Ximing

Future is here :)

forked from Future is here :) by Ashish Patel(阿希什) (+0/−0)
last run 7 days ago · IPython Notebook HTML
using data from multiple data sources · Private

Introduction

Not much here except very simple features that build on the fact we know the future...

In all time series competition where you're allowed to use future events the best features are time to next session for a given visitor.

This competition is no exception.

I left part of the features I already tested and don't seem to generalize... but what can we really trust here ?

In [1]:
```
import os
print(os.listdir("../input"))
```

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
from sklearn.metrics import mean_squared_error
import gc
import time
from pandas.core.common import SettingWithCopyWarning
import warnings
import lightgbm as lgb
from sklearn.model_selection import GroupKFold

# I don't like SettingWithCopyWarnings ...
warnings.simplefilter('error', SettingWithCopyWarning)
gc.enable()
%matplotlib inline
```

Get the extracted data

In [3]:

```
train = pd.read_csv('../input/create-extracted-json-fields-dataset/extracted_fields_train.gz',
                    dtype={'date': str, 'fullVisitorId': str, 'sessionId':str},
nrows=None)
test = pd.read_csv('../input/create-extracted-json-fields-dataset/extracted_fields_test.gz',
                   dtype={'date': str, 'fullVisitorId': str, 'sessionId':str}, nrows=None)
train.shape, test.shape
```

Out[3]:

Define folding strategy

In [4]:

```
def get_folds(df=None, n_splits=5):
    """Returns dataframe indices corresponding to Visitors Group KFold"""
    # Get sorted unique visitors
    unique_vis = np.array(sorted(df['fullVisitorId'].unique()))

    # Get folds
    folds = GroupKFold(n_splits=n_splits)
    fold_ids = []
```

```
    ids = np.arange(df.shape[0])
    for trn_vis, val_vis in folds.split(X=unique_vis, y=unique_vis, groups=uniqu
e_vis):
        fold_ids.append(
            [
                ids[df['fullVisitorId'].isin(unique_vis[trn_vis])],
                ids[df['fullVisitorId'].isin(unique_vis[val_vis])]
            ]
        )

    return fold_ids
```

Get session target

In [5]:

```
y_reg = train['totals.transactionRevenue'].fillna(0)
del train['totals.transactionRevenue']

if 'totals.transactionRevenue' in test.columns:
    del test['totals.transactionRevenue']
```

Add date features

Only add the one I think can ganeralize

In [6]:

```
train.columns
```

Out[6]:

In [7]:
```
train['target'] = y_reg
for df in [train, test]:
    df['date'] = pd.to_datetime(df['visitStartTime'], unit='s')
    df['sess_date_dow'] = df['date'].dt.dayofweek
    df['sess_date_hours'] = df['date'].dt.hour
    df['sess_date_dom'] = df['date'].dt.day
    df.sort_values(['fullVisitorId', 'date'], ascending=True, inplace=True)
    df['next_session_1'] = (
        df['date'] - df[['fullVisitorId', 'date']].groupby('fullVisitorId')['dat
e'].shift(1)
    ).astype(np.int64) // 1e9 // 60 // 60
    df['next_session_2'] = (
        df['date'] - df[['fullVisitorId', 'date']].groupby('fullVisitorId')['dat
e'].shift(-1)
    ).astype(np.int64) // 1e9 // 60 // 60

y_reg = train['target']
del train['target']
```

In [8]:
```
# https://www.kaggle.com/prashantkikani/teach-lightgbm-to-sum-predictions-fe
def browser_mapping(x):
    browsers = ['chrome','safari','firefox','internet explorer','edge','opera','
coc coc','maxthon','iron']
    if x in browsers:
        return x.lower()
    elif  ('android' in x) or ('samsung' in x) or ('mini' in x) or ('iphone' in
x) or ('in-app' in x) or ('playstation' in x):
        return 'mobile browser'
    elif  ('mozilla' in x) or ('chrome' in x) or ('blackberry' in x) or ('nokia
' in x) or ('browser' in x) or ('amazon' in x):
        return 'mobile browser'
    elif  ('lunascape' in x) or ('netscape' in x) or ('blackberry' in x) or ('k
onqueror' in x) or ('puffin' in x) or ('amazon' in x):
        return 'mobile browser'
    elif '(not set)' in x:
        return x
    else:
        return 'others'
```

```
def adcontents_mapping(x):
    if  ('google' in x):
        return 'google'
    elif  ('placement' in x) | ('placememnt' in x):
        return 'placement'
    elif '(not set)' in x or 'nan' in x:
        return x
    elif 'ad' in x:
        return 'ad'
    else:
        return 'others'

def source_mapping(x):
    if  ('google' in x):
        return 'google'
    elif  ('youtube' in x):
        return 'youtube'
    elif '(not set)' in x or 'nan' in x:
        return x
    elif 'yahoo' in x:
        return 'yahoo'
    elif 'facebook' in x:
        return 'facebook'
    elif 'reddit' in x:
        return 'reddit'
    elif 'bing' in x:
        return 'bing'
    elif 'quora' in x:
        return 'quora'
    elif 'outlook' in x:
        return 'outlook'
    elif 'linkedin' in x:
        return 'linkedin'
    elif 'pinterest' in x:
        return 'pinterest'
    elif 'ask' in x:
        return 'ask'
    elif 'siliconvalley' in x:
        return 'siliconvalley'
    elif 'lunametrics' in x:
        return 'lunametrics'
    elif 'amazon' in x:
```

```
        return 'amazon'
    elif 'mysearch' in x:
        return 'mysearch'
    elif 'qiita' in x:
        return 'qiita'
    elif 'messenger' in x:
        return 'messenger'
    elif 'twitter' in x:
        return 'twitter'
    elif 't.co' in x:
        return 't.co'
    elif 'vk.com' in x:
        return 'vk.com'
    elif 'search' in x:
        return 'search'
    elif 'edu' in x:
        return 'edu'
    elif 'mail' in x:
        return 'mail'
    elif 'ad' in x:
        return 'ad'
    elif 'golang' in x:
        return 'golang'
    elif 'direct' in x:
        return 'direct'
    elif 'dealspotr' in x:
        return 'dealspotr'
    elif 'sashihara' in x:
        return 'sashihara'
    elif 'phandroid' in x:
        return 'phandroid'
    elif 'baidu' in x:
        return 'baidu'
    elif 'mdn' in x:
        return 'mdn'
    elif 'duckduckgo' in x:
        return 'duckduckgo'
    elif 'seroundtable' in x:
        return 'seroundtable'
    elif 'metrics' in x:
        return 'metrics'
    elif 'sogou' in x:
        return 'sogou'
```

```
        return '360cn'
    elif 'businessinsider' in x:
        return 'businessinsider'
    elif 'github' in x:
        return 'github'
    elif 'gophergala' in x:
        return 'gophergala'
    elif 'yandex' in x:
        return 'yandex'
    elif 'msn' in x:
        return 'msn'
    elif 'dfa' in x:
        return 'dfa'
    elif '(not set)' in x:
        return '(not set)'
    elif 'feedly' in x:
        return 'feedly'
    elif 'arstechnica' in x:
        return 'arstechnica'
    elif 'squishable' in x:
        return 'squishable'
    elif 'flipboard' in x:
        return 'flipboard'
    elif 't-online.de' in x:
        return 't-online.de'
    elif 'sm.cn' in x:
        return 'sm.cn'
    elif 'wow' in x:
        return 'wow'
    elif 'baidu' in x:
        return 'baidu'
    elif 'partners' in x:
        return 'partners'
    else:
        return 'others'

train['device.browser'] = train['device.browser'].map(lambda x:browser_mapping(s
tr(x).lower())).astype('str')
train['trafficSource.adContent'] = train['trafficSource.adContent'].map(lambda x
:adcontents_mapping(str(x).lower())).astype('str')
train['trafficSource.source'] = train['trafficSource.source'].map(lambda x:sourc
e_mapping(str(x).lower())).astype('str')

test['device.browser'] = test['device.browser'].map(lambda x:browser_mapping(str
```

```
test['device.browser'] = test['device.browser'].map(lambda x:browser_mapping(str
(x).lower())).astype('str')
test['trafficSource.adContent'] = test['trafficSource.adContent'].map(lambda x:a
dcontents_mapping(str(x).lower())).astype('str')
test['trafficSource.source'] = test['trafficSource.source'].map(lambda x:source_
mapping(str(x).lower())).astype('str')

def process_device(data_df):
    print("process device ...")
    data_df['source.country'] = data_df['trafficSource.source'] + '_' + data_df[
'geoNetwork.country']
    data_df['campaign.medium'] = data_df['trafficSource.campaign'] + '_' + data_
df['trafficSource.medium']
    data_df['browser.category'] = data_df['device.browser'] + '_' + data_df['dev
ice.deviceCategory']
    data_df['browser.os'] = data_df['device.browser'] + '_' + data_df['device.op
eratingSystem']
    return data_df

train = process_device(train)
test = process_device(test)

def custom(data):
    print('custom..')
    data['device_deviceCategory_channelGrouping'] = data['device.deviceCategory'
] + "_" + data['channelGrouping']
    data['channelGrouping_browser'] = data['device.browser'] + "_" + data['chann
elGrouping']
    data['channelGrouping_OS'] = data['device.operatingSystem'] + "_" + data['ch
annelGrouping']

    for i in ['geoNetwork.city', 'geoNetwork.continent', 'geoNetwork.country','g
eoNetwork.metro', 'geoNetwork.networkDomain', 'geoNetwork.region','geoNetwork.su
bContinent']:
        for j in ['device.browser','device.deviceCategory', 'device.operatingSys
tem', 'trafficSource.source']:
            data[i + "_" + j] = data[i] + "_" + data[j]

    data['content.source'] = data['trafficSource.adContent'] + "_" + data['sourc
e.country']
    data['medium.source'] = data['trafficSource.medium'] + "_" + data['source.co
untry']
    return data
```

```
train = custom(train)
test = custom(test)
```

Create features list

In [9]:

```
excluded_features = [
    'date', 'fullVisitorId', 'sessionId', 'totals.transactionRevenue',
    'visitId', 'visitStartTime', 'vis_date', 'nb_sessions', 'max_visits'
]

categorical_features = [
    _f for _f in train.columns
    if (_f not in excluded_features) & (train[_f].dtype == 'object')
]
```

Factorize categoricals

In [10]:

```
for f in categorical_features:
    train[f], indexer = pd.factorize(train[f])
    test[f] = indexer.get_indexer(test[f])
```

Predict revenues at session level

In [11]:

```
xgb_params = {
        'objective': 'reg:linear',
        'booster': 'gbtree',
        'learning_rate': 0.02,
        'max_depth': 22,
        'min_child_weight': 57
```

```
        'min_child_weight' : 57,
        'gamma' : 1.45,
        'alpha': 0.0,
        'lambda': 0.0,
        'subsample': 0.67,
        'colsample_bytree': 0.054,
        'colsample_bylevel': 0.50,
        'n_jobs': -1,
        'random_state': 456
    }
```

In [12]:

```
folds = get_folds(df=train, n_splits=5)

train_features = [_f for _f in train.columns if _f not in excluded_features]
print(train_features)

importances = pd.DataFrame()
oof_reg_preds = np.zeros(train.shape[0])
sub_reg_preds = np.zeros(test.shape[0])
for fold_, (trn_, val_) in enumerate(folds):
    trn_x, trn_y = train[train_features].iloc[trn_], y_reg.iloc[trn_]
    val_x, val_y = train[train_features].iloc[val_], y_reg.iloc[val_]

    reg = lgb.LGBMRegressor(
        num_leaves=31,
        learning_rate=0.03,
        n_estimators=1000,
        subsample=.9,
        colsample_bytree=.9,
        random_state=1
    )
    reg.fit(
        trn_x, np.log1p(trn_y),
        eval_set=[(val_x, np.log1p(val_y))],
        early_stopping_rounds=50,
        verbose=100,
        eval_metric='rmse'
    )
    imp_df = pd.DataFrame()
    imp_df['feature'] = train_features
    imp_df['gain'] = reg.booster_.feature_importance(importance_type='gain')
```

```
    imp_df['fold'] = fold_ + 1
    importances = pd.concat([importances, imp_df], axis=0, sort=False)

    oof_reg_preds[val_] = reg.predict(val_x, num_iteration=reg.best_iteration_)
    oof_reg_preds[oof_reg_preds < 0] = 0
    _preds = reg.predict(test[train_features], num_iteration=reg.best_iteration_
)
    _preds[_preds < 0] = 0
    sub_reg_preds += np.expm1(_preds) / len(folds)

mean_squared_error(np.log1p(y_reg), oof_reg_preds) ** .5
```

Out[12]:

Display feature importances

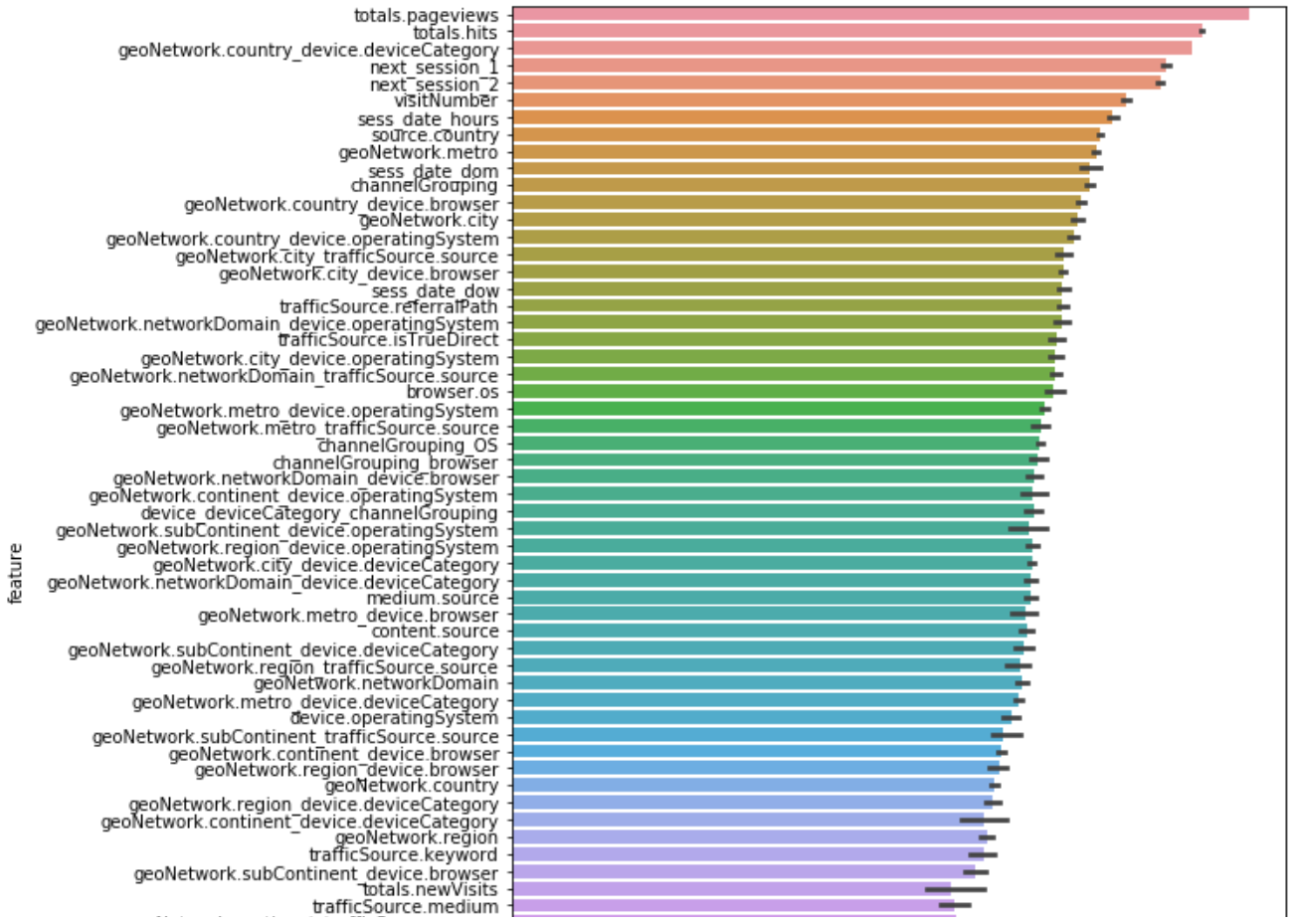
In [13]:

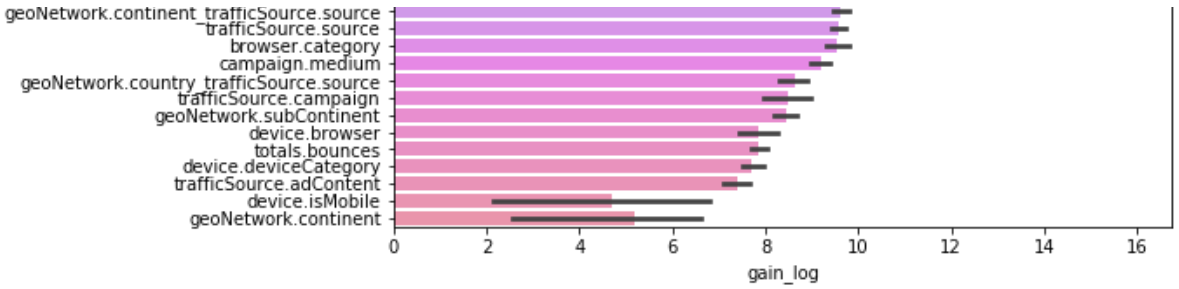
```
import warnings
warnings.simplefilter('ignore', FutureWarning)

importances['gain_log'] = np.log1p(importances['gain'])
mean_gain = importances[['gain', 'feature']].groupby('feature').mean()
importances['mean_gain'] = importances['feature'].map(mean_gain['gain'])

plt.figure(figsize=(8, 12))
sns.barplot(x='gain_log', y='feature', data=importances.sort_values('mean_gain',
ascending=False))
```

Out[13]:





Create user level predictions

In [14]:
```
train['predictions'] = np.expm1(oof_reg_preds)
test['predictions'] = sub_reg_preds
```

In [15]:
```
# Aggregate data at User level
trn_data = train[train_features + ['fullVisitorId']].groupby('fullVisitorId').me
an()
```

In [16]:
```
%%time
# Create a list of predictions for each Visitor
trn_pred_list = train[['fullVisitorId', 'predictions']].groupby('fullVisitorId')
\
    .apply(lambda df: list(df.predictions))\
    .apply(lambda x: {'pred_'+str(i): pred for i, pred in enumerate(x)})
```

In [17]:
```
# Create a DataFrame with VisitorId as index
# trn_pred_list contains dict
# so creating a dataframe from it will expand dict values into columns
trn_all_predictions = pd.DataFrame(list(trn_pred_list.values), index=trn_data.in
dex)
trn_feats = trn_all_predictions.columns
trn_all_predictions['t_mean'] = np.log1p(trn_all_predictions[trn_feats].mean(axi
s=1))
```

```
trn_all_predictions['t_median'] = np.log1p(trn_all_predictions[trn_feats].median
(axis=1))
trn_all_predictions['t_sum_log'] = np.log1p(trn_all_predictions[trn_feats]).sum(
axis=1)
trn_all_predictions['t_sum_act'] = np.log1p(trn_all_predictions[trn_feats].filln
a(0).sum(axis=1))
trn_all_predictions['t_nb_sess'] = trn_all_predictions[trn_feats].isnull().sum(a
xis=1)
full_data = pd.concat([trn_data, trn_all_predictions], axis=1)
del trn_data, trn_all_predictions
gc.collect()
full_data.shape
```

Out[17]:

In [18]:

```
%%time
sub_pred_list = test[['fullVisitorId', 'predictions']].groupby('fullVisitorId')\
    .apply(lambda df: list(df.predictions))\
    .apply(lambda x: {'pred_'+str(i): pred for i, pred in enumerate(x)})
```

In [19]:

```
sub_data = test[train_features + ['fullVisitorId']].groupby('fullVisitorId').mea
n()
sub_all_predictions = pd.DataFrame(list(sub_pred_list.values), index=sub_data.in
dex)
for f in trn_feats:
    if f not in sub_all_predictions.columns:
        sub_all_predictions[f] = np.nan
sub_all_predictions['t_mean'] = np.log1p(sub_all_predictions[trn_feats].mean(axi
s=1))
sub_all_predictions['t_median'] = np.log1p(sub_all_predictions[trn_feats].median
(axis=1))
sub_all_predictions['t_sum_log'] = np.log1p(sub_all_predictions[trn_feats]).sum(
axis=1)
sub_all_predictions['t_sum_act'] = np.log1p(sub_all_predictions[trn_feats].filln
a(0).sum(axis=1))
sub_all_predictions['t_nb_sess'] = sub_all_predictions[trn_feats].isnull().sum(a
```

```
xis=1)
sub_full_data = pd.concat([sub_data, sub_all_predictions], axis=1)
del sub_data, sub_all_predictions
gc.collect()
sub_full_data.shape
```

Out[19]:

Create target at Visitor level

In [20]:

```
train['target'] = y_reg
trn_user_target = train[['fullVisitorId', 'target']].groupby('fullVisitorId').su
m()
```

Train a model at Visitor level

In [21]:

```
from xgboost import XGBRegressor
folds = get_folds(df=full_data[['totals.pageviews']].reset_index(), n_splits=5)

oof_preds = np.zeros(full_data.shape[0])
oof_preds1 = np.zeros(full_data.shape[0])
both_oof = np.zeros(full_data.shape[0])
sub_preds = np.zeros(sub_full_data.shape[0])
vis_importances = pd.DataFrame()

for fold_, (trn_, val_) in enumerate(folds):
    print("-"* 20 + "Fold :"+str(fold_) + "-"* 20)
    trn_x, trn_y = full_data.iloc[trn_], trn_user_target['target'].iloc[trn_]
    val_x, val_y = full_data.iloc[val_], trn_user_target['target'].iloc[val_]
    xg = XGBRegressor(**xgb_params, n_estimators=1000)
    reg = lgb.LGBMRegressor(
        num_leaves=31,
        learning_rate=0.03,
        n_estimators=1000,
        subsample=.9,
        colsample_bytree=.9,
```

```
        random_state=1
    )
    print("-"* 20 + "LightGBM Training" + "-"* 20)
    reg.fit(
        trn_x, np.log1p(trn_y),
        eval_set=[(trn_x, np.log1p(trn_y)), (val_x, np.log1p(val_y))],
        eval_names=['TRAIN', 'VALID'],
        early_stopping_rounds=50,
        eval_metric='rmse',
        verbose=100
    )
    print("-"* 20 + "Xgboost Training" + "-"* 20)
    xg.fit(
        trn_x, np.log1p(trn_y),
        eval_set=[(trn_x, np.log1p(trn_y)), (val_x, np.log1p(val_y))],
        early_stopping_rounds=50,
        eval_metric='rmse',
        verbose=100
    )
    imp_df = pd.DataFrame()
    imp_df['feature'] = trn_x.columns
    imp_df['gain'] = reg.booster_.feature_importance(importance_type='gain')

    imp_df['fold'] = fold_ + 1
    vis_importances = pd.concat([vis_importances, imp_df], axis=0, sort=False)

    oof_preds[val_] = reg.predict(val_x, num_iteration=reg.best_iteration_)
    oof_preds1[val_] = xg.predict(val_x)

    oof_preds[oof_preds < 0] = 0
    oof_preds1[oof_preds1 < 0] = 0

    both_oof[val_] = oof_preds[val_] * 0.6 + oof_preds1[val_] * 0.4

    # Make sure features are in the same order
    _preds = reg.predict(sub_full_data[full_data.columns], num_iteration=reg.bes
t_iteration_)
    _preds[_preds < 0] = 0

    pre = xg.predict(sub_full_data[full_data.columns])
    pre[pre<0]=0

    sub_preds += (_preds / len(folds)) * 0.6 + (pre / len(folds)) * 0.4
```

```
print("LGB  ", mean_squared_error(np.log1p(trn_user_target['target']), oof_preds
) ** .5)
print("XGB  ", mean_squared_error(np.log1p(trn_user_target['target']), oof_preds
1) ** .5)
print("Combine  ", mean_squared_error(np.log1p(trn_user_target['target']), both_
oof) ** .5)
```

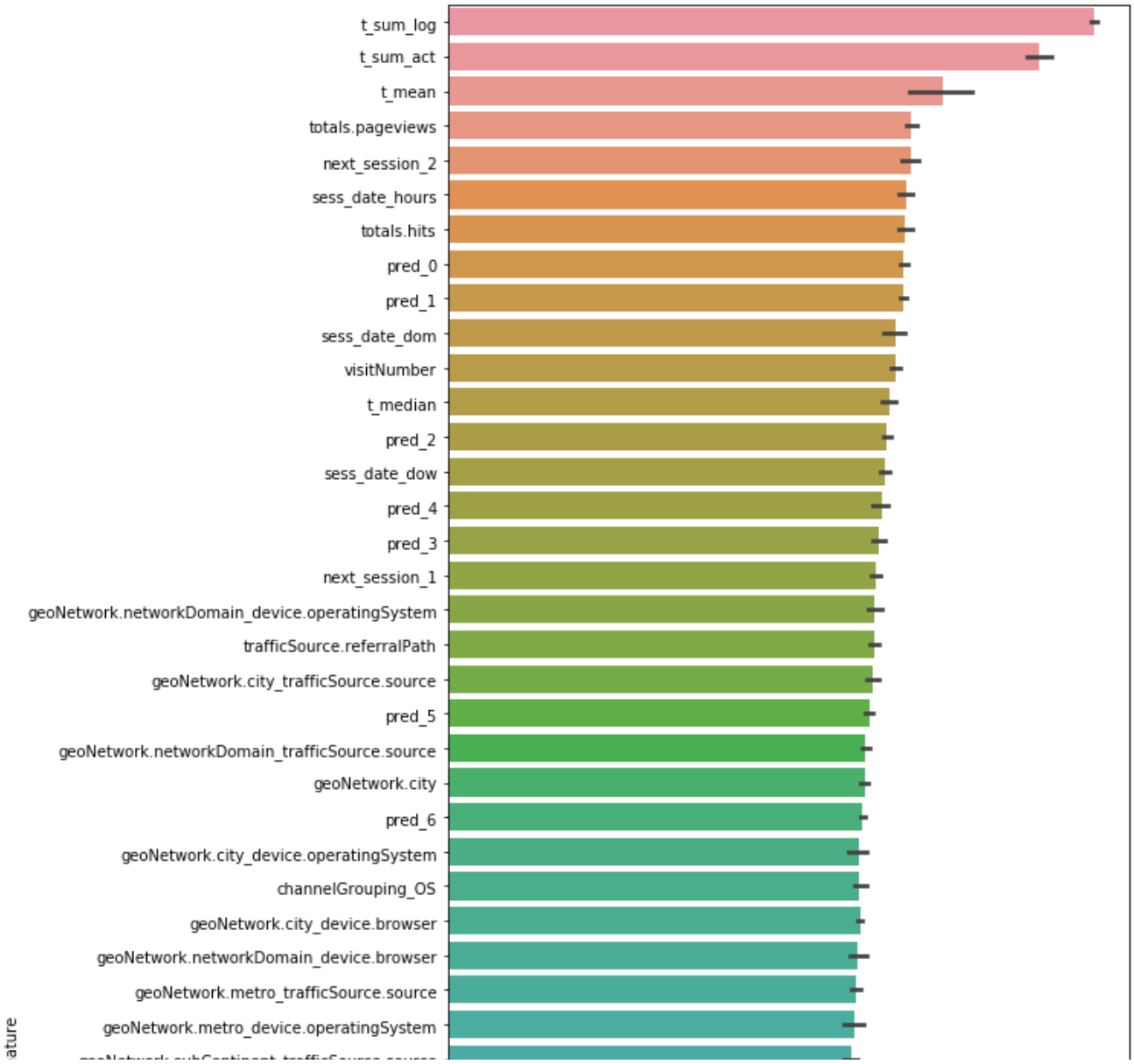
Display feature importances

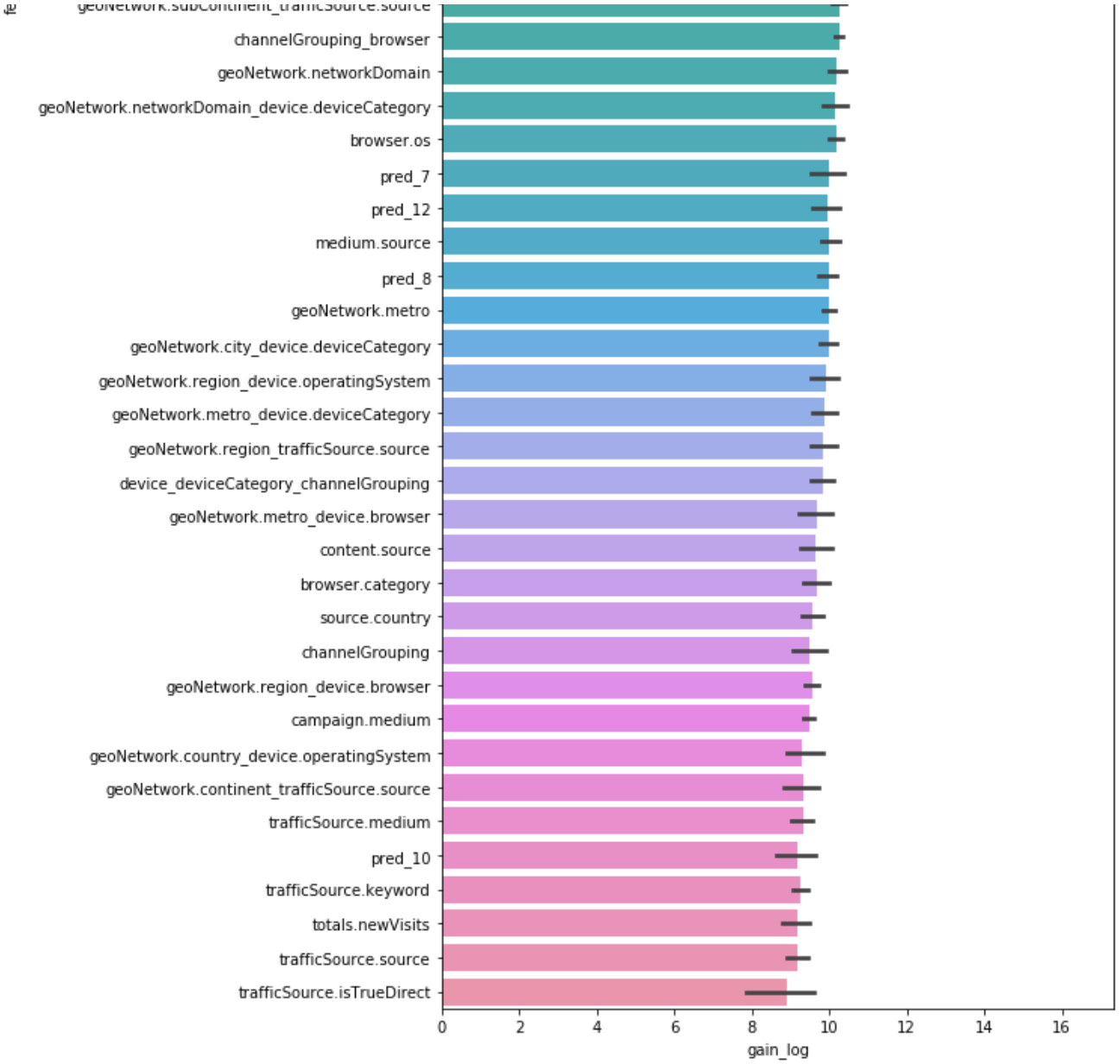
In [22]:

```
vis_importances['gain_log'] = np.log1p(vis_importances['gain'])
mean_gain = vis_importances[['gain', 'feature']].groupby('feature').mean()
vis_importances['mean_gain'] = vis_importances['feature'].map(mean_gain['gain'])

plt.figure(figsize=(8, 25))
sns.barplot(x='gain_log', y='feature', data=vis_importances.sort_values('mean_ga
in', ascending=False).iloc[:300])
```

Out[22]:





In [23]:
```
tips = 2
```

Save predictions

In [24]:
```
sub_full_data['PredictedLogRevenue'] = sub_preds
sub_full_data[['PredictedLogRevenue']].to_csv('new_test.csv', index=True)
```

In [ ]:

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0

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