```
┌──────────────┐
│ Hourly Store │
│ Traffic      │
└──────────────┘

┌──────────────┐
│ Marketing    │
│ Events       │
└──────────────┘
                  ┃      ⟶      (  XGBoost  )  ⟶  ┌──────────────┐
┌──────────────┐  ┃             (  Daily    )     │ Daily Traffic│
│ Holidays     │  ┃             (          )      │ Forecast     │
└──────────────┘  ┃                               └──────────────┘
                  ┃                                        │
┌──────────────┐  ┃          ┌──────────────┐  ⇨           │
│ Store        │  ┃          │ PO Dates &   │              ↓
│ Operational  │  ┃          │ Hourly Traffic│     ┌──────────────┐
│ Hour         │  ┃          └──────────────┘      │ Hourly       │
└──────────────┘  ┃                                │ Traffic      │
                                                   └──────────────┘
┌──────────────┐
│ Weekday,     │
│ Month,       │
│ Season       │
└──────────────┘
```

Formula

Traffic ~ marketing_events + holiday_events + weekday_month_season + before_after_special_days

Or,

log(sales) – log(sales_po) ~ marketing_events_diff + holiday_events + weekday_month_season + before_after_special_days

Data input for daily traffic prediction

Store operational hour
This is used to clear hourly traffic so that non-operational hours having "0" IN and OUT traffic.

Weekday, Month, Season
Weekday is Monday, Tuesday, …
Month is January, February, …
Season is ToBlackFriday, days to Black Friday.

Holidays Used in the Model
'MemorialDay', 'IndependenceDay', 'LaborDay', 'ColumbusDay', 'BlackFriday', 'NewYearsDay',
'ChristmasDay', 'VeteransDay', 'Halloween', 'CyberMonday', 'GreenMonday', 'MLKJrDay',
'PresidentsDay', 'NewYearsEve'

Marketing Events
The selected marketing events in the model are: 'KohlsCashEarn', 'KohlsCashRedeem', 'LTO',
'FriendsFamily', 'GPO', 'AFFILIATE_ONLY', 'Associate_Shop', 'BC_Shopping_Pass',
'BMSM_1520_BC', 'BMSM_1520_KC', 'BTS_10_50_GPO', 'Credit_Event',
'DirectMail_Support_Flag', 'Email_Mystery_Offer', 'GPO_CASP_15', 'GPO_CASP_20',
'KC_Shopping_Pass', 'Merch_GPO', 'ONLINE_ONLY', 'PAD_MVC_Burg',
'Radio_Support_Flag', 'TV_Support_Flag', 'Tab_Support_Flag'

XGBoost Daily Model

We use a store-wise model to predict daily traffic for each of the stores. For 1151 stores, we
have a total of 1151 models.

The best hyperparameters used for daily forecast are:
{'n_estimators': 70, 'min_child_weight': 3, 'max_depth': 9, 'gamma': 0.3}

Default XGBoost parameters besides the hyperparameters are:
n_jobs=-1, silent=1, subsample=0.9, eval_metric='rmse'

All the features used in the model:
'AFFILIATE_ONLY', 'Associate_Shop', 'BC_Shopping_Pass', 'BMSM_1520_BC',
'BTS_10_50_GPO', 'Credit_Event', 'DirectMail_Support_Flag', 'Email_Mystery_Offer',
'FriendsFamily', 'GPO', 'GPO_CASP_15', 'GPO_CASP_20', 'KC_Shopping_Pass',
'KohlsCashEarn', 'KohlsCashRedeem', 'Merch_GPO', 'Month_1', 'ONLINE_ONLY',
'PAD_MVC_Burg', 'Radio_Support_Flag', 'TV_Support_Flag', 'Tab_Support_Flag',
'ToBlackFriday', 'WeekAfterBlackFriday', 'WeekAfterNewYear', 'WeekBeforeChristmas1',
'WeekBeforeChristmas2', 'WeekBeforeLaborDay', 'Weekday_0', 'Weekday_1', 'Weekday_2',
'Weekday_3', 'Weekday_4', 'Weekday_5', 'Weekday_6'

Hourly Traffic Prediction From Daily

From daily traffic prediction, we just distribute the daily traffic into different hours. First we assume the hourly traffic percentage with the day is the same as its PO_Date. If we have PO_Date hourly traffic, we just calculate the hourly traffic percentage and we get the hourly prediction from the daily prediction. If we do not have PO_Date hourly traffic, we use a standardized hourly traffic distribution within a day to get hourly traffic prediction from daily prediction.