 28s
74:     learn: 0.8786541     total: 1m 27s    remaining: 1m 27s
75:     learn: 0.8788183     total: 1m 28s    remaining: 1m 26s
76:     learn: 0.8792092     total: 1m 29s    remaining: 1m 25s
77:     learn: 0.8804242     total: 1mO 31s   remaining: 1m 24s
78:     learn: 0.8807744     total: 1m 32s    remaining: 1m 22s
79:     learn: 0.8819626     total: 1m 33s    remaining: 1m 21s
80:     learn: 0.8829678     total: 1m 34s    remaining: 1m 20s
81:     learn: 0.8837585     total: 1m 35s    remaining: 1m 19s
82:     learn: 0.8846475     total: 1m 36s    remaining: 1m 18s
83:     learn: 0.8847718     total: 1m 37s    remaining: 1m 16s
84:     learn: 0.8857374     total: 1m 39s    remaining: 1m 15s
85:     learn: 0.8865997     total: 1m 40s    remaining: 1m 14s
```

```
86:      learn: 0.8870820    total: 1m 41s    remaining: 1m 13s
87:      learn: 0.8879361    total: 1m 42s    remaining: 1m 12s
88:      learn: 0.8886106    total: 1m 43s    remaining: 1m 11s
89:      learn: 0.8898779    total: 1m 44s    remaining: 1m 9s
90:      learn: 0.8904898    total: 1m 46s    remaining: 1m 8s
91:      learn: 0.8915039    total: 1m 47s    remaining: 1m 7s
92:      learn: 0.8918242    total: 1m 48s    remaining: 1m 6s
93:      learn: 0.8925693    total: 1m 49s    remaining: 1m 5s
94:      learn: 0.8938026    total: 1m 50s    remaining: 1m 4s
95:      learn: 0.8939125    total: 1m 51s    remaining: 1m 2s
96:      learn: 0.8944724    total: 1m 52s    remaining: 1m 1s
97:      learn: 0.8951488    total: 1m 53s    remaining: 1m
98:      learn: 0.8952466    total: 1m 54s    remaining: 59.2s
99:      learn: 0.8962015    total: 1m 56s    remaining: 58s
100:     learn: 0.8969515    total: 1m 57s    remaining: 56.8s
101:     learn: 0.8981697    total: 1m 58s    remaining: 55.7s
102:     learn: 0.8984639    total: 1m 59s    remaining: 54.5s
103:     learn: 0.8992987    total: 2m        remaining: 53.3s
104:     learn: 0.9000721    total: 2m 1s     remaining: 52.2s
105:     learn: 0.9005125    total: 2m 2s     remaining: 51s
106:     learn: 0.9009917    total: 2m 3s     remaining: 49.8s
107:     learn: 0.9016035    total: 2m 5s     remaining: 48.7s
108:     learn: 0.9024829    total: 2m 6s     remaining: 47.5s
109:     learn: 0.9024883    total: 2m 7s     remaining: 46.3s
110:     learn: 0.9023614    total: 2m 8s     remaining: 45.2s
111:     learn: 0.9028938    total: 2m 9s     remaining: 44s
112:     learn: 0.9031901    total: 2m 10s    remaining: 42.8s
113:     learn: 0.9033436    total: 2m 11s    remaining: 41.6s
114:     learn: 0.9033739    total: 2m 12s    remaining: 40.4s
115:     learn: 0.9044737    total: 2m 13s    remaining: 39.3s
116:     learn: 0.9049764    total: 2m 15s    remaining: 38.1s
117:     learn: 0.9055196    total: 2m 16s    remaining: 36.9s
118:     learn: 0.9063596    total: 2m 17s    remaining: 35.8s
119:     learn: 0.9065304    total: 2m 18s    remaining: 34.6s
120:     learn: 0.9068728    total: 2m 19s    remaining: 33.4s
121:     learn: 0.9075204    total: 2m 20s    remaining: 32.3s
122:     learn: 0.9081021    total: 2m 21s    remaining: 31.1s
123:     learn: 0.9087748    total: 2m 22s    remaining: 30s
124:     learn: 0.9092615    total: 2m 24s    remaining: 28.8s
125:     learn: 0.9098433    total: 2m 25s    remaining: 27.6s
126:     learn: 0.9101489    total: 2m 26s    remaining: 26.5s
127:     learn: 0.9106050    total: 2m 27s    remaining: 25.3s
128:     learn: 0.9110314    total: 2m 28s    remaining: 24.2s
129:     learn: 0.9117371    total: 2m 29s    remaining: 23s
130:     learn: 0.9121173    total: 2m 30s    remaining: 21.9s
131:     learn: 0.9125486    total: 2m 32s    remaining: 20.7s
132:     learn: 0.9128985    total: 2m 33s    remaining: 19.6s
133:     learn: 0.9134674    total: 2m 34s    remaining: 18.4s
134:     learn: 0.9141016    total: 2m 35s    remaining: 17.3s
135:     learn: 0.9143219    total: 2m 36s    remaining: 16.1s
136:     learn: 0.9141363    total: 2m 37s    remaining: 15s
137:     learn: 0.9149604    total: 2m 38s    remaining: 13.8s
138:     learn: 0.9156143    total: 2m 39s    remaining: 12.6s
139:     learn: 0.9166529    total: 2m 40s    remaining: 11.5s
140:     learn: 0.9171183    total: 2m 42s    remaining: 10.3s
141:     learn: 0.9174827    total: 2m 43s    remaining: 9.19s
142:     learn: 0.9180256    total: 2m 44s    remaining: 8.04s
143:     learn: 0.9183095    total: 2m 45s    remaining: 6.89s
144:     learn: 0.9190259    total: 2m 46s    remaining: 5.74s
145:     learn: 0.9194404    total: 2m 47s    remaining: 4.59s
146:     learn: 0.9201231    total: 2m 48s    remaining: 3.45s
147:     learn: 0.9201264    total: 2m 49s    remaining: 2.3s
148:     learn: 0.9207448    total: 2m 51s    remaining: 1.15s
149:     learn: 0.9212145    total: 2m 52s    remaining: 0us
Learning rate set to 0.278232
0:       learn: 0.7824984    total: 1.27s     remaining: 3m 8s
1:       learn: 0.7846604    total: 2.57s     remaining: 3m 10s
2:       learn: 0.7917455    total: 3.83s     remaining: 3m 7s
3:       learn: 0.7985701    total: 5.11s     remaining: 3m 6s
```

```
4:      learn: 0.8010517    total: 6.38s    remaining: 3m 5s
5:      learn: 0.8040778    total: 7.59s    remaining: 3m 2s
6:      learn: 0.8064999    total: 8.84s    remaining: 3m
7:      learn: 0.8086537    total: 10.1s    remaining: 2m 58s
8:      learn: 0.8103043    total: 11.3s    remaining: 2m 56s
9:      learn: 0.8129452    total: 12.5s    remaining: 2m 55s
10:     learn: 0.8155230    total: 13.8s    remaining: 2m 54s
11:     learn: 0.8175236    total: 15s      remaining: 2m 51s
12:     learn: 0.8182718    total: 16.1s    remaining: 2m 49s
13:     learn: 0.8200650    total: 17.4s    remaining: 2m 48s
14:     learn: 0.8212134    total: 18.5s    remaining: 2m 46s
15:     learn: 0.8231702    total: 19.7s    remaining: 2m 44s
16:     learn: 0.8232768    total: 20.9s    remaining: 2m 43s
17:     learn: 0.8242534    total: 22s      remaining: 2m 41s
18:     learn: 0.8248588    total: 23.2s    remaining: 2m 39s
19:     learn: 0.8274792    total: 24.3s    remaining: 2m 38s
20:     learn: 0.8283666    total: 25.5s    remaining: 2m 36s
21:     learn: 0.8296067    total: 26.9s    remaining: 2m 36s
22:     learn: 0.8317501    total: 28.2s    remaining: 2m 35s
23:     learn: 0.8317077    total: 29.4s    remaining: 2m 34s
24:     learn: 0.8328637    total: 30.6s    remaining: 2m 32s
25:     learn: 0.8338214    total: 31.8s    remaining: 2m 31s
26:     learn: 0.8341590    total: 32.9s    remaining: 2m 30s
27:     learn: 0.8356770    total: 34.1s    remaining: 2m 28s
28:     learn: 0.8363647    total: 35.3s    remaining: 2m 27s
29:     learn: 0.8371962    total: 36.5s    remaining: 2m 25s
30:     learn: 0.8383713    total: 37.7s    remaining: 2m 24s
31:     learn: 0.8390607    total: 38.9s    remaining: 2m 23s
32:     learn: 0.8398839    total: 40.1s    remaining: 2m 22s
33:     learn: 0.8417051    total: 41.3s    remaining: 2m 20s
34:     learn: 0.8430622    total: 42.5s    remaining: 2m 19s
35:     learn: 0.8438441    total: 43.7s    remaining: 2m 18s
36:     learn: 0.8443594    total: 44.8s    remaining: 2m 16s
37:     learn: 0.8451132    total: 46s      remaining: 2m 15s
38:     learn: 0.8466644    total: 47.2s    remaining: 2m 14s
39:     learn: 0.8479221    total: 48.4s    remaining: 2m 13s
40:     learn: 0.8489148    total: 49.6s    remaining: 2m 11s
41:     learn: 0.8498931    total: 50.7s    remaining: 2m 10s
42:     learn: 0.8504460    total: 51.8s    remaining: 2m 9s
43:     learn: 0.8519592    total: 53s      remaining: 2m 7s
44:     learn: 0.8529437    total: 54.2s    remaining: 2m 6s
45:     learn: 0.8535619    total: 55.3s    remaining: 2m 4s
46:     learn: 0.8545654    total: 56.4s    remaining: 2m 3s
47:     learn: 0.8558017    total: 57.6s    remaining: 2m 2s
48:     learn: 0.8557541    total: 58.7s    remaining: 2m 1s
49:     learn: 0.8565647    total: 59.9s    remaining: 1m 59s
50:     learn: 0.8578411    total: 1m       remaining: 1m 58s
51:     learn: 0.8589167    total: 1m 2s    remaining: 1m 56s
52:     learn: 0.8599012    total: 1m 3s    remaining: 1m 55s
53:     learn: 0.8609249    total: 1m 4s    remaining: 1m 54s
54:     learn: 0.8620380    total: 1m 5s    remaining: 1m 53s
55:     learn: 0.8633969    total: 1m 6s    remaining: 1m 51s
56:     learn: 0.8642861    total: 1m 7s    remaining: 1m 50s
57:     learn: 0.8647937    total: 1m 9s    remaining: 1m 49s
58:     learn: 0.8661232    total: 1m 10s   remaining: 1m 48s
59:     learn: 0.8671838    total: 1m 11s   remaining: 1m 46s
60:     learn: 0.8687129    total: 1m 12s   remaining: 1m 45s
61:     learn: 0.8692611    total: 1m 13s   remaining: 1m 44s
62:     learn: 0.8700710    total: 1m 14s   remaining: 1m 43s
63:     learn: 0.8715212    total: 1m 15s   remaining: 1m 42s
64:     learn: 0.8721372    total: 1m0 17s  remaining: 1m 40s
65:     learn: 0.8727374    total: 1m 18s   remaining: 1m 39s
66:     learn: 0.8734849    total: 1m 19s   remaining: 1m 38s
67:     learn: 0.8746022    total: 1m 20s   remaining: 1m 37s
68:     learn: 0.8750314    total: 1m 21s   remaining: 1m 35s
69:     learn: 0.8755477    total: 1m 22s   remaining: 1m 34s
70:     learn: 0.8766245    total: 1m 23s   remaining: 1m 33s
71:     learn: 0.8770736    total: 1m 25s   remaining: 1m 32s
72:     learn: 0.8774737    total: 1m 26s   remaining: 1m 30s
```

```
73:     learn: 0.8782078    total: 1m 27s    remaining: 1m 29s
74:     learn: 0.8789010    total: 1m 28s    remaining: 1m 28s
75:     learn: 0.8791754    total: 1m 29s    remaining: 1m 27s
76:     learn: 0.8800579    total: 1m 30s    remaining: 1m 25s
77:     learn: 0.8803516    total: 1m 31s    remaining: 1m 24s
78:     learn: 0.8818490    total: 1m 33s    remaining: 1m 23s
79:     learn: 0.8827832    total: 1m 34s    remaining: 1m 22s
80:     learn: 0.8841877    total: 1m 35s    remaining: 1m 21s
81:     learn: 0.8851967    total: 1m 36s    remaining: 1m 19s
82:     learn: 0.8859325    total: 1m 37s    remaining: 1m 18s
83:     learn: 0.8867285    total: 1m 38s    remaining: 1m 17s
84:     learn: 0.8875500    total: 1m 39s    remaining: 1m 16s
85:     learn: 0.8884817    total: 1m 40s    remaining: 1m 15s
86:     learn: 0.8886545    total: 1m 41s    remaining: 1m 13s
87:     learn: 0.8897891    total: 1m 43s    remaining: 1m 12s
88:     learn: 0.8907265    total: 1m 44s    remaining: 1m 11s
89:     learn: 0.8907386    total: 1m 45s    remaining: 1m 10s
90:     learn: 0.8910473    total: 1m 46s    remaining: 1m 9s
91:     learn: 0.8913924    total: 1m 47s    remaining: 1m 7s
92:     learn: 0.8923657    total: 1m 48s    remaining: 1m 6s
93:     learn: 0.8927650    total: 1m 49s    remaining: 1m 5s
94:     learn: 0.8930552    total: 1m 51s    remaining: 1m 4s
95:     learn: 0.8939545    total: 1m 52s    remaining: 1m 3s
96:     learn: 0.8945442    total: 1m 53s    remaining: 1m 1s
97:     learn: 0.8955100    total: 1m 54s    remaining: 1m
98:     learn: 0.8961846    total: 1m 55s    remaining: 59.5s
99:     learn: 0.8967660    total: 1m 56s    remaining: 58.4s
100:    learn: 0.8973890    total: 1m 57s    remaining: 57.2s
101:    learn: 0.8977238    total: 1m 58s    remaining: 56s
102:    learn: 0.8988552    total: 2m        remaining: 54.8s
103:    learn: 0.8994181    total: 2m 1s     remaining: 53.6s
104:    learn: 0.8996427    total: 2m 2s     remaining: 52.4s
105:    learn: 0.8995122    total: 2m 3s     remaining: 51.2s
106:    learn: 0.8998809    total: 2m 4s     remaining: 50.1s
107:    learn: 0.9007173    total: 2m 5s     remaining: 48.9s
108:    learn: 0.9013960    total: 2m 6s     remaining: 47.7s
109:    learn: 0.9014264    total: 2m 7s     remaining: 46.5s
110:    learn: 0.9017111    total: 2m 8s     remaining: 45.3s
111:    learn: 0.9020629    total: 2m 10s    remaining: 44.1s
112:    learn: 0.9027151    total: 2m 11s    remaining: 43s
113:    learn: 0.9031580    total: 2m 12s    remaining: 41.8s
114:    learn: 0.9039148    total: 2m 13s    remaining: 40.6s
115:    learn: 0.9044959    total: 2m 14s    remaining: 39.5s
116:    learn: 0.9050752    total: 2m 15s    remaining: 38.3s
117:    learn: 0.9061455    total: 2m 17s    remaining: 37.2s
118:    learn: 0.9065937    total: 2m 18s    remaining: 36s
119:    learn: 0.9070314    total: 2m 19s    remaining: 34.8s
120:    learn: 0.9079714    total: 2m 20s    remaining: 33.7s
121:    learn: 0.9079362    total: 2m 21s    remaining: 32.5s
122:    learn: 0.9079914    total: 2m 22s    remaining: 31.3s
123:    learn: 0.9087193    total: 2m 23s    remaining: 30.1s
124:    learn: 0.9089955    total: 2m 24s    remaining: 29s
125:    learn: 0.9098483    total: 2m 25s    remaining: 27.8s
126:    learn: 0.9100891    total: 2m 27s    remaining: 26.6s
127:    learn: 0.9101192    total: 2m 28s    remaining: 25.4s
128:    learn: 0.9102041    total: 2m 29s    remaining: 24.3s
129:    learn: 0.9113017    total: 2m 30s    remaining: 23.1s
130:    learn: 0.9120494    total: 2m 31s    remaining: 22s
131:    learn: 0.9123949    total: 2m 32s    remaining: 20.8s
132:    learn: 0.9124848    total: 2m 33s    remaining: 19.6s
133:    learn: 0.9131262    total: 2m 34s    remaining: 18.5s
134:    learn: 0.9134918    total: 2m 35s    remaining: 17.3s
135:    learn: 0.9141708    total: 2m 37s    remaining: 16.2s
136:    learn: 0.9147312    total: 2m 38s    remaining: 15s
137:    learn: 0.9153346    total: 2m 39s    remaining: 13.9s
138:    learn: 0.9154243    total: 2m 40s    remaining: 12.7s
139:    learn: 0.9157622    total: 2m 41s    remaining: 11.5s
140:    learn: 0.9161297    total: 2m 42s    remaining: 10.4s
141:    learn: 0.9169166    total: 2m 43s    remaining: 9.22s
```

```
142:      learn: 0.9171505      total: 2m 44s    remaining: 8.06s
143:      learn: 0.9174049      total: 2m 45s    remaining: 6.91s
144:      learn: 0.9178244      total: 2m 47s    remaining: 5.76s
145:      learn: 0.9186321      total: 2m 48s    remaining: 4.61s
146:      learn: 0.9188862      total: 2m 49s    remaining: 3.46s
147:      learn: 0.9194581      total: 2m 50s    remaining: 2.3s
148:      learn: 0.9198231      total: 2m 51s    remaining: 1.15s
149:      learn: 0.9203384      total: 2m 52s    remaining: 0us
Learning rate set to 0.278232
0:        learn: 0.7894222      total: 1.26s     remaining: 3m 7s
1:        learn: 0.7939721      total: 2.51s     remaining: 3m 5s
2:        learn: 0.7966840      total: 3.74s     remaining: 3m 3s
3:        learn: 0.7995603      total: 5.01s     remaining: 3m 2s
4:        learn: 0.8023667      total: 6.29s     remaining: 3m 2s
5:        learn: 0.8037787      total: 7.56s     remaining: 3m 1s
6:        learn: 0.8077032      total: 8.8s      remaining: 2m 59s
7:        learn: 0.8098079      total: 10s       remaining: 2m 58s
8:        learn: 0.8124098      total: 11.2s     remaining: 2m 55s
9:        learn: 0.8139962      total: 12.4s     remaining: 2m 53s
10:       learn: 0.8156787      total: 13.6s     remaining: 2m 51s
11:       learn: 0.8156077      total: 14.8s     remaining: 2m 49s
12:       learn: 0.8176542      total: 15.9s     remaining: 2m 47s
13:       learn: 0.8187429      total: 17.1s     remaining: 2m 46s
14:       learn: 0.8202562      total: 18.3s     remaining: 2m 44s
15:       learn: 0.8216033      total: 19.5s     remaining: 2m 43s
16:       learn: 0.8230406      total: 20.7s     remaining: 2m 41s
17:       learn: 0.8241615      total: 21.9s     remaining: 2m 40s
18:       learn: 0.8255079      total: 23s       remaining: 2m 38s
19:       learn: 0.8270392      total: 24.3s     remaining: 2m 37s
20:       learn: 0.8280902      total: 25.5s     remaining: 2m 36s
21:       learn: 0.8292559      total: 26.7s     remaining: 2m 35s
22:       learn: 0.8298610      total: 27.9s     remaining: 2m 34s
23:       learn: 0.8312845      total: 29.1s     remaining: 2m 32s
24:       learn: 0.8316039      total: 30.3s     remaining: 2m 31s
25:       learn: 0.8324638      total: 31.5s     remaining: 2m 30s
26:       learn: 0.8338125      total: 32.7s     remaining: 2m 28s
27:       learn: 0.8343472      total: 33.8s     remaining: 2m 27s
28:       learn: 0.8356781      total: 35s       remaining: 2m 26s
29:       learn: 0.8372695      total: 36.2s     remaining: 2m 24s
30:       learn: 0.8386716      total: 37.4s     remaining: 2m 23s
31:       learn: 0.8393430      total: 38.6s     remaining: 2m 22s
32:       learn: 0.8406359      total: 39.8s     remaining: 2m 20s
33:       learn: 0.8425573      total: 40.9s     remaining: 2m 19s
34:       learn: 0.8433938      total: 42.1s     remaining: 2m 18s
35:       learn: 0.8433349      total: 43.2s     remaining: 2m 16s
36:       learn: 0.8445155      total: 44.5s     remaining: 2m 15s
37:       learn: 0.8453256      total: 45.7s     remaining: 2m 14s
38:       learn: 0.8466973      total: 46.9s     remaining: 2m 13s
39:       learn: 0.8480121      total: 48s       remaining: 2m 12s
40:       learn: 0.8484338      total: 49.2s     remaining: 2m 10s
41:       learn: 0.8494219      total: 50.3s     remaining: 2m 9s
42:       learn: 0.8502668      total: 51.4s     remaining: 2m 7s
43:       learn: 0.8506922      total: 52.5s     remaining: 2m 6s
44:       learn: 0.8518716      total: 53.7s     remaining: 2m 5s
45:       learn: 0.8536606      total: 54.9s     remaining: 2m 4s
46:       learn: 0.8550973      total: 56s       remaining: 2m 2s
47:       learn: 0.8561323      total: 57.1s     remaining: 2m 1s
48:       learn: 0.8570467      total: 58.3s     remaining: 2m
49:       learn: 0.8579042      total: 59.5s     remaining: 1m 58s
50:       learn: 0.8584808      total: 1m        remaining: 1m 57s
51:       learn: 0.8597937      total: 1m 1s     remaining: 1m 56s
52:       learn: 0.8604664      total: 1m 2s     remaining: 1m 54s
53:       learn: 0.8605942      total: 1m 3s     remaining: 1m 53s
54:       learn: 0.8617161      total: 1m 5s     remaining: 1m 52s
55:       learn: 0.8627627      total: 1m 6s     remaining: 1m 51s
56:       learn: 0.8631768      total: 1m 7s     remaining: 1m 49s
57:       learn: 0.8640834      total: 1m 8s     remaining: 1m 48s
58:       learn: 0.8647604      total: 1m 9s     remaining: 1m 47s
59:       learn: 0.8652661      total: 1m 10s    remaining: 1m 46s
```

```
60:     learn: 0.8657427     total: 1m 11s     remaining: 1m 44s
61:     learn: 0.8657820     total: 1m 12s     remaining: 1m 43s
62:     learn: 0.8664222     total: 1m 13s     remaining: 1m 42s
63:     learn: 0.8673687     total: 1m 15s     remaining: 1m 40s
64:     learn: 0.8683563     total: 1m 16s     remaining: 1m 39s
65:     learn: 0.8696747     total: 1m 17s     remaining: 1m 38s
66:     learn: 0.8699567     total: 1m 18s     remaining: 1m 37s
67:     learn: 0.8701342     total: 1m 19s     remaining: 1m 36s
68:     learn: 0.8716888     total: 1m 21s     remaining: 1m 35s
69:     learn: 0.8720774     total: 1m 22s     remaining: 1m 33s
70:     learn: 0.8722464     total: 1m 23s     remaining: 1m 32s
71:     learn: 0.8729906     total: 1m 24s     remaining: 1m 31s
72:     learn: 0.8740323     total: 1m 25s     remaining: 1m 30s
73:     learn: 0.8747695     total: 1m 26s     remaining: 1m 29s
74:     learn: 0.8754051     total: 1m 27s     remaining: 1m 27s
75:     learn: 0.8765684     total: 1m 28s     remaining: 1m 26s
76:     learn: 0.8776303     total: 1m 30s     remaining: 1m 25s
77:     learn: 0.8790570     total: 1m 31s     remaining: 1m 24s
78:     learn: 0.8794370     total: 1m 32s     remaining: 1m 23s
79:     learn: 0.8800089     total: 1m 33s     remaining: 1m 21s
80:     learn: 0.8802569     total: 1m 34s     remaining: 1m 20s
81:     learn: 0.8805628     total: 1m 35s     remaining: 1m 19s
82:     learn: 0.8812442     total: 1m 36s     remaining: 1m 18s
83:     learn: 0.8816682     total: 1m 38s     remaining: 1m 17s
84:     learn: 0.8825023     total: 1m 39s     remaining: 1m 15s
85:     learn: 0.8833873     total: 1m 40s     remaining: 1m 14s
86:     learn: 0.8835859     total: 1m 41s     remaining: 1m 13s
87:     learn: 0.8840766     total: 1m 42s     remaining: 1m 12s
88:     learn: 0.8848985     total: 1m 43s     remaining: 1m 11s
89:     learn: 0.8859356     total: 1m 44s     remaining: 1m 9s
90:     learn: 0.8861472     total: 1m 46s     remaining: 1m 8s
91:     learn: 0.8869706     total: 1m 47s     remaining: 1m 7s
92:     learn: 0.8878994     total: 1m 48s     remaining: 1m 6s
93:     learn: 0.8882829     total: 1m 49s     remaining: 1m 5s
94:     learn: 0.8885859     total: 1m 50s     remaining: 1m 3s
95:     learn: 0.8892042     total: 1m 51s     remaining: 1m 2s
96:     learn: 0.8898098     total: 1m 52s     remaining: 1m 1s
97:     learn: 0.8906437     total: 1m 53s     remaining: 1m
98:     learn: 0.8915274     total: 1m 55s     remaining: 59.3s
99:     learn: 0.8927062     total: 1m 56s     remaining: 58.1s
100:    learn: 0.8928045     total: 1m 57s     remaining: 56.9s
101:    learn: 0.8932600     total: 1m 58s     remaining: 55.7s
102:    learn: 0.8940497     total: 1m 59s     remaining: 54.5s
103:    learn: 0.8940059     total: 2m         remaining: 53.3s
104:    learn: 0.8948932     total: 2m 1s      remaining: 52.1s
105:    learn: 0.8952920     total: 2m 2s      remaining: 51s
106:    learn: 0.8957460     total: 2m 3s      remaining: 49.8s
107:    learn: 0.8966645     total: 2m 5s      remaining: 48.6s
108:    learn: 0.8970164     total: 2m 6s      remaining: 47.5s
109:    learn: 0.8967545     total: 2m 7s      remaining: 46.3s
110:    learn: 0.8974636     total: 2m 8s      remaining: 45.1s
111:    learn: 0.8983009     total: 2m 9s      remaining: 44s
112:    learn: 0.8990053     total: 2m 10s     remaining: 42.8s
113:    learn: 0.8995430     total: 2m 11s     remaining: 41.6s
114:    learn: 0.9003794     total: 2m 12s     remaining: 40.4s
115:    learn: 0.9008001     total: 2m 14s     remaining: 39.3s
116:    learn: 0.9009328     total: 2m 15s     remaining: 38.1s
117:    learn: 0.9009882     total: 2m 16s     remaining: 36.9s
118:    learn: 0.9019347     total: 2m 17s     remaining: 35.8s
119:    learn: 0.9020758     total: 2m 18s     remaining: 34.6s
120:    learn: 0.9031455     total: 2m 19s     remaining: 33.5s
121:    learn: 0.9036898     total: 2m 20s     remaining: 32.3s
122:    learn: 0.9040611     total: 2m 21s     remaining: 31.1s
123:    learn: 0.9047237     total: 2m 22s     remaining: 30s
124:    learn: 0.9052265     total: 2m 24s     remaining: 28.8s
125:    learn: 0.9054831     total: 2m 25s     remaining: 27.7s
126:    learn: 0.9063493     total: 2m 26s     remaining: 26.5s
127:    learn: 0.9069119     total: 2m 27s     remaining: 25.3s
128:    learn: 0.9081275     total: 2m 28s     remaining: 24.2s
```

```
129:     learn: 0.9081528     total: 2m 29s     remaining: 23s
130:     learn: 0.9083788     total: 2m 30s     remaining: 21.9s
131:     learn: 0.9092964     total: 2m 31s     remaining: 20.7s
132:     learn: 0.9098076     total: 2m 33s     remaining: 19.6s
133:     learn: 0.9106045     total: 2m 34s     remaining: 18.4s
134:     learn: 0.9104543     total: 2m 35s     remaining: 17.3s
135:     learn: 0.9109948     total: 2m 36s     remaining: 16.1s
136:     learn: 0.9114098     total: 2m 37s     remaining: 15s
137:     learn: 0.9117258     total: 2m 38s     remaining: 13.8s
138:     learn: 0.9123967     total: 2m 39s     remaining: 12.6s
139:     learn: 0.9128878     total: 2m 40s     remaining: 11.5s
140:     learn: 0.9131620     total: 2m 42s     remaining: 10.3s
141:     learn: 0.9137836     total: 2m 43s     remaining: 9.19s
142:     learn: 0.9141582     total: 2m 44s     remaining: 8.04s
143:     learn: 0.9143565     total: 2m 45s     remaining: 6.89s
144:     learn: 0.9152832     total: 2m 46s     remaining: 5.74s
145:     learn: 0.9157999     total: 2m 47s     remaining: 4.59s
146:     learn: 0.9161532     total: 2m 48s     remaining: 3.44s
147:     learn: 0.9167056     total: 2m 49s     remaining: 2.29s
148:     learn: 0.9169097     total: 2m 51s     remaining: 1.15s
149:     learn: 0.9180481     total: 2m 52s     remaining: 0us
```

```
Out[32]: StackingClassifier(cv=5,
                   estimators=[('cat',
                                <catboost.core.CatBoostClassifier object at 0x7f6672
         a35e10>),
                               ('knn',
                                KNeighborsClassifier(n_jobs=-1,
                                                     n_neighbors=3))])
```

In [33]:
```python
stacked_report = classification_report(y_test, stacked_clf.predict(x_test))
print(stacked_report)
```

```
              precision    recall  f1-score   support

           0       0.83      0.90      0.86      6104
           1       0.53      0.37      0.43      1845

    accuracy                           0.78      7949
   macro avg       0.68      0.63      0.65      7949
weighted avg       0.76      0.78      0.76      7949
```

11) Подведем итоговое сравнение обученных моделей с baseline

In [72]:
```python
!pip install get-variable-name
from get_variable_name import get_variable_name

def get_metrics_from_report(report_string):
  res_dict = {}
  splited = report_string.split('\n')
  macro_str = splited[6].split()
  recall_macro = macro_str[3]
  f1_score_macro = macro_str[4]
  accuracy = splited[5].split()[1]
  return [recall_macro, f1_score_macro, accuracy]

baseline_reports = [baseline_tree_report, baseline_forest_report, baseline_catboost_
smote_reports = [smote_tree_report, smote_forest_report, smote_catboost_report, smot
best_params_reports = [best_params_tree_report, best_params_forest_report, best_para


data_dict ={'stage':[], 'model':[], 'recall':[], 'f1_score':[], 'accuracy':[]}
```

```python
stage_names = ['Baseline', 'SMOTE', 'BestParams']
model_names = ['DecisionTree', 'RandomForest', 'CatBoost', 'KNeighbors']
for stage_num, report_list in enumerate([baseline_reports, smote_reports, best_param
    for num, rep in enumerate(report_list):
        stage = stage_names[stage_num]
        model = model_names[num]
        recall, f1_score, accuracy = get_metrics_from_report(rep)
        data_dict['stage'].append(stage)
        data_dict['model'].append(model)
        data_dict['recall'].append(recall)
        data_dict['f1_score'].append(f1_score)
        data_dict['accuracy'].append(accuracy)

# for stacking
recall, f1_score, accuracy = get_metrics_from_report(stacked_report)
stage = stage_names[-1]
model = 'Stacking'
data_dict['stage'].append(stage)
data_dict['model'].append(model)
data_dict['recall'].append(recall)
data_dict['f1_score'].append(f1_score)
data_dict['accuracy'].append(accuracy)

metrics_df = pd.DataFrame({'Stage':data_dict['stage'], 'Model':data_dict['model'],
                           'recall_macro_avg':data_dict['recall'], 'f1_score_macro_a
                           'accuracy':data_dict['accuracy']})
```

```
Requirement already satisfied: get-variable-name in /usr/local/lib/python3.7/dist-pa
ckages (0.0.2)
WARNING: Running pip as root will break packages and permissions. You should install
packages reliably by using venv: https://pip.pypa.io/warnings/venv
```

Из результатов обучения, видно что оверсемплинг, подбор гипер параметров, кросс валидация, дали ощутимый прирост метрик практически всем моделям baseline

Наилучший результат был получен с помощью стекинга KNN и CatBoost

In [76]:
```python
metrics_df.sort_values(by=['recall_macro_avg', 'f1_score_macro_avg', 'accuracy'], as
metrics_df
```

Out[76]:

	index	Stage	Model	recall_macro_avg	f1_score_macro_avg	accuracy
0	12	BestParams	Stacking	0.63	0.65	0.78
1	10	BestParams	CatBoost	0.62	0.64	0.79
2	9	BestParams	RandomForest	0.59	0.61	0.78
3	5	SMOTE	RandomForest	0.59	0.60	0.77
4	8	BestParams	DecisionTree	0.59	0.60	0.76
5	6	SMOTE	CatBoost	0.58	0.58	0.75
6	4	SMOTE	DecisionTree	0.58	0.58	0.70
7	0	Baseline	DecisionTree	0.58	0.57	0.69
8	7	SMOTE	KNeighbors	0.56	0.56	0.72
9	11	BestParams	KNeighbors	0.55	0.55	0.70
10	1	Baseline	RandomForest	0.55	0.54	0.78
11	3	Baseline	KNeighbors	0.54	0.54	0.74

	index	Stage	Model	recall_macro_avg	f1_score_macro_avg	accuracy
12	2	Baseline	CatBoost	0.54	0.52	0.77