

```
In [1]: # import required packages
from scipy.stats import chi2_contingency
from consort import ConsortGraph
from matplotlib.lines import Line2D
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
import json
import sklearn
from sklearn.preprocessing import LabelEncoder
import networkx as nx
from sklearn.model_selection import train_test_split
import xgboost as xgb
from sklearn.metrics import accuracy_score
from sklearn.metrics import confusion_matrix
from sklearn.preprocessing import LabelEncoder
from matplotlib.pylab import rcParams
from itertools import combinations
from sklearn.model_selection import GridSearchCV
from sklearn.linear_model import LogisticRegression
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
```

```
In [2]: class PredictaVie_Preprocess:
    def __init__(self, dataframe):
        self.dataframe = dataframe

    def event_pie_chart(self, column_name):
        counts = self.dataframe[column_name].value_counts()
        total_count = counts.sum()
        ratios = counts / total_count
        significant_events = ratios[ratios > 0.01].index.tolist()
        other_ratio = ratios[ratios <= 0.01].sum()
        plt.figure(figsize=(8, 6))
        plt.pie(ratios[ratios > 0.01].values.tolist() + [other_ratio], labels=si
        plt.title('Distribution of ' + column_name + ' in the target dataset:')
        plt.show()

    def filter_data_by_significant_events(self, column_name):
        significant_events = self.dataframe[column_name].value_counts(normalize=
        significant_events_data = self.dataframe[self.dataframe[column_name].isi
        self.filtered = significant_events_data
        return significant_events_data

    def ind_event_sequence(self, person_id):
        df = self.dataframe
        df['event_date'] = pd.to_datetime(df['event_date'])
        df0 = df[df['person_id'] == person_id]
        df1 = df0.sort_values(by='event_date')
        df2 = df1[df1['event'] != df1['event'].shift(-1)]
        df2.reset_index(drop=True, inplace=True)
        return df2

    def plot_journey(self, person_id):
        df = self.dataframe
        df['event_date'] = pd.to_datetime(df['event_date'])
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person_data = df[df['person_id'] == person_id]
person_data_sorted = person_data.sort_values(by='event_date')
person_data_unique = person_data_sorted[person_data_sorted['event'] != p
person_data_unique.reset_index(drop=True, inplace=True)
G = nx.DiGraph()
for _, row in person_data_unique.iterrows():
    G.add_node(row['event'])
for i in range(len(person_data_unique) - 1):
    current_event = person_data_unique.iloc[i]['event']
    next_event = person_data_unique.iloc[i + 1]['event']
    G.add_edge(current_event, next_event)
pos = nx.circular_layout(G)
nx.draw(G, pos, with_labels=True, node_size=2000, node_color='skyblue',
        arrows=True, arrowsize=20)
plt.title('Event Sequence for Person ID: ' + str(person_id))
plt.show()

def create_event_sequence(self):
    if not hasattr(self, 'filtered'):
        raise AttributeError("The 'filtered' data has not been generated. Pl

event_sequence_df = pd.DataFrame(columns=['person_id', 'gender'])
last_event_df = pd.DataFrame(columns=['person_id'])
for person_id, group in self.filtered.groupby('person_id'):
    gender = group['gender'].iloc[0]
    events = group.sort_values(by='event_date')['event'].tolist()
    previous_event = None
    event_list = []
    for event in events:
        if event != previous_event:
            event_list.append(event)
            previous_event = event
    event_sequence = {'person_id': person_id, 'gender': gender}
    sequence_count = 0
    for i in event_list[::-1]:
        sequence_count += 1
        event_sequence[f'condition_{sequence_count}'] = i
    event_sequence_df = pd.concat([event_sequence_df, pd.DataFrame(event
                                ignore_index=True)
    last_event_df = pd.concat([last_event_df, pd.DataFrame({'person_id':
                                                            'last_condit

                                ignore_index=True)
    all_together = pd.merge(event_sequence_df, last_event_df, on='person_id'
    self.event_sequence = all_together
    return all_together

def filter_long_journey(self, top_numbers=2000):
    if not hasattr(self, 'event_sequence'):
        raise AttributeError("The 'event_sequence' attribute has not been ge

    data = self.event_sequence
    data['null_count'] = data.isnull().sum(axis=1)
    sort = data.sort_values(by='null_count', ascending=True)
    sort.reset_index(drop=True, inplace=True)
    result = sort.iloc[:, :-1].head(top_numbers)
    self.long_journey = result
    return result

def generate_pairs(self):
    if not hasattr(self, 'long_journey'):

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        raise AttributeError("The 'long_journey' attribute has not been gene

df = self.long_journey
pairs = []
for index, row in df.iterrows():
    person_id = row['person_id']
    gender = row['gender']
    last = row['last_condition']
    conditions = [col for col in row['condition_1':'last_condition'] if

    for pair in combinations(conditions, 2):
        if pair[0] != pair[1]: # avoid having same conditions paired
            pair_str = ' -> '.join(pair)
            pair_str = pair_str.replace('[', '').replace(']', '')
            pairs.append({'person_id': person_id, 'gender': gender, 'pai
                           'last_condition': last})

pairs_df = pd.DataFrame(pairs)
self.pairs = pairs_df
return pairs_df

def pairs_to_bin(self):
    if not hasattr(self, 'pairs'):
        raise AttributeError("The 'pairs' attribute has not been generated.

df = self.pairs
pair_type = df['pair'].unique()
pair_bin_df = pd.DataFrame(columns=['person_id', 'MALE', 'FEMALE'] + lis

for person_id, group in df.groupby('person_id'):
    gender = group['gender'].iloc[0]
    last = group['last_condition'].iloc[0]
    pair_bin = {'person_id': person_id, 'last_condition': last}

    for i in ['MALE', 'FEMALE']:
        pair_bin[i] = 0
        if i == gender:
            pair_bin[i] = 1

    for i in pair_type:
        pair_bin[i] = 0
        if i in group['pair'].values:
            pair_bin[i] = 1

    pair_bin_df = pd.concat([pair_bin_df, pd.DataFrame(pair_bin, index=[

return pair_bin_df

def pairs_to_count(self):
    if not hasattr(self, 'pairs'):
        raise AttributeError("The 'pairs' attribute has not been generated.

df = self.pairs
pair_types = df['pair'].unique()
pair_count_df = pd.DataFrame(columns=['person_id', 'MALE', 'FEMALE'] + 1

for person_id, group in df.groupby('person_id'):
    gender = group['gender'].iloc[0]
    last = group['last_condition'].iloc[0]

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pair_counts = group['pair'].value_counts().to_dict()

pair_count = {'person_id': person_id, 'last_condition': last}

for i in ['MALE', 'FEMALE']:
    pair_count[i] = 0
    if i == gender:
        pair_count[i] = 1

for pair_type in pair_types:
    pair_count[pair_type] = pair_counts.get(pair_type, 0)

pair_count_df = pd.concat([pair_count_df, pd.DataFrame([pair_count])])

return pair_count_df

class PredictaVie_SplitData:
    def __init__(self, dataframe):
        self.dataframe = dataframe

    def c2c_split_data(self, test_size=0.2, random_state=42):
        df = self.dataframe
        exclude_column = ['person_id', 'last_condition']
        filtered_columns = [col for col in df.columns if col not in exclude_column]
        y = df['last_condition']
        x = df.loc[:, filtered_columns].astype(int)
        x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=test_size, random_state=random_state)
        return x_train, x_test, y_train, y_test

class PredictaVie_Model:
    def __init__(self, x_train, y_train, x_test, y_test):
        self.x_train = x_train
        self.y_train = y_train
        self.x_test = x_test
        self.y_test = y_test

    def c2c_train_xgb(self, param_grid=None, cv=5):
        label_encoder = LabelEncoder()
        y_train_encoded = label_encoder.fit_transform(self.y_train)

        if param_grid is None:
            param_grid = {
                'n_estimators': [100, 150, 200],
                'max_depth': [3, 4, 5],
                'learning_rate': [0.1, 0.01, 0.001]
            }

        model = xgb.XGBClassifier()
        grid_search = GridSearchCV(model, param_grid, cv=cv, scoring='accuracy')
        grid_search.fit(self.x_train, y_train_encoded)

        best_model = grid_search.best_estimator_
        best_params = grid_search.best_params_
        best_score = grid_search.best_score_

        print("Best parameters:", best_params)
        print("Best cross-validation accuracy:", best_score)

        self.best_xgbmodel = best_model

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        return best_model

def c2c_evaluate_xgb(self):
    if not hasattr(self, 'best_xgbmodel'):
        raise AttributeError("The 'best_xgbmodel' has not been generated. Pl

    best = self.best_xgbmodel

    label_encoder = LabelEncoder()
    y_test_encoded = label_encoder.fit_transform(self.y_test)

    y_pred = best.predict(self.x_test)

    accuracy = accuracy_score(y_test_encoded, y_pred)
    print("Test Accuracy:", accuracy)

    original_labels = label_encoder.inverse_transform(y_test_encoded)
    predicted_labels = label_encoder.inverse_transform(y_pred)
    cm = confusion_matrix(original_labels, predicted_labels)

    cm_df = pd.DataFrame(cm, index=label_encoder.classes_, columns=label_enc

    plt.figure(figsize=(10, 8))
    sns.heatmap(cm_df, annot=True, cmap="YlGnBu", fmt="d")
    plt.xlabel('Predicted')
    plt.ylabel('Actual')
    plt.title('Confusion Matrix')
    plt.show()

def c2c_xgb_feature_importance(self):
    if not hasattr(self, 'best_xgbmodel'):
        raise AttributeError("The 'best_xgbmodel' has not been generated. Pl

    xgb_model = self.best_xgbmodel
    feature_importance = xgb_model.feature_importances_
    feature_names = xgb_model.get_booster().feature_names
    feature_importance_dict = dict(zip(feature_names, feature_importance))
    sorted_feature_importance = sorted(feature_importance_dict.items(), key=

    features = [x[0] for x in sorted_feature_importance[:20]]
    importance = [x[1] for x in sorted_feature_importance[:20]]

    plt.figure(figsize=(10, 8))
    plt.barh(features, importance, color='skyblue')
    plt.xlabel('Feature Importance')
    plt.ylabel('Features')
    plt.title('XGBoost Feature Importance')
    plt.gca().invert_yaxis()
    plt.show()
    top_20_feature_indices = [item[0] for item in sorted_feature_importance[
    return top_20_feature_indices

def c2c_train_logreg(self, param_grid=None):
    logistic_reg = LogisticRegression()

    if param_grid is None:
        param_grid = {
            'penalty': ['l1', 'l2', 'elasticnet', 'none'],
            'C': [0.001, 0.01, 0.1, 1, 10, 100],
            'solver': ['newton-cg', 'lbfgs', 'liblinear', 'sag', 'saga']

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    }

    grid_search = GridSearchCV(estimator=logistic_reg, param_grid=param_grid)
    grid_search.fit(self.x_train, self.y_train)
    print("Best Parameters:", grid_search.best_params_)

    best_model = grid_search.best_estimator_

    feature_names = list(self.x_train.columns)
    feature_weights = best_model.coef_[0]
    feature_weight_dict = dict(zip(feature_names, feature_weights))
    print("\nFeature Weights in the Best Model:")
    for feature, weight in feature_weight_dict.items():
        print(f"{feature}: {weight}")

    abs_feature_weights = np.abs(feature_weights)
    top_20_indices = np.argsort(abs_feature_weights)[::-1][:20]
    top_20_features = [feature_names[i] for i in top_20_indices]

    self.best_logregmodel = best_model

    return best_model, top_20_features

def c2c_evaluate_logreg(self):
    if not hasattr(self, 'best_logregmodel'):
        raise AttributeError("The 'best_logregmodel' has not been generated.")

    best = self.best_logregmodel

    y_pred = best.predict(self.x_test)

    accuracy = accuracy_score(self.y_test, y_pred)
    print("Test Accuracy:", accuracy)

    cm = confusion_matrix(self.y_test, y_pred)
    cm_df = pd.DataFrame(cm, index=best.classes_, columns=best.classes_)

    plt.figure(figsize=(10, 8))
    sns.heatmap(cm_df, annot=True, cmap="Blues", fmt='g')
    plt.xlabel('Predicted')
    plt.ylabel('Actual')
    plt.title('Confusion Matrix Heatmap')
    plt.show()

```

```

In [3]: # Load the Anxiety event data
from dbconns import ImpalaConnector
ic = ImpalaConnector('CHUNGAX6', 'Francais1418!', connection = "arch-prod-impala-

data_anxiety = ic.read("SELECT * FROM app_rwd_capstone_group3.data_anxiety ORDER
data_anxiety.head()

```

Out[3]:

	person_id	age_when_event	gender	event	event_date
<b>0</b>	802	63	8532	divalproex sodium 500 MG Delayed Release Oral ...	2000-07-18
<b>1</b>	802	63	8532	divalproex sodium 500 MG Delayed Release Oral ...	2000-02-15
<b>2</b>	802	63	8532	12 HR bupropion hydrochloride 100 MG Extended ...	2000-04-12
<b>3</b>	802	63	8532	lorazepam 0.5 MG Oral Tablet	2000-02-23
<b>4</b>	802	63	8532	12 HR bupropion hydrochloride 100 MG Extended ...	2000-11-29

In [4]: `data_anxiety.replace({'gender': {8532: 'FEMALE', 8507: 'MALE'}}, inplace=True)`

In [5]: `data_anxiety`

Out[5]:

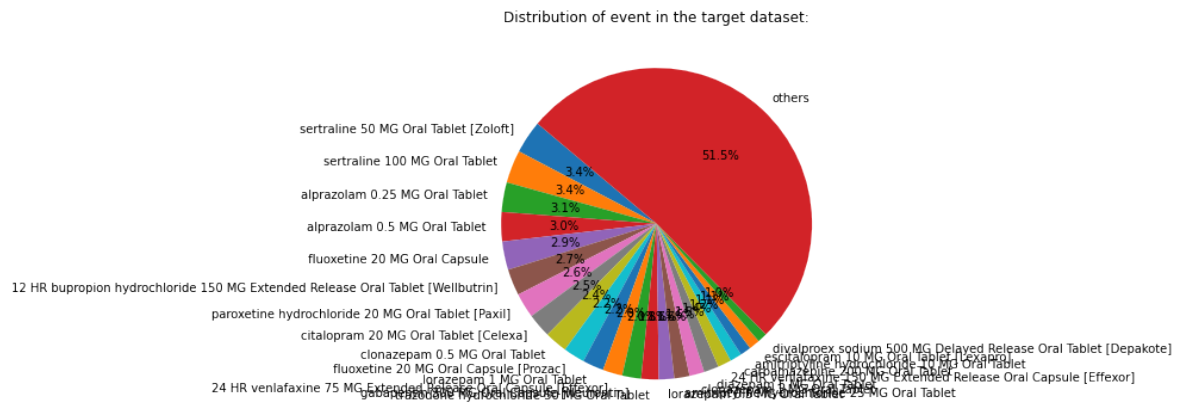
	person_id	age_when_event	gender	event	event_date
<b>0</b>	802	63	FEMALE	divalproex sodium 500 MG Delayed Release Oral ...	2000-07-18
<b>1</b>	802	63	FEMALE	divalproex sodium 500 MG Delayed Release Oral ...	2000-02-15
<b>2</b>	802	63	FEMALE	12 HR bupropion hydrochloride 100 MG Extended ...	2000-04-12
<b>3</b>	802	63	FEMALE	lorazepam 0.5 MG Oral Tablet	2000-02-23
<b>4</b>	802	63	FEMALE	12 HR bupropion hydrochloride 100 MG Extended ...	2000-11-29
<b>...</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>...</b>
<b>299995</b>	5253302	51	FEMALE	fluoxetine 40 MG Oral Capsule	2002-08-30
<b>299996</b>	5253302	50	FEMALE	fluoxetine 40 MG Oral Capsule [Prozac]	2001-07-30
<b>299997</b>	5253302	50	FEMALE	fluoxetine 40 MG Oral Capsule [Prozac]	2001-02-25
<b>299998</b>	5253302	51	FEMALE	fluoxetine 40 MG Oral Capsule	2002-01-17
<b>299999</b>	5253302	51	FEMALE	fluoxetine 40 MG Oral Capsule	2002-09-30

300000 rows × 5 columns

In [6]: `# Load the preprocess package`

```
preprocess = PredictaVie_Preprocess(data_anxiety)
```

```
In [7]: # show the distribution of each events in the dataset
preprocess.event_pie_chart('event')
```



```
In [8]: # filter those insignificant events for smoother model building
preprocess.filter_data_by_significant_events('event')
```

Out[8]:	person_id	age_when_event	gender	event	event_date
0	802	63	FEMALE	divalproex sodium 500 MG Delayed Release Oral ...	2000-07-18
1	802	63	FEMALE	divalproex sodium 500 MG Delayed Release Oral ...	2000-02-15
3	802	63	FEMALE	lorazepam 0.5 MG Oral Tablet	2000-02-23
6	802	63	FEMALE	lorazepam 0.5 MG Oral Tablet	2000-06-01
8	802	63	FEMALE	lorazepam 1 MG Oral Tablet	2000-12-19
...	...	...	...	...	...
299988	5252701	63	MALE	trazodone hydrochloride 50 MG Oral Tablet	2001-01-31
299989	5252701	63	MALE	24 HR venlafaxine 150 MG Extended Release Oral...	2001-09-17
299990	5252701	63	MALE	trazodone hydrochloride 50 MG Oral Tablet	2001-04-17
299991	5252701	64	MALE	trazodone hydrochloride 50 MG Oral Tablet	2002-10-23
299992	5252802	52	FEMALE	alprazolam 0.25 MG Oral Tablet	2001-06-30

145614 rows × 5 columns

```
In [9]: # take "patient 802" as an example
preprocess.ind_event_sequence(802)
```



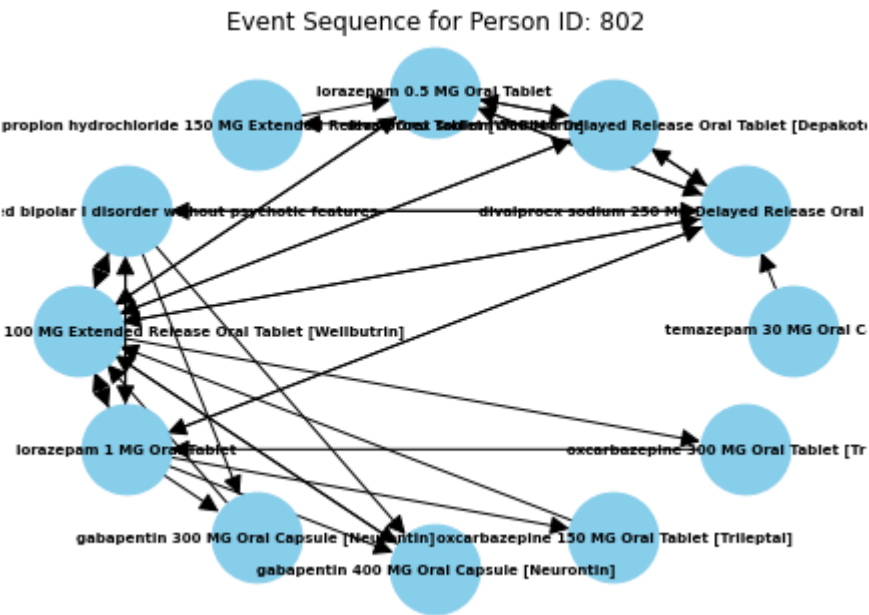
Out[9]:

	person_id	age_when_event	gender	event	event_date
0	802	63	FEMALE	temazepam 30 MG Oral Capsule	2000-01-05
1	802	63	FEMALE	divalproex sodium 250 MG Delayed Release Oral ...	2000-01-15
2	802	63	FEMALE	divalproex sodium 500 MG Delayed Release Oral ...	2000-01-15
3	802	63	FEMALE	lorazepam 0.5 MG Oral Tablet	2000-01-26
4	802	63	FEMALE	divalproex sodium 500 MG Delayed Release Oral ...	2000-02-15
...	...	...	...	...	...
89	802	65	FEMALE	oxcarbazepine 150 MG Oral Tablet [Trileptal]	2002-02-09
90	802	65	FEMALE	12 HR bupropion hydrochloride 100 MG Extended ...	2002-02-21
91	802	65	FEMALE	oxcarbazepine 300 MG Oral Tablet [Trileptal]	2002-02-21
92	802	65	FEMALE	lorazepam 1 MG Oral Tablet	2002-02-21
93	802	65	FEMALE	12 HR bupropion hydrochloride 100 MG Extended ...	2002-02-21

94 rows × 5 columns

In [10]:

```
# pateint 802's condition journey
preprocess.plot_journey(802)
```



In [11]:

```
# create the condition sequence
preprocess.create_event_sequence()
```

Out[11]:

	person_id	gender	condition_1	condition_2	condition_3	condition_4	cor
<b>0</b>	802	FEMALE	divalproex sodium 500 MG Delayed Release Oral ...	lorazepam 0.5 MG Oral Tablet	divalproex sodium 500 MG Delayed Release Oral ...	12 HR bupropion hydrochloride 150 MG Extended ...	lc 0.5
<b>1</b>	1501	MALE	clonazepam 0.5 MG Oral Tablet	NaN	NaN	NaN	
<b>2</b>	2401	FEMALE	NaN	NaN	NaN	NaN	
<b>3</b>	2502	FEMALE	NaN	NaN	NaN	NaN	
<b>4</b>	3102	FEMALE	gabapentin 300 MG Oral Capsule [Neurontin]	citalopram 20 MG Oral Tablet [Celexa]	NaN	NaN	
...	...	...	...	...	...	...	
<b>11166</b>	5250602	MALE	alprazolam 0.25 MG Oral Tablet	alprazolam 0.5 MG Oral Tablet	citalopram 20 MG Oral Tablet [Celexa]	alprazolam 0.5 MG Oral Tablet	b hydr Ex
<b>11167</b>	5250701	FEMALE	trazodone hydrochloride 50 MG Oral Tablet	gabapentin 300 MG Oral Capsule [Neurontin]	NaN	NaN	
<b>11168</b>	5251701	FEMALE	NaN	NaN	NaN	NaN	
<b>11169</b>	5252701	MALE	fluoxetine 20 MG Oral Capsule [Prozac]	trazodone hydrochloride 50 MG Oral Tablet	fluoxetine 20 MG Oral Capsule [Prozac]	trazodone hydrochloride 50 MG Oral Tablet	ve Rel
<b>11170</b>	5252802	FEMALE	NaN	NaN	NaN	NaN	

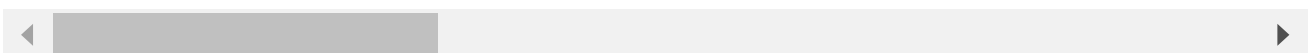
11171 rows × 264 columns

In [12]: `# take the top 2000 patients who have long condition journey (lots of event hist  
preprocess.filter_long_journey())`

Out[12]:

	person_id	gender	condition_1	condition_2	condition_3	condition_4	cc
0	2202602	FEMALE	fluoxetine 20 MG Oral Capsule [Prozac]	24 HR venlafaxine 75 MG Extended Release Oral ...	clonazepam 1 MG Oral Tablet	24 HR venlafaxine 75 MG Extended Release Oral ...	clo
1	1526105	MALE	trazodone hydrochloride 50 MG Oral Tablet	lorazepam 1 MG Oral Tablet	trazodone hydrochloride 50 MG Oral Tablet	lorazepam 1 MG Oral Tablet	hyc 5
2	1628803	FEMALE	fluoxetine 20 MG Oral Capsule [Prozac]	carbamazepine 200 MG Oral Tablet	clonazepam 0.5 MG Oral Tablet	fluoxetine 20 MG Oral Capsule [Prozac]	cl 0
3	2098601	MALE	sertraline 50 MG Oral Tablet [Zoloft]	alprazolam 0.5 MG Oral Tablet	amitriptyline hydrochloride 25 MG Oral Tablet	sertraline 50 MG Oral Tablet [Zoloft]	ar hyc 2
4	1508401	FEMALE	alprazolam 0.5 MG Oral Tablet	trazodone hydrochloride 50 MG Oral Tablet	alprazolam 0.5 MG Oral Tablet	trazodone hydrochloride 50 MG Oral Tablet	i 0
...	...	...	...	...	...	...	...
1995	1181401	MALE	alprazolam 0.5 MG Oral Tablet	paroxetine hydrochloride 20 MG Oral Tablet [Pa...	alprazolam 0.25 MG Oral Tablet	lorazepam 0.5 MG Oral Tablet	
1996	3596101	FEMALE	diazepam 5 MG Oral Tablet	fluoxetine 20 MG Oral Capsule	trazodone hydrochloride 50 MG Oral Tablet	diazepam 5 MG Oral Tablet	
1997	4688002	FEMALE	lorazepam 1 MG Oral Tablet	12 HR bupropion hydrochloride 150 MG Extended ...	alprazolam 0.25 MG Oral Tablet	alprazolam 0.5 MG Oral Tablet	
1998	1962701	MALE	paroxetine hydrochloride 20 MG Oral Tablet [Pa...	citalopram 20 MG Oral Tablet [Celexa]	paroxetine hydrochloride 20 MG Oral Tablet [Pa...	sertraline 100 MG Oral Tablet	
1999	4368402	FEMALE	paroxetine hydrochloride 20 MG Oral Tablet [Pa...	amitriptyline hydrochloride 25 MG Oral Tablet	paroxetine hydrochloride 20 MG Oral Tablet [Pa...	amitriptyline hydrochloride 25 MG Oral Tablet	

2000 rows × 264 columns



```
In [13]: # create condition pairs on the filtered data (including duplicated pairs)
preprocess.generate_pairs()
```

Out[13]:

	person_id	gender	pair	last_condition
<b>0</b>	2202602	FEMALE	fluoxetine 20 MG Oral Capsule Prozac -> 24 HR ...	alprazolam 0.5 MG Oral Tablet
<b>1</b>	2202602	FEMALE	fluoxetine 20 MG Oral Capsule Prozac -> clonaz...	alprazolam 0.5 MG Oral Tablet
<b>2</b>	2202602	FEMALE	fluoxetine 20 MG Oral Capsule Prozac -> 24 HR ...	alprazolam 0.5 MG Oral Tablet
<b>3</b>	2202602	FEMALE	fluoxetine 20 MG Oral Capsule Prozac -> clonaz...	alprazolam 0.5 MG Oral Tablet
<b>4</b>	2202602	FEMALE	fluoxetine 20 MG Oral Capsule Prozac -> 24 HR ...	alprazolam 0.5 MG Oral Tablet
...	...	...	...	...
<b>611524</b>	4368402	FEMALE	paroxetine hydrochloride 20 MG Oral Tablet Pax...	paroxetine hydrochloride 20 MG Oral Tablet [Pa...
<b>611525</b>	4368402	FEMALE	amitriptyline hydrochloride 25 MG Oral Tablet ...	paroxetine hydrochloride 20 MG Oral Tablet [Pa...
<b>611526</b>	4368402	FEMALE	amitriptyline hydrochloride 25 MG Oral Tablet ...	paroxetine hydrochloride 20 MG Oral Tablet [Pa...
<b>611527</b>	4368402	FEMALE	paroxetine hydrochloride 20 MG Oral Tablet Pax...	paroxetine hydrochloride 20 MG Oral Tablet [Pa...
<b>611528</b>	4368402	FEMALE	amitriptyline hydrochloride 25 MG Oral Tablet ...	paroxetine hydrochloride 20 MG Oral Tablet [Pa...

611529 rows × 4 columns

```
In [14]: # make the condition pairs into count
paircount = preprocess.pairs_to_count()
paircount
```

Out[14]:

	person_id	MALE	FEMALE	fluoxetine 20 MG Oral Capsule Prozac -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor	fluoxetine 20 MG Oral Capsule Prozac -> clonazepam 1 MG Oral Tablet	fluoxetine 20 MG Oral Capsule Prozac -> diazepam 5 MG Oral Tablet	fluoxetine 20 MG Oral Capsule Prozac -> alprazolam 0.5 MG Oral Tablet	fl 20  p cloi  Or
0	802	0	1	0	0	0	0	
1	3803	1	0	0	1	0	0	
2	6002	0	1	0	0	0	0	
3	7102	0	1	0	10	0	0	
4	8502	0	1	0	0	0	0	
...	...	...	...	...	...	...	...	
1995	5244101	1	0	0	0	0	0	
1996	5249901	0	1	0	0	0	0	
1997	5249902	1	0	0	0	0	0	
1998	5250602	1	0	0	0	0	0	
1999	5252701	1	0	8	0	0	0	

2000 rows × 508 columns

```
In [15]: # make the condition pairs into binary  
pairbin = preprocess.pairs_to_bin()  
pairbin
```

Out[15]:

	person_id	MALE	FEMALE	fluoxetine 20 MG Oral Capsule Prozac -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor	fluoxetine 20 MG Oral Capsule Prozac -> clonazepam 1 MG Oral Tablet	fluoxetine 20 MG Oral Capsule Prozac -> diazepam 5 MG Oral Tablet	fluoxetine 20 MG Oral Capsule Prozac -> alprazolam 0.5 MG Oral Tablet	fl 20  p cloi  Or
0	802	0	1	0	0	0	0	
1	3803	1	0	0	1	0	0	
2	6002	0	1	0	0	0	0	
3	7102	0	1	0	1	0	0	
4	8502	0	1	0	0	0	0	
...	...	...	...	...	...	...	...	
1995	5244101	1	0	0	0	0	0	
1996	5249901	0	1	0	0	0	0	
1997	5249902	1	0	0	0	0	0	
1998	5250602	1	0	0	0	0	0	
1999	5252701	1	0	1	0	0	0	

2000 rows × 508 columns

```
In [16]: # Load the train_test_split package
paircountsplit = PredictaVie_SplitData(paircount)
pairbinsplit = PredictaVie_SplitData(pairbin)
```

```
In [17]: # Split data into training and testing, respectively
x_train, x_test, y_train, y_test = paircountsplit.c2c_split_data() # for count data
X_train, X_test, Y_train, Y_test = pairbinsplit.c2c_split_data() # for binary data
```

```
In [18]: # Load the model package
countmodel = PredictaVie_Model(x_train, y_train, x_test, y_test)
binmodel = PredictaVie_Model(X_train, Y_train, X_test, Y_test)
```

```
In [19]: # Use Gridsearch to build and find the best XGBoost model
binmodel.c2c_train_xgb()
```

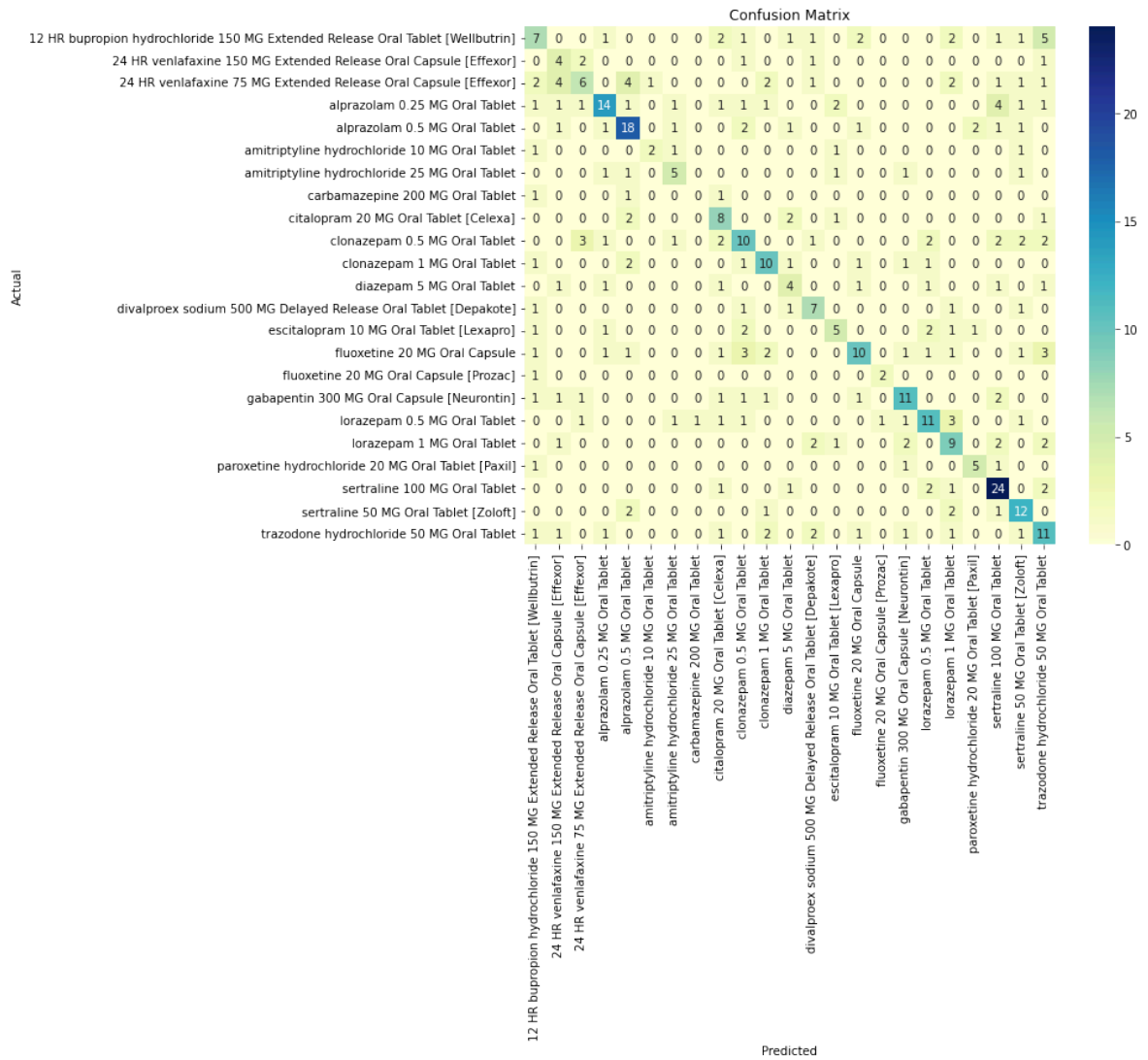
Best parameters: {'learning\_rate': 0.1, 'max\_depth': 3, 'n\_estimators': 200}  
Best cross-validation accuracy: 0.48125

```
Out[19]: XGBClassifier
XGBClassifier(base_score=None, booster=None, callbacks=None,
              colsample_bylevel=None, colsample_bynode=None,
              colsample_bytree=None, device=None, early_stopping_rounds=None,
              enable_categorical=False, eval_metric=None, feature_types=None,
              gamma=None, grow_policy=None, importance_type=None,
              interaction_constraints=None, learning_rate=0.1, max_bin=None,
              min_child_weight=None, missing=None, monotone_constraints=None,
              multi_output_label=False, multi_output_scores=False, num_parallel_tree=None,
              n_estimators=None, n_jobs=None, num_threads=None, objective=None,
              random_state=None, scale_pos_weight=None, seed=None, silent=None,
              subsample=None, tree_method=None, validate_each_iteration=True, verbose=None,
              watchlog=None, watchmetric=None)
```

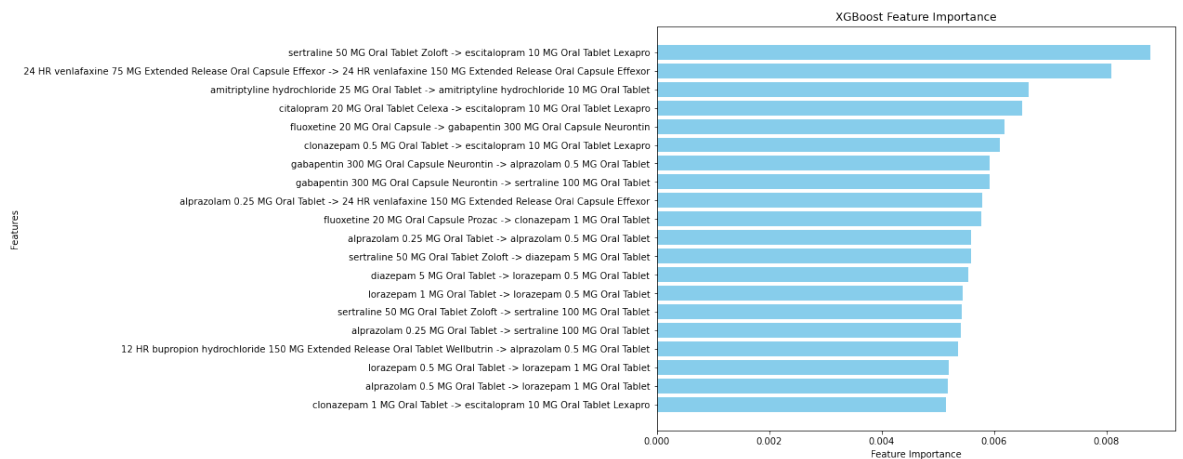
```
In [20]: # test the best XGBoost model to see its performance
binmodel.c2c_evaluate_xgb()
```

Test Accuracy: 0.4875





```
In [21]: # Check which condtion pairs are important for predictions
xgb_top_features = binmodel.c2c_xgb_feature_importance()
xgb_top_features # store the top 20 important features into a list
```



```

Out[21]: ['sertraline 50 MG Oral Tablet Zoloft -> escitalopram 10 MG Oral Tablet Lexapro',
'24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor',
'amitriptyline hydrochloride 25 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet',
'citalopram 20 MG Oral Tablet Celexa -> escitalopram 10 MG Oral Tablet Lexapro',
'fluoxetine 20 MG Oral Capsule -> gabapentin 300 MG Oral Capsule Neurontin',
'clonazepam 0.5 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro',
'gabapentin 300 MG Oral Capsule Neurontin -> alprazolam 0.5 MG Oral Tablet',
'gabapentin 300 MG Oral Capsule Neurontin -> sertraline 100 MG Oral Tablet',
'alprazolam 0.25 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor',
'fluoxetine 20 MG Oral Capsule Prozac -> clonazepam 1 MG Oral Tablet',
'alprazolam 0.25 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet',
'sertraline 50 MG Oral Tablet Zoloft -> diazepam 5 MG Oral Tablet',
'diazepam 5 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet',
'lorazepam 1 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet',
'sertraline 50 MG Oral Tablet Zoloft -> sertraline 100 MG Oral Tablet',
'alprazolam 0.25 MG Oral Tablet -> sertraline 100 MG Oral Tablet',
'12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> alprazolam 0.5 MG Oral Tablet',
'lorazepam 0.5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet',
'alprazolam 0.5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet',
'clonazepam 1 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro']

```

```

In [22]: # ignore "convergence not found" warnings while the gridsearch is running
from sklearn.exceptions import ConvergenceWarning
import warnings
warnings.filterwarnings("ignore", category=ConvergenceWarning)

# Use Gridsearch to build and find the best Logistic Regression model
_, logreg_top_features = countmodel.c2c_train_logreg()
logreg_top_features # store the top 20 important features into a list

```

```
/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py:547: FitFailedWarning:
390 fits failed out of a total of 600.
The score on these train-test partitions for these parameters will be set to nan.
If these failures are not expected, you can try to debug them by setting error_score='raise'.
```

Below are more details about the failures:

-----

30 fits failed with the following error:

Traceback (most recent call last):

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
```

```
ValueError: Solver newton-cg supports only 'l2' or None penalties, got l1 penalty.
```

-----

30 fits failed with the following error:

Traceback (most recent call last):

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
```

```
ValueError: Solver lbfgs supports only 'l2' or None penalties, got l1 penalty.
```

-----

30 fits failed with the following error:

Traceback (most recent call last):

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
```

```
ValueError: Solver sag supports only 'l2' or None penalties, got l1 penalty.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
ValueError: Solver newton-cg supports only 'l2' or None penalties, got elasticnet penalty.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
ValueError: Solver lbfgs supports only 'l2' or None penalties, got elasticnet penalty.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 75, in _check_solver
    raise ValueError(
ValueError: Only 'saga' solver supports elasticnet penalty, got solver=liblinear.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 147
```

```

4, in wrapper
    return fit_method(estimator, *args, **kwargs)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
ValueError: Solver sag supports only 'l2' or None penalties, got elasticnet penalty.

```

-----

30 fits failed with the following error:

Traceback (most recent call last):

```

File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1182, in fit
    raise ValueError("l1_ratio must be specified when penalty is elasticnet.")
ValueError: l1_ratio must be specified when penalty is elasticnet.

```

-----

150 fits failed with the following error:

Traceback (most recent call last):

```

File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1467, in wrapper
    estimator._validate_params()
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 666, in _validate_params
    validate_parameter_constraints(
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/utils/_param_validation.py", line 95, in validate_parameter_constraints
    raise InvalidParameterError(
sklearn.utils._param_validation.InvalidParameterError: The 'penalty' parameter of LogisticRegression must be a str among {'l1', 'elasticnet', 'l2'} or None. Got 'none' instead.

```

```

warnings.warn(some_fits_failed_message, FitFailedWarning)
/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_search.py:1051: UserWarning: One or more of the test scores are non-finite: [
nan
nan 0.138125      nan 0.168125 0.35875  0.441875 0.499375
0.370625 0.368125      nan      nan      nan      nan      nan
      nan      nan      nan      nan      nan      nan 0.228125      nan
0.33875  0.52625  0.556875 0.55625  0.37125  0.366875      nan      nan
      nan      nan      nan      nan      nan      nan      nan      nan
      nan      nan 0.4275      nan 0.366875 0.595625 0.573125 0.5925
0.37375  0.368125      nan      nan      nan      nan      nan      nan
      nan      nan      nan      nan      nan      nan 0.54625      nan
0.36625  0.594375 0.564375 0.575    0.37125  0.365625      nan      nan
      nan      nan      nan      nan      nan      nan      nan      nan
      nan      nan 0.521875      nan 0.366875 0.580625 0.553125 0.565
0.371875 0.368125      nan      nan      nan      nan      nan      nan
      nan      nan      nan      nan      nan      nan 0.46375      nan

```

```
0.3675  0.57    0.5425  0.566875 0.37125  0.366875    nan    nan
      nan      nan      nan      nan      nan      nan      nan    nan]
warnings.warn(
```

Best Parameters: {'C': 0.1, 'penalty': 'l2', 'solver': 'newton-cg'}

Feature Weights in the Best Model:

MALE: -0.08972650094265208

FEMALE: 0.08972735987067701

fluoxetine 20 MG Oral Capsule Prozac -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.06664177530974169

fluoxetine 20 MG Oral Capsule Prozac -> clonazepam 1 MG Oral Tablet: -0.038164070006625354

fluoxetine 20 MG Oral Capsule Prozac -> diazepam 5 MG Oral Tablet: -0.05730880988532265

fluoxetine 20 MG Oral Capsule Prozac -> alprazolam 0.5 MG Oral Tablet: 0.04411804767796207

fluoxetine 20 MG Oral Capsule Prozac -> clonazepam 0.5 MG Oral Tablet: -0.1333366974312014

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> clonazepam 1 MG Oral Tablet: -0.02633783949519565

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> diazepam 5 MG Oral Tablet: 0.05945219920984739

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> alprazolam 0.5 MG Oral Tablet: -0.061543274853678165

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> clonazepam 0.5 MG Oral Tablet: 0.17705061223091534

clonazepam 1 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.18237494816033056

clonazepam 1 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.0222013855465318

clonazepam 1 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.02544943265520814

clonazepam 1 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: 0.0917647208958146

diazepam 5 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.018129839268371386

diazepam 5 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.017219804955970443

diazepam 5 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.07637027382049076

diazepam 5 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: -0.038232388424151414

alprazolam 0.5 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.10288529652507412

alprazolam 0.5 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: -0.1561990189861314

clonazepam 0.5 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.028543994019686065

clonazepam 0.5 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.13129261710344825

trazodone hydrochloride 50 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.08739925063726

trazodone hydrochloride 50 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: -0.07554839652232154

trazodone hydrochloride 50 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.016786550834399342

trazodone hydrochloride 50 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.019547475598692726

lorazepam 1 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: -0.12128612432014686

lorazepam 1 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: 0.01813255827042534

lorazepam 1 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: 0.0011710774332963252

lorazepam 1 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.05287416012111021

clonazepam 0.5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: 0.038915907543241916

clonazepam 0.5 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: -0.10225237431751681

clonazepam 0.5 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.03347315978582862

clonazepam 1 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: 0.05023

597865232087  
clonazepam 1 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: 0.018086234171826733  
diazepam 5 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: -0.07206231278459961  
fluoxetine 20 MG Oral Capsule Prozac -> carbamazepine 200 MG Oral Tablet: -0.011966660041542938  
fluoxetine 20 MG Oral Capsule Prozac -> trazodone hydrochloride 50 MG Oral Tablet: 0.010292339683922139  
fluoxetine 20 MG Oral Capsule Prozac -> fluoxetine 20 MG Oral Capsule: -0.1964087706039749  
fluoxetine 20 MG Oral Capsule Prozac -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.014692350226327124  
fluoxetine 20 MG Oral Capsule Prozac -> escitalopram 10 MG Oral Tablet Lexapro: -0.025152470841230897  
carbamazepine 200 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: -0.020432376417296835  
carbamazepine 200 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.001633831757193754  
carbamazepine 200 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: -0.01178546728742833  
carbamazepine 200 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.0005964168267277865  
carbamazepine 200 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.015130197517441732  
carbamazepine 200 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.012679279005076444  
carbamazepine 200 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.0005199305219540382  
carbamazepine 200 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.012515948310930013  
clonazepam 0.5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.05531809375707431  
clonazepam 0.5 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.02006269060965097  
clonazepam 0.5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.009080248438003126  
clonazepam 0.5 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.024135839574094146  
clonazepam 0.5 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.0376543559655524  
trazodone hydrochloride 50 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.03784769592065501  
trazodone hydrochloride 50 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.01928552754988418  
trazodone hydrochloride 50 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.052879425838390184  
trazodone hydrochloride 50 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.043975471917879115  
trazodone hydrochloride 50 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.06731159645239641  
fluoxetine 20 MG Oral Capsule -> carbamazepine 200 MG Oral Tablet: -0.0001702093965236694  
fluoxetine 20 MG Oral Capsule -> clonazepam 0.5 MG Oral Tablet: -0.024168103333480663  
fluoxetine 20 MG Oral Capsule -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.007092947356049087  
fluoxetine 20 MG Oral Capsule -> diazepam 5 MG Oral Tablet: -0.003536862795877499  
fluoxetine 20 MG Oral Capsule -> escitalopram 10 MG Oral Tablet Lexapro: -0.03004165049381156  
fluoxetine 20 MG Oral Capsule -> clonazepam 1 MG Oral Tablet: -0.0254089096517231



fluoxetine 20 MG Oral Capsule -> trazodone hydrochloride 50 MG Oral Tablet: 0.018430296008604942  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> clonazepam 0.5 MG Oral Tablet: -0.037207581483768154  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> carbamazepine 200 MG Oral Tablet: -0.010320406839970023  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> diazepam 5 MG Oral Tablet: -0.024253374786343835  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> escitalopram 10 MG Oral Tablet Lexapro: 0.05543863216018224  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> clonazepam 1 MG Oral Tablet: -0.015076392043078455  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> trazodone hydrochloride 50 MG Oral Tablet: -0.02737782659630186  
 diazepam 5 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: 0.01544389906143022  
 diazepam 5 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.027739069046110613  
 escitalopram 10 MG Oral Tablet Lexapro -> carbamazepine 200 MG Oral Tablet: 4.259009704058846e-11  
 escitalopram 10 MG Oral Tablet Lexapro -> clonazepam 0.5 MG Oral Tablet: -0.030166468284456103  
 escitalopram 10 MG Oral Tablet Lexapro -> clonazepam 1 MG Oral Tablet: -0.036921557763936796  
 escitalopram 10 MG Oral Tablet Lexapro -> diazepam 5 MG Oral Tablet: -0.025290997906433927  
 escitalopram 10 MG Oral Tablet Lexapro -> trazodone hydrochloride 50 MG Oral Tablet: -0.027058465335163675  
 clonazepam 1 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.00021686527173779994  
 sertraline 50 MG Oral Tablet Zoloft -> alprazolam 0.5 MG Oral Tablet: -0.031206287251284298  
 sertraline 50 MG Oral Tablet Zoloft -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.04219079223834797  
 sertraline 50 MG Oral Tablet Zoloft -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.4771388831804726  
 sertraline 50 MG Oral Tablet Zoloft -> sertraline 100 MG Oral Tablet: -0.1947873157670206  
 alprazolam 0.5 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.020949775315737874  
 alprazolam 0.5 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.0704622510483341  
 alprazolam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.276490310047086  
 alprazolam 0.5 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.04166262041043525  
 amitriptyline hydrochloride 25 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.023775364128945625  
 amitriptyline hydrochloride 25 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.043888158576968046  
 amitriptyline hydrochloride 25 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.4015889858711776  
 amitriptyline hydrochloride 25 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.08955741504907858  
 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> sertraline 50 MG Oral Tablet Zoloft: -0.15776963755398107  
 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> amitriptyline hydrochloride 25 MG Oral Tablet: 0.013401023456564746  
 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> s

ertraline 100 MG Oral Tablet: -0.043275865936675206  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> a  
lprazolam 0.5 MG Oral Tablet: 0.12735805333274006  
sertraline 100 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -  
0.028099430071503034  
sertraline 100 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.03990382909988  
094  
sertraline 100 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.07583695  
864745252  
alprazolam 0.5 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: 0.011  
51558388005548  
alprazolam 0.5 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.049  
189992579637506  
alprazolam 0.5 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.081286688198003  
72  
alprazolam 0.5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.03323257977661675  
5  
alprazolam 0.5 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Ta  
blet Depakote: -0.0716649998609018  
alprazolam 0.5 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.13929893153817477  
alprazolam 0.5 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.1584616148144  
1134  
trazodone hydrochloride 50 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.06  
464722991859315  
trazodone hydrochloride 50 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neuro  
ntin: -0.03426135432390111  
trazodone hydrochloride 50 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: 0.0707  
2543038368122  
trazodone hydrochloride 50 MG Oral Tablet -> divalproex sodium 500 MG Delayed Rel  
ease Oral Tablet Depakote: -0.1966089534957262  
trazodone hydrochloride 50 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.0  
38938150527687586  
gabapentin 300 MG Oral Capsule Neurontin -> alprazolam 0.5 MG Oral Tablet: -0.103  
41962781173704  
gabapentin 300 MG Oral Capsule Neurontin -> trazodone hydrochloride 50 MG Oral Ta  
blet: -0.0681041579607598  
gabapentin 300 MG Oral Capsule Neurontin -> lorazepam 0.5 MG Oral Tablet: -0.0439  
2089859616016  
gabapentin 300 MG Oral Capsule Neurontin -> lorazepam 1 MG Oral Tablet: -0.003814  
312128088735  
gabapentin 300 MG Oral Capsule Neurontin -> divalproex sodium 500 MG Delayed Rele  
ase Oral Tablet Depakote: 0.01965584011410505  
gabapentin 300 MG Oral Capsule Neurontin -> diazepam 5 MG Oral Tablet: -0.0064399  
83130725081  
gabapentin 300 MG Oral Capsule Neurontin -> alprazolam 0.25 MG Oral Tablet: -0.01  
204189609815606  
lorazepam 0.5 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: 0.0686  
2395748167441  
lorazepam 0.5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.21427212938956852  
lorazepam 0.5 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tab  
let Depakote: -0.04150214794140121  
lorazepam 0.5 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.05237780313467971  
lorazepam 0.5 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.03158054522012  
8695  
lorazepam 0.5 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.065538200612649  
27  
lorazepam 1 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.11221298921138921  
lorazepam 1 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Table  
t Depakote: -0.0034900984238198716  
lorazepam 1 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.0664507917403792

1

lorazepam 1 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.10034064504005023  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> lorazepam 1 MG Oral Tablet: -0.008268288116109888  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> lorazepam 0.5 MG Oral Tablet: -0.023127847365005  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> diazepam 5 MG Oral Tablet: -0.03631135176505703  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> alprazolam 0.25 MG Oral Tablet: 0.009929089286083362  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> alprazolam 0.5 MG Oral Tablet: -0.044560156141967455  
diazepam 5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.05232692601058621  
diazepam 5 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.01544542576357976  
diazepam 5 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.04164564117340812  
alprazolam 0.25 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.0409899441977664  
3  
alprazolam 0.25 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.08351430731406997  
alprazolam 0.25 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: -0.04990949267109241  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> gabapentin 300 MG Oral Capsule Neurontin: 0.01785632121822503  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.29624014006064053  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> trazodone hydrochloride 50 MG Oral Tablet: -0.1136284012689055  
gabapentin 300 MG Oral Capsule Neurontin -> clonazepam 1 MG Oral Tablet: -0.07981475894565454  
gabapentin 300 MG Oral Capsule Neurontin -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.10152962978108206  
gabapentin 300 MG Oral Capsule Neurontin -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.04289080914312588  
gabapentin 300 MG Oral Capsule Neurontin -> clonazepam 0.5 MG Oral Tablet: -0.03922592982069655  
clonazepam 1 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.07114901125512078  
clonazepam 1 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: 0.05124453680976693  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.03606328499657101  
clonazepam 0.5 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.03502889303295045  
trazodone hydrochloride 50 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.04205408268864665  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> clonazepam 0.5 MG Oral Tablet: 0.0014091584744518988  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> trazodone hydrochloride 50 MG Oral Tablet: 0.019111603057850483  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> sertraline 50 MG Oral Tablet Zoloft: -0.03597427137931536  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> sertraline 100 MG Oral Tablet: -0.15302446263313332  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> clonazepam 1 MG Oral Tablet: -0.1025785647992666  
clonazepam 0.5 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.16926810754800556  
clonazepam 0.5 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.040525576247029446

clonazepam 0.5 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.02913098380892132  
trazodone hydrochloride 50 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.09444609633037682  
trazodone hydrochloride 50 MG Oral Tablet -> sertraline 100 MG Oral Tablet: 0.044623978236711666  
sertraline 50 MG Oral Tablet Zoloft -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.026812271662062893  
sertraline 50 MG Oral Tablet Zoloft -> clonazepam 0.5 MG Oral Tablet: -0.023866368750793825  
sertraline 50 MG Oral Tablet Zoloft -> clonazepam 1 MG Oral Tablet: -0.01738935298322019  
sertraline 100 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.1422334179061597  
sertraline 100 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: 0.01959601142830376  
sertraline 100 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.005274660300688997  
clonazepam 1 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.011647814241889059  
fluoxetine 20 MG Oral Capsule Prozac -> gabapentin 300 MG Oral Capsule Neurontin: -0.06130862058695613  
fluoxetine 20 MG Oral Capsule Prozac -> alprazolam 0.25 MG Oral Tablet: -0.06608486160113808  
alprazolam 0.5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: 0.08292929871753789  
alprazolam 0.5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.03351558268164899  
gabapentin 300 MG Oral Capsule Neurontin -> fluoxetine 20 MG Oral Capsule Prozac: -0.05941600834983152  
gabapentin 300 MG Oral Capsule Neurontin -> fluoxetine 20 MG Oral Capsule: -0.059596782633071825  
fluoxetine 20 MG Oral Capsule -> alprazolam 0.5 MG Oral Tablet: -0.0947937951642396  
fluoxetine 20 MG Oral Capsule -> alprazolam 0.25 MG Oral Tablet: -0.014790880056434173  
alprazolam 0.25 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: 0.008168280566146541  
alprazolam 0.25 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.053625985047560984  
diazepam 5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: 0.026855541250973464  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> clonazepam 0.5 MG Oral Tablet: 0.036753502881649094  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> fluoxetine 20 MG Oral Capsule Prozac: -0.09800409156778252  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> fluoxetine 20 MG Oral Capsule: -0.009223830662353383  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: 0.021529282483814312  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> diazepam 5 MG Oral Tablet: 0.23048311723168463  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> clonazepam 1 MG Oral Tablet: 0.08051817156503904  
clonazepam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.336332922808341  
fluoxetine 20 MG Oral Capsule Prozac -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.35850636330603614  
fluoxetine 20 MG Oral Capsule Prozac -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.0021936789448780887

fluoxetine 20 MG Oral Capsule Prozac -> lorazepam 1 MG Oral Tablet: -0.018235458009422747

fluoxetine 20 MG Oral Capsule -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.47198907381735433

fluoxetine 20 MG Oral Capsule -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.0029436346807561976

fluoxetine 20 MG Oral Capsule -> lorazepam 1 MG Oral Tablet: -0.04472138297077737

divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> fluoxetine 20 MG Oral Capsule: -0.014494460478942222

divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.19643573468731113

lorazepam 1 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.042277834571020155

carbamazepine 200 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.042168137930866066

diazepam 5 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.07300720446742014

trazodone hydrochloride 50 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: 0.06010810340143294

trazodone hydrochloride 50 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: 0.030190428878297454

alprazolam 0.25 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: -0.011132210353350089

alprazolam 0.25 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.14163778983227174

alprazolam 0.25 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.01732075383252017

alprazolam 0.25 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.06858348889715367

citalopram 20 MG Oral Tablet Celexa -> trazodone hydrochloride 50 MG Oral Tablet: -0.0909071934937533

citalopram 20 MG Oral Tablet Celexa -> alprazolam 0.25 MG Oral Tablet: -0.20146741780019703

citalopram 20 MG Oral Tablet Celexa -> gabapentin 300 MG Oral Capsule Neurontin: -0.11451103708284674

citalopram 20 MG Oral Tablet Celexa -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: 0.02715064983528013

gabapentin 300 MG Oral Capsule Neurontin -> citalopram 20 MG Oral Tablet Celexa: -0.004582471624760828

gabapentin 300 MG Oral Capsule Neurontin -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.008248954179498726

paroxetine hydrochloride 20 MG Oral Tablet Paxil -> gabapentin 300 MG Oral Capsule Neurontin: -0.07298914381679314

12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> trazodone hydrochloride 50 MG Oral Tablet: -0.0469723153211313

trazodone hydrochloride 50 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.4288587975629816

24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> alprazolam 0.5 MG Oral Tablet: -0.026409111587804426

alprazolam 0.5 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.037083739081153415

alprazolam 0.5 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.04260811831567053

fluoxetine 20 MG Oral Capsule -> fluoxetine 20 MG Oral Capsule Prozac: 0.013095603087879366

fluoxetine 20 MG Oral Capsule -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.12175195884364019

alprazolam 0.25 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.08677810162833224

alprazolam 0.25 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: 0.09783174530289943

alprazolam 0.25 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.03275779203613475  
alprazolam 0.25 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.015797034652044052  
sertraline 100 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: 0.01688873264078483  
sertraline 100 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.04125688560715402  
sertraline 100 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.01181905150141276  
sertraline 100 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.03530612936736433  
sertraline 100 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.022438198545162692  
alprazolam 0.5 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.0538919802972738  
clonazepam 0.5 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.08906052037393511  
clonazepam 0.5 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.0170870881443346  
citalopram 20 MG Oral Tablet Celexa -> alprazolam 0.5 MG Oral Tablet: -0.0880026215522772  
citalopram 20 MG Oral Tablet Celexa -> sertraline 100 MG Oral Tablet: -0.10260913316757578  
citalopram 20 MG Oral Tablet Celexa -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.011576287134251914  
citalopram 20 MG Oral Tablet Celexa -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: 0.08148543576685999  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> alprazolam 0.25 MG Oral Tablet: 0.011460846171509454  
sertraline 50 MG Oral Tablet Zoloft -> lorazepam 1 MG Oral Tablet: -0.05211282165766288  
sertraline 50 MG Oral Tablet Zoloft -> diazepam 5 MG Oral Tablet: 0.05430936677685535  
lorazepam 1 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.08489786820827117  
carbamazepine 200 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.025429963903782323  
lorazepam 1 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.008487381206651491  
alprazolam 0.25 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.001212132584257339  
amitriptyline hydrochloride 25 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.008577487811456693  
amitriptyline hydrochloride 25 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.05202635848241993  
amitriptyline hydrochloride 25 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: -0.021539753199968623  
gabapentin 300 MG Oral Capsule Neurontin -> amitriptyline hydrochloride 25 MG Oral Tablet: 0.026601722480439356  
trazodone hydrochloride 50 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.03453111682281765  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.05916061582381395  
lorazepam 1 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.038593475083321296  
sertraline 50 MG Oral Tablet Zoloft -> trazodone hydrochloride 50 MG Oral Tablet: -0.03778894188687266  
sertraline 50 MG Oral Tablet Zoloft -> citalopram 20 MG Oral Tablet Celexa: -0.01

8774381413526997  
citalopram 20 MG Oral Tablet Celexa -> sertraline 50 MG Oral Tablet Zoloft: -0.0926334196542934  
alprazolam 0.25 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.13910753371983994  
alprazolam 0.25 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.08224796708970641  
diazepam 5 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: 0.009651393704339185  
diazepam 5 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.022483949199513326  
diazepam 5 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: 0.03727148353162651  
amitriptyline hydrochloride 25 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.013420689134351457  
amitriptyline hydrochloride 25 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.052318137556080516  
amitriptyline hydrochloride 25 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.017998489930680293  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> alprazolam 0.25 MG Oral Tablet: -0.0668983942275602  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> alprazolam 0.5 MG Oral Tablet: -0.08922063399456608  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> sertraline 50 MG Oral Tablet Zoloft: 0.025528604611226087  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.14456993950863034  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> escitalopram 10 MG Oral Tablet Lexapro: -0.029928058545979064  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.05539728717951946  
alprazolam 0.5 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.07228219405026216  
alprazolam 0.5 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.04681993738574214  
sertraline 50 MG Oral Tablet Zoloft -> alprazolam 0.25 MG Oral Tablet: 0.03034445439367397  
sertraline 50 MG Oral Tablet Zoloft -> escitalopram 10 MG Oral Tablet Lexapro: -0.07618423297839111  
sertraline 50 MG Oral Tablet Zoloft -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.0010294756441290528  
escitalopram 10 MG Oral Tablet Lexapro -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.012820745651099601  
escitalopram 10 MG Oral Tablet Lexapro -> alprazolam 0.25 MG Oral Tablet: -0.0825792141872432  
escitalopram 10 MG Oral Tablet Lexapro -> alprazolam 0.5 MG Oral Tablet: -0.03998543259821272  
escitalopram 10 MG Oral Tablet Lexapro -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.00783342563533425  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: 0.039792970055591084  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> escitalopram 10 MG Oral Tablet Lexapro: -0.012426733576817709  
clonazepam 0.5 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.10968009691112311  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.04413654608725433  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> escitalopram 10 MG Oral Tablet Lexapro: -0.055622729412685916  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> a

lprazolam 0.25 MG Oral Tablet: 0.07347170610842174  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: 0.019792592299760915  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> trazodone hydrochloride 50 MG Oral Tablet: -0.10682570399483927  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.3914121800505929  
escitalopram 10 MG Oral Tablet Lexapro -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.039411099731699595  
escitalopram 10 MG Oral Tablet Lexapro -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.001129817434668564  
gabapentin 300 MG Oral Capsule Neurontin -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.37588317061230764  
clonazepam 1 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.1874242291131404  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.41968138689692214  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.3875275688450211  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> clonazepam 1 MG Oral Tablet: -0.059040812018624635  
diazepam 5 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.025543250030955398  
sertraline 50 MG Oral Tablet Zoloft -> gabapentin 300 MG Oral Capsule Neurontin: -0.0479218235834966  
clonazepam 0.5 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.09358840428068024  
lorazepam 1 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.03891569382248986  
lorazepam 1 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.050124927741187576  
lorazepam 1 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.02852605689393088  
gabapentin 300 MG Oral Capsule Neurontin -> sertraline 50 MG Oral Tablet Zoloft: -0.05801627879409697  
gabapentin 300 MG Oral Capsule Neurontin -> sertraline 100 MG Oral Tablet: -0.02490956383077547  
gabapentin 300 MG Oral Capsule Neurontin -> escitalopram 10 MG Oral Tablet Lexapro: -0.06864777192054734  
sertraline 100 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.051316761576690136  
sertraline 100 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.10418430855774309  
sertraline 100 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.031416058740133854  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> gabapentin 300 MG Oral Capsule Neurontin: -0.09510200090023292  
escitalopram 10 MG Oral Tablet Lexapro -> fluoxetine 20 MG Oral Capsule: -0.013883846688060043  
diazepam 5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.0426677669097879  
diazepam 5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.4707609953178698  
clonazepam 1 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.01734197100861695  
clonazepam 1 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.038158174610075174  
citalopram 20 MG Oral Tablet Celexa -> clonazepam 1 MG Oral Tablet: -0.036146910148013765  
clonazepam 1 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.02128861978754547



clonazepam 1 MG Oral Tablet -> sertraline 100 MG Oral Tablet: 0.02875326691301116  
3  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> lorazepam 1 MG Oral Tablet: -  
0.08378571352720318  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> lorazepam 0.5 MG Oral Tablet:  
-0.06972055908752701  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> fluoxetine 20 MG Oral Capsul  
e: 0.008235813282825542  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> sertraline 100 MG Oral Table  
t: -0.03562127279355154  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> diazepam 5 MG Oral Tablet: -  
0.06801443407248495  
lorazepam 1 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -  
0.05046923528246052  
lorazepam 1 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.0  
27869772939114464  
lorazepam 1 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Relea  
se Oral Tablet Wellbutrin: 0.29820593150780145  
amitriptyline hydrochloride 25 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.0  
16463069973260098  
amitriptyline hydrochloride 25 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -  
0.03357426245377015  
amitriptyline hydrochloride 25 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule:  
0.038535550460544514  
amitriptyline hydrochloride 25 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.08  
69448583942867  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> l  
orazepam 0.5 MG Oral Tablet: 0.030241093359241966  
lorazepam 0.5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.015222243239222  
045  
lorazepam 0.5 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.057219458  
639141685  
lorazepam 0.5 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.045583192707105  
17  
fluoxetine 20 MG Oral Capsule -> sertraline 50 MG Oral Tablet Zoloft: 0.051990714  
11953217  
fluoxetine 20 MG Oral Capsule -> sertraline 100 MG Oral Tablet: -0.05423695980180  
855  
sertraline 100 MG Oral Tablet -> diazepam 5 MG Oral Tablet: -0.05743411622078169  
diazepam 5 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.038500089483355364  
citalopram 20 MG Oral Tablet Celexa -> clonazepam 0.5 MG Oral Tablet: -0.12648163  
006952826  
citalopram 20 MG Oral Tablet Celexa -> 12 HR bupropion hydrochloride 150 MG Exten  
ded Release Oral Tablet Wellbutrin: 0.48487029573918844  
citalopram 20 MG Oral Tablet Celexa -> escitalopram 10 MG Oral Tablet Lexapro: -  
0.04365771005621239  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> c  
italopram 20 MG Oral Tablet Celexa: -0.11614798700730546  
alprazolam 0.25 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.015394393711216  
085  
clonazepam 1 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.0341969  
8927920804  
escitalopram 10 MG Oral Tablet Lexapro -> gabapentin 300 MG Oral Capsule Neuronti  
n: -0.01707305205842199  
clonazepam 1 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.0494710262  
776686  
fluoxetine 20 MG Oral Capsule Prozac -> sertraline 50 MG Oral Tablet Zoloft: -0.0  
2141627639179366  
fluoxetine 20 MG Oral Capsule Prozac -> sertraline 100 MG Oral Tablet: -0.0579198  
4525181404

clonazepam 1 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: 0.0045238692683816  
 04  
 sertraline 100 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: -0.02918336721875  
 677  
 amitriptyline hydrochloride 10 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet:  
 -0.07140009390431049  
 amitriptyline hydrochloride 10 MG Oral Tablet -> diazepam 5 MG Oral Tablet: 0.023  
 22011212493282  
 alprazolam 0.25 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet:  
 0.06834757338671338  
 diazepam 5 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.02  
 4707368152374305  
 lorazepam 0.5 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.00908626  
 2888754838  
 lorazepam 0.5 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -  
 0.03198463461485937  
 lorazepam 0.5 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.0272  
 07080978999054  
 fluoxetine 20 MG Oral Capsule Prozac -> amitriptyline hydrochloride 25 MG Oral Ta  
 blet: -0.026707088991029204  
 fluoxetine 20 MG Oral Capsule Prozac -> lorazepam 0.5 MG Oral Tablet: 0.087562297  
 63049087  
 amitriptyline hydrochloride 25 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Pr  
 ozac: 0.06934699248253277  
 fluoxetine 20 MG Oral Capsule -> amitriptyline hydrochloride 25 MG Oral Tablet: -  
 0.017307161396944076  
 fluoxetine 20 MG Oral Capsule -> gabapentin 300 MG Oral Capsule Neurontin: 0.0502  
 9953531602177  
 fluoxetine 20 MG Oral Capsule -> lorazepam 0.5 MG Oral Tablet: 0.0030939753583690  
 377  
 alprazolam 0.5 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet:  
 0.03873906571048341  
 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> amitriptyline hy  
 drochloride 10 MG Oral Tablet: -0.00904002683112791  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> amitriptyline h  
 ydrochloride 10 MG Oral Tablet: -0.00361689065620839  
 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> gabapentin 300  
 MG Oral Capsule Neurontin: 0.016193500830711634  
 amitriptyline hydrochloride 10 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet:  
 0.04814436346703525  
 amitriptyline hydrochloride 10 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extende  
 d Release Oral Capsule Effexor: -0.014869447962107677  
 amitriptyline hydrochloride 10 MG Oral Tablet -> gabapentin 300 MG Oral Capsule N  
 eurontin: -0.08130026032008104  
 paroxetine hydrochloride 20 MG Oral Tablet Paxil -> clonazepam 0.5 MG Oral Table  
 t: -0.2028301544752869  
 paroxetine hydrochloride 20 MG Oral Tablet Paxil -> 24 HR venlafaxine 150 MG Exte  
 nded Release Oral Capsule Effexor: -0.041707407348218074  
 clonazepam 1 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: 0.0  
 3554105968207458  
 amitriptyline hydrochloride 25 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.  
 015406826805058331  
 amitriptyline hydrochloride 25 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: -  
 0.006771579526086791  
 alprazolam 0.25 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.03849348808395  
 7694  
 citalopram 20 MG Oral Tablet Celexa -> diazepam 5 MG Oral Tablet: -0.031924026150  
 20198  
 citalopram 20 MG Oral Tablet Celexa -> lorazepam 0.5 MG Oral Tablet: 0.0020470377  
 893121996

diazepam 5 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.018202027263441535  
clonazepam 1 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.013791909572232077  
lorazepam 0.5 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: 0.004033592636306155  
lorazepam 0.5 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.02085556331163958  
citalopram 20 MG Oral Tablet Celexa -> lorazepam 1 MG Oral Tablet: -0.06526836548867436  
lorazepam 1 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.07186015109379454  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> citalopram 20 MG Oral Tablet Celexa: -0.09675253081490486  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> fluoxetine 20 MG Oral Capsule: -0.021384808961296912  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.03332889726314954  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> lorazepam 0.5 MG Oral Tablet: 0.011806838543276372  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> lorazepam 1 MG Oral Tablet: -0.029851109341587596  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> carbamazepine 200 MG Oral Tablet: 0.03636864249442216  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> sertraline 100 MG Oral Tablet: -0.1793335083963225  
lorazepam 0.5 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.016304545004487032  
lorazepam 0.5 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.01608960684768447  
lorazepam 0.5 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.04719413170105542  
clonazepam 0.5 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.007543106325769789  
alprazolam 0.25 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.011352947078827821  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> alprazolam 0.25 MG Oral Tablet: -0.018965720077574473  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> lorazepam 0.5 MG Oral Tablet: -0.005116839123831339  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> lorazepam 1 MG Oral Tablet: -0.023133367911153786  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> sertraline 100 MG Oral Tablet: -0.01567263087198609  
carbamazepine 200 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.020250904520164904  
sertraline 100 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.03104527024880915  
alprazolam 0.25 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.03698459364524005  
lorazepam 1 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.0740515154114748  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> clonazepam 1 MG Oral Tablet: -0.04377328384437229  
sertraline 50 MG Oral Tablet Zoloft -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: 0.002895511852863654  
sertraline 50 MG Oral Tablet Zoloft -> lorazepam 0.5 MG Oral Tablet: -0.03794161245377751  
clonazepam 1 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.07085910728218046

carbamazepine 200 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.029290996611934347  
citalopram 20 MG Oral Tablet Celexa -> carbamazepine 200 MG Oral Tablet: 0.011648375132709927  
sertraline 100 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.0528950259476408  
12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> carbamazepine 200 MG Oral Tablet: 0.059758806356102846  
amitriptyline hydrochloride 25 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: -0.02261624915695473  
diazepam 5 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.11819767795033422  
gabapentin 300 MG Oral Capsule Neurontin -> carbamazepine 200 MG Oral Tablet: -0.04853549594301378  
sertraline 50 MG Oral Tablet Zoloft -> carbamazepine 200 MG Oral Tablet: -0.014447622538634353  
carbamazepine 200 MG Oral Tablet -> alprazolam 0.25 MG Oral Tablet: -0.03165571432374779  
carbamazepine 200 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.018227255503144663  
lorazepam 1 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.0192877020320447  
sertraline 50 MG Oral Tablet Zoloft -> amitriptyline hydrochloride 10 MG Oral Tablet: 0.024222516287796474  
sertraline 100 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.01604251957701431  
amitriptyline hydrochloride 10 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.029410416532387237  
amitriptyline hydrochloride 10 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.0034627804125576082  
amitriptyline hydrochloride 10 MG Oral Tablet -> sertraline 100 MG Oral Tablet: -0.008497393026617305  
gabapentin 300 MG Oral Capsule Neurontin -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.046978867860048235  
clonazepam 1 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.0032463129886346346  
amitriptyline hydrochloride 10 MG Oral Tablet -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.018282582847245123  
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clonazepam 0.5 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.04724098868177573  
amitriptyline hydrochloride 10 MG Oral Tablet -> clonazepam 0.5 MG Oral Tablet: -0.03715133494227456  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> fluoxetine 20 MG Oral Capsule Prozac: -0.001629383165058905  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> gabapentin 300 MG Oral Capsule Neurontin: -0.07530548369158142  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.016773070497064346  
divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: -0.07083266564224995  
lorazepam 1 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.002000469430732726  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> escitalopram 10 MG Oral Tablet Lexapro: -0.016435185594830305

escitalopram 10 MG Oral Tablet Lexapro -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.008665422192764033  
sertraline 100 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.39041701752117647  
amitriptyline hydrochloride 25 MG Oral Tablet -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.05176374294346199  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> citalopram 20 MG Oral Tablet Celexa: -0.0036014799097529786  
amitriptyline hydrochloride 10 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.053939918849647585  
citalopram 20 MG Oral Tablet Celexa -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.08218354949581394  
citalopram 20 MG Oral Tablet Celexa -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.07264521446120419  
carbamazepine 200 MG Oral Tablet -> gabapentin 300 MG Oral Capsule Neurontin: -0.07346577253699137  
carbamazepine 200 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.03477092245443702  
lorazepam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.3918227653902357  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: 0.03390357214053046  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> fluoxetine 20 MG Oral Capsule: -0.04243065505082038  
lorazepam 0.5 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.014376424558753507  
sertraline 50 MG Oral Tablet Zoloft -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.046090992273058046  
lorazepam 0.5 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: -0.05358338544104276  
lorazepam 0.5 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.041618413311181573  
alprazolam 0.25 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.4527379895787042  
escitalopram 10 MG Oral Tablet Lexapro -> sertraline 100 MG Oral Tablet: -0.011435758200847744  
escitalopram 10 MG Oral Tablet Lexapro -> lorazepam 1 MG Oral Tablet: -0.02926811034518988  
escitalopram 10 MG Oral Tablet Lexapro -> lorazepam 0.5 MG Oral Tablet: -0.0313482983768073  
fluoxetine 20 MG Oral Capsule Prozac -> citalopram 20 MG Oral Tablet Celexa: -0.13019087809390925  
citalopram 20 MG Oral Tablet Celexa -> fluoxetine 20 MG Oral Capsule: 0.022848315442487815  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> sertraline 50 MG Oral Tablet Zoloft: -0.0788008457646868  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> fluoxetine 20 MG Oral Capsule Prozac: -0.010299576423589692  
24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: 0.055928338775770615  
fluoxetine 20 MG Oral Capsule Prozac -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.022358352620226805  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> fluoxetine 20 MG Oral Capsule Prozac: -0.01179297131576541  
fluoxetine 20 MG Oral Capsule -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.021238153861775747  
amitriptyline hydrochloride 10 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule: 0.014323797828796628  
amitriptyline hydrochloride 25 MG Oral Tablet -> citalopram 20 MG Oral Tablet Celexa: 0.04885281560160747

sertraline 50 MG Oral Tablet Zoloft -> fluoxetine 20 MG Oral Capsule: -0.007526187390057234

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> citalopram 20 MG Oral Tablet Celexa: 0.0005244742570551647

fluoxetine 20 MG Oral Capsule -> citalopram 20 MG Oral Tablet Celexa: -0.062084526053188045

carbamazepine 200 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.012093617228523831

paroxetine hydrochloride 20 MG Oral Tablet Paxil -> carbamazepine 200 MG Oral Tablet: 0.01070104906328137

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.053874875970635665

24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.07681946697541002

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.03589313521672604

24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -2.7437285096768383e-05

divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> citalopram 20 MG Oral Tablet Celexa: -0.03413589396238891

citalopram 20 MG Oral Tablet Celexa -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.030683105999588504

fluoxetine 20 MG Oral Capsule Prozac -> amitriptyline hydrochloride 10 MG Oral Tablet: 0.08096742591695863

amitriptyline hydrochloride 10 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: 2.205989624084482e-11

amitriptyline hydrochloride 10 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: 0.07402265943742933

amitriptyline hydrochloride 10 MG Oral Tablet -> escitalopram 10 MG Oral Tablet Lexapro: -0.03581640511312099

citalopram 20 MG Oral Tablet Celexa -> fluoxetine 20 MG Oral Capsule Prozac: -0.08295035025236396

amitriptyline hydrochloride 10 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.19920948827549986

amitriptyline hydrochloride 10 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.03233875657552922

12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> amitriptyline hydrochloride 10 MG Oral Tablet: 0.027990826713025274

divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> carbamazepine 200 MG Oral Tablet: -0.008520359202407018

amitriptyline hydrochloride 10 MG Oral Tablet -> clonazepam 1 MG Oral Tablet: -0.010922752359940032

carbamazepine 200 MG Oral Tablet -> alprazolam 0.5 MG Oral Tablet: 0.008822121290563712

carbamazepine 200 MG Oral Tablet -> sertraline 50 MG Oral Tablet Zoloft: -0.008578694193736051

alprazolam 0.5 MG Oral Tablet -> carbamazepine 200 MG Oral Tablet: 0.0014064491640911675

divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> amitriptyline hydrochloride 25 MG Oral Tablet: -0.08473719841162307

divalproex sodium 500 MG Delayed Release Oral Tablet Depakote -> amitriptyline hydrochloride 10 MG Oral Tablet: 1.3690881025513762e-10

sertraline 100 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: 0.011112000372310773

amitriptyline hydrochloride 25 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.009951956403011008

amitriptyline hydrochloride 10 MG Oral Tablet -> trazodone hydrochloride 50 MG Oral Tablet: -0.02914763069745991

lorazepam 0.5 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.0160511462392906

paroxetine hydrochloride 20 MG Oral Tablet Paxil -> amitriptyline hydrochloride 10 MG Oral Tablet: 0.046375891810271526  
amitriptyline hydrochloride 10 MG Oral Tablet -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.01970294706379009  
24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> sertraline 50 MG Oral Tablet Zoloft: -0.050337797516962386  
carbamazepine 200 MG Oral Tablet -> 24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor: 0.0017958426728475524  
escitalopram 10 MG Oral Tablet Lexapro -> sertraline 50 MG Oral Tablet Zoloft: -0.0024023119379597163  
amitriptyline hydrochloride 10 MG Oral Tablet -> lorazepam 0.5 MG Oral Tablet: -0.018025886526594734  
sertraline 50 MG Oral Tablet Zoloft -> fluoxetine 20 MG Oral Capsule Prozac: -0.0028053781904066916  
fluoxetine 20 MG Oral Capsule -> paroxetine hydrochloride 20 MG Oral Tablet Paxil: -0.018870874864542243  
carbamazepine 200 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -0.01133177040508322  
paroxetine hydrochloride 20 MG Oral Tablet Paxil -> fluoxetine 20 MG Oral Capsule Prozac: -0.008727298550000704  
sertraline 100 MG Oral Tablet -> fluoxetine 20 MG Oral Capsule Prozac: -0.005547678681309804  
escitalopram 10 MG Oral Tablet Lexapro -> citalopram 20 MG Oral Tablet Celexa: -0.0012666948734061136  
escitalopram 10 MG Oral Tablet Lexapro -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.003623656044077225  
amitriptyline hydrochloride 10 MG Oral Tablet -> divalproex sodium 500 MG Delayed Release Oral Tablet Depakote: -7.566713471531319e-09  
carbamazepine 200 MG Oral Tablet -> amitriptyline hydrochloride 10 MG Oral Tablet: -0.01964103905287264

```

Out[22]: ['citalopram 20 MG Oral Tablet Celexa -> 12 HR bupropion hydrochloride 150 MG E
xtended Release Oral Tablet Wellbutrin',
'sertraline 50 MG Oral Tablet Zoloft -> 12 HR bupropion hydrochloride 150 MG E
xtended Release Oral Tablet Wellbutrin',
'fluoxetine 20 MG Oral Capsule -> 12 HR bupropion hydrochloride 150 MG Extende
d Release Oral Tablet Wellbutrin',
'diazepam 5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Re
lease Oral Tablet Wellbutrin',
'alprazolam 0.25 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extend
ed Release Oral Tablet Wellbutrin',
'trazodone hydrochloride 50 MG Oral Tablet -> 12 HR bupropion hydrochloride 15
0 MG Extended Release Oral Tablet Wellbutrin',
'24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> 12 HR buprop
ion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin',
'amitriptyline hydrochloride 25 MG Oral Tablet -> 12 HR bupropion hydrochlorid
e 150 MG Extended Release Oral Tablet Wellbutrin',
'lorazepam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended
Release Oral Tablet Wellbutrin',
'paroxetine hydrochloride 20 MG Oral Tablet Paxil -> 12 HR bupropion hydrochlo
ride 150 MG Extended Release Oral Tablet Wellbutrin',
'sertraline 100 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extende
d Release Oral Tablet Wellbutrin',
'24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> 12 HR bupro
pion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin',
'gabapentin 300 MG Oral Capsule Neurontin -> 12 HR bupropion hydrochloride 150
MG Extended Release Oral Tablet Wellbutrin',
'fluoxetine 20 MG Oral Capsule Prozac -> 12 HR bupropion hydrochloride 150 MG
Extended Release Oral Tablet Wellbutrin',
'clonazepam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extende
d Release Oral Tablet Wellbutrin',
'lorazepam 1 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended R
elease Oral Tablet Wellbutrin',
'24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> 24 HR venlaf
axine 150 MG Extended Release Oral Capsule Effexor',
'alprazolam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extende
d Release Oral Tablet Wellbutrin',
'12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin
-> diazepam 5 MG Oral Tablet',
'lorazepam 0.5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet']

```

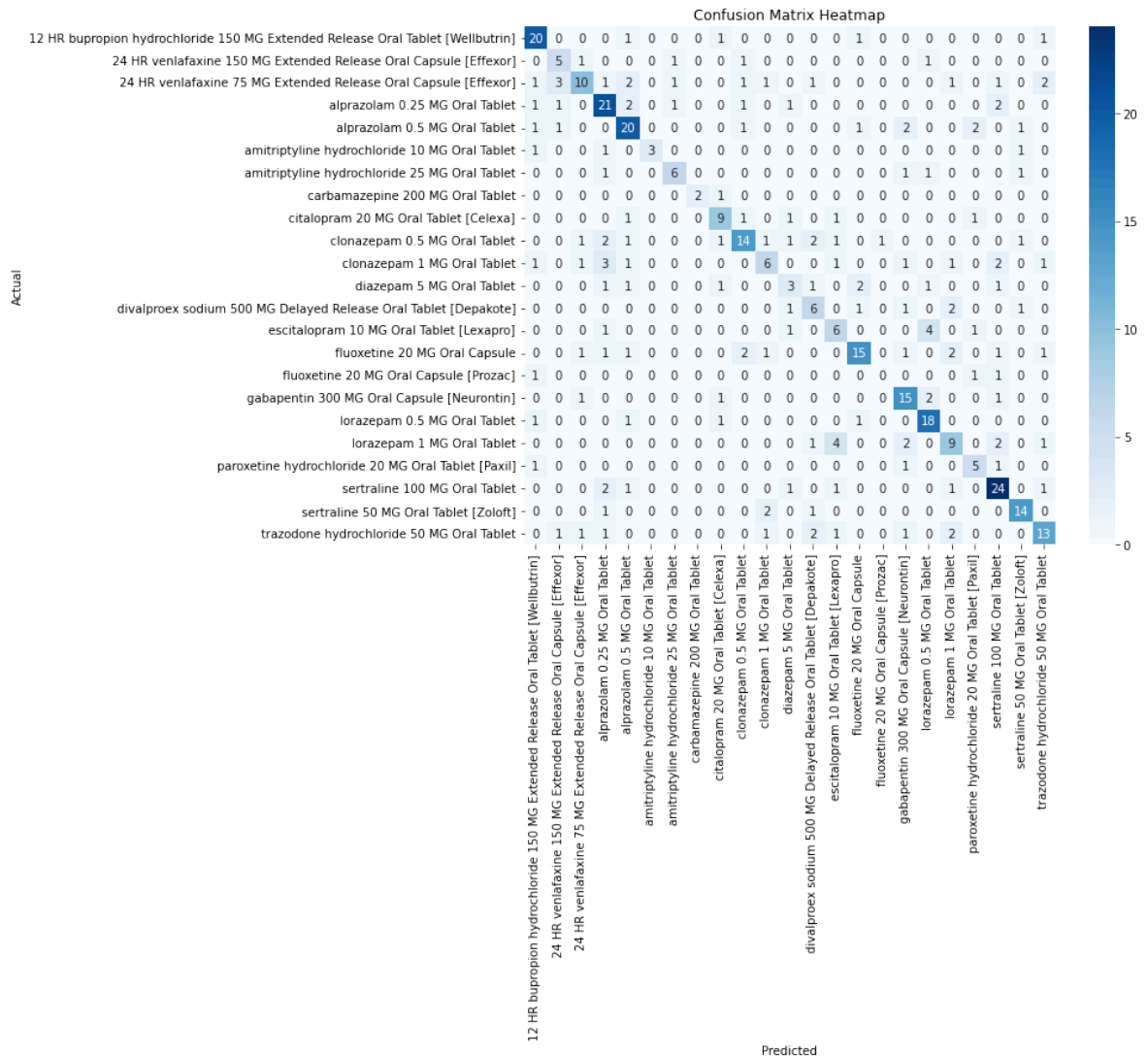
```

In [23]: # test the best Logistic Regression model to see its performance
countmodel.c2c_evaluate_logreg()

```

Test Accuracy: 0.61





```
In [24]: # try using less columns (focus on the top condition pairs)
paircountsplit = PredictaVie_SplitData(paircount[['person_id', 'MALE', 'FEMALE',
pairbinsplit = PredictaVie_SplitData(pairbin[['person_id', 'MALE', 'FEMALE', 'la

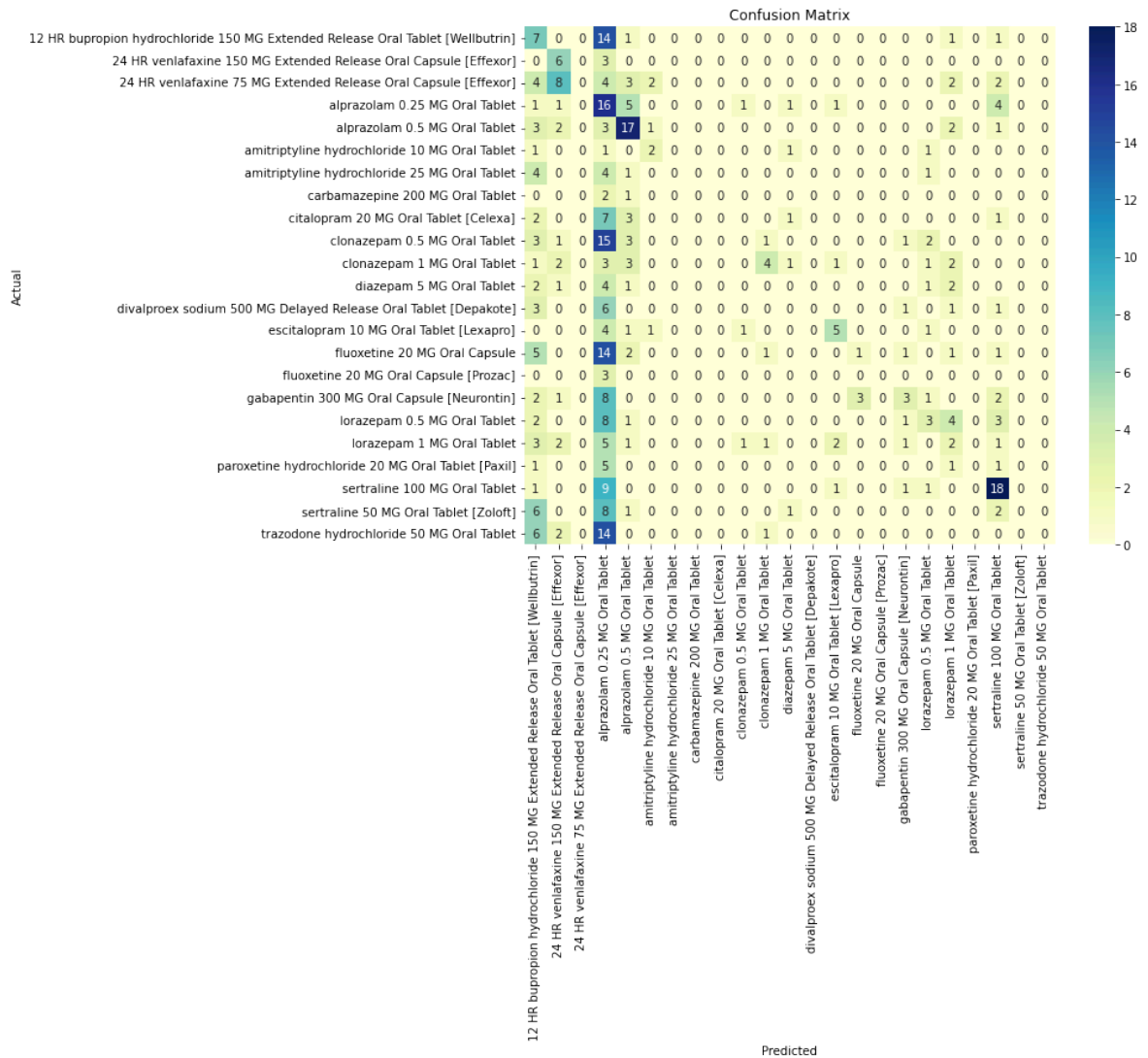
# Split data
x_train, x_test, y_train, y_test = paircountsplit.c2c_split_data() # for count a
X_train, X_test, Y_train, Y_test = pairbinsplit.c2c_split_data() # for binary da

# Load the model package
countmodel = PredictaVie_Model(x_train, y_train, x_test, y_test)
binmodel = PredictaVie_Model(X_train, Y_train, X_test, Y_test)
```

```
In [25]: # Use Gridsearch to build and find the best XGBoost model
binmodel.c2c_train_xgb()

# test the best XGBoost model to see its performance
binmodel.c2c_evaluate_xgb()
```

Best parameters: {'learning\_rate': 0.1, 'max\_depth': 3, 'n\_estimators': 100}  
Best cross-validation accuracy: 0.25625  
Test Accuracy: 0.21



```
In [26]: # Use Gridsearch to build and find the best Logistic Regression model
countmodel.c2c_train_logreg()

# test the best Logistic Regression model to see its performance
countmodel.c2c_evaluate_logreg()
```

```
/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py:547: FitFailedWarning:
390 fits failed out of a total of 600.
The score on these train-test partitions for these parameters will be set to nan.
If these failures are not expected, you can try to debug them by setting error_score='raise'.
```

Below are more details about the failures:

-----

30 fits failed with the following error:

Traceback (most recent call last):

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
```

```
ValueError: Solver newton-cg supports only 'l2' or None penalties, got l1 penalty.
```

-----

30 fits failed with the following error:

Traceback (most recent call last):

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
```

```
ValueError: Solver lbfgs supports only 'l2' or None penalties, got l1 penalty.
```

-----

30 fits failed with the following error:

Traceback (most recent call last):

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
```

```
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
```

```
ValueError: Solver sag supports only 'l2' or None penalties, got l1 penalty.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
ValueError: Solver newton-cg supports only 'l2' or None penalties, got elasticnet penalty.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
ValueError: Solver lbfgs supports only 'l2' or None penalties, got elasticnet penalty.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 75, in _check_solver
    raise ValueError(
ValueError: Only 'saga' solver supports elasticnet penalty, got solver=liblinear.
```

```
-----
30 fits failed with the following error:
Traceback (most recent call last):
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 147
```

```

4, in wrapper
    return fit_method(estimator, *args, **kwargs)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1172, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 67, in _check_solver
    raise ValueError(
ValueError: Solver sag supports only 'l2' or None penalties, got elasticnet penalty.

```

-----

30 fits failed with the following error:

Traceback (most recent call last):

```

File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1474, in wrapper
    return fit_method(estimator, *args, **kwargs)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/linear_model/_logistic.py", line 1182, in fit
    raise ValueError("l1_ratio must be specified when penalty is elasticnet.")
ValueError: l1_ratio must be specified when penalty is elasticnet.

```

-----

150 fits failed with the following error:

Traceback (most recent call last):

```

File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_validation.py", line 895, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 1467, in wrapper
    estimator._validate_params()
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/base.py", line 666, in _validate_params
    validate_parameter_constraints(
File "/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/utils/_param_validation.py", line 95, in validate_parameter_constraints
    raise InvalidParameterError(
sklearn.utils._param_validation.InvalidParameterError: The 'penalty' parameter of LogisticRegression must be a str among {'l1', 'elasticnet', 'l2'} or None. Got 'none' instead.

```

```

warnings.warn(some_fits_failed_message, FitFailedWarning)
/home/cdsdw/.local/lib/python3.9/site-packages/sklearn/model_selection/_search.py:1051: UserWarning: One or more of the test scores are non-finite: [
nan
nan 0.08125      nan 0.099375 0.11125  0.10625  0.136875
0.139375 0.15625      nan      nan      nan      nan      nan
      nan      nan      nan      nan      nan      nan 0.09875      nan
0.1475   0.119375 0.115   0.13      0.14125  0.15125      nan      nan
      nan      nan      nan      nan      nan      nan      nan      nan
      nan      nan 0.11375      nan 0.156875 0.113125 0.119375 0.115625
0.1425   0.159375      nan      nan      nan      nan      nan      nan
      nan      nan      nan      nan      nan      nan 0.113125      nan
0.15625 0.1125   0.12      0.109375 0.141875 0.155625      nan      nan
      nan      nan      nan      nan      nan      nan      nan      nan
      nan      nan 0.108125      nan 0.154375 0.1125   0.12      0.10875
0.141875 0.150625      nan      nan      nan      nan      nan      nan
      nan      nan      nan      nan      nan      nan 0.1075      nan

```

0.150625	0.11125	0.11875	0.108125	0.139375	0.15125	nan	nan
nan	nan	nan	nan	nan	nan	nan	nan]

warnings.warn(

Best Parameters: {'C': 0.1, 'penalty': 'l2', 'solver': 'saga'}

Feature Weights in the Best Model:

MALE: 0.0006056550010167796

FEMALE: 0.0010572218335059478

citalopram 20 MG Oral Tablet Celexa -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.01994356697750418

sertraline 50 MG Oral Tablet Zoloft -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.0034611918886186866

fluoxetine 20 MG Oral Capsule -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.0015193336114342761

diazepam 5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.008195895321267322

alprazolam 0.25 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.00976407252572644

trazodone hydrochloride 50 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.011825717531399509

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.0059458994833126826

amitriptyline hydrochloride 25 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.0035974171171045018

lorazepam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.009130251742824128

paroxetine hydrochloride 20 MG Oral Tablet Paxil -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.006803096047380356

sertraline 100 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.009755473253764775

24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.011784060235444042

gabapentin 300 MG Oral Capsule Neurontin -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.005602087186800489

fluoxetine 20 MG Oral Capsule Prozac -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.01047491085591525

clonazepam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.011771086270665065

lorazepam 1 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.005874027098534865

24 HR venlafaxine 75 MG Extended Release Oral Capsule Effexor -> 24 HR venlafaxine 150 MG Extended Release Oral Capsule Effexor: -0.007824009980801036

alprazolam 0.5 MG Oral Tablet -> 12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin: 0.0025522878345835553

12 HR bupropion hydrochloride 150 MG Extended Release Oral Tablet Wellbutrin -> diazepam 5 MG Oral Tablet: 0.00696226792267473

lorazepam 0.5 MG Oral Tablet -> lorazepam 1 MG Oral Tablet: -0.003088411965185653

Test Accuracy: 0.12

### Confusion Matrix Heatmap

