FBProphet_time_series_forecast

April 25, 2018

```
In [34]: %matplotlib inline
        import pandas as pd
        import numpy as np
        import datetime
        from fbprophet import Prophet
In [35]: df = pd.read_csv('sms_usage.csv',parse_dates=True)
        df.tail()
Out[35]:
                   Date Usage
        835 2018-04-14 55897
        836 2018-04-15 40892
        837 2018-04-16 66625
        838 2018-04-17 45260
        839 2018-04-18 37927
In [36]: df.columns = ['ds', 'y']
In [37]: model = Prophet(daily_seasonality=True,changepoint_prior_scale=0.15,yearly_seasonality=
In [39]: model.fit(df)
/home/multiplexer/anaconda3/envs/py3/lib/python3.6/site-packages/pystan/misc.py:399: FutureWarni
  elif np.issubdtype(np.asarray(v).dtype, float):
Out[39]: <fbprophet.forecaster.Prophet at 0x7f37da6c1e80>
In [40]: model.set_auto_seasonalities()
INFO:fbprophet.forecaster:Found custom seasonality named "weekly", disabling built-in weekly sea
In [41]: future = model.make_future_dataframe(periods=30,freq='D')
In [42]: forecast = model.predict(future)
In [51]: forecast[['ds', 'yhat', 'yhat_lower', 'yhat_upper', 'trend', 'OLD']].head()
```

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Out[51]:
                                                                                       OLD.
                    ds
                                yhat
                                        yhat_lower
                                                        yhat_upper
                                                                            trend
         0 2016-01-01
                        39630.768050 -19355.082733
                                                     100417.396513
                                                                     45840.711411
                                                                                   47139.0
         1 2016-01-02
                       48018.097648 -11343.589670
                                                     110190.685407
                                                                     45906.981207
                                                                                   85312.0
         2 2016-01-03
                        25631.024399 -36213.665612
                                                      87827.240487
                                                                     45973.251003
                                                                                   14301.0
                        34570.274262 -26897.341475
         3 2016-01-04
                                                      96976.152585
                                                                     46039.520799
                                                                                   20510.0
         4 2016-01-05
                       50298.293699 -13296.045877
                                                     111759.534940
                                                                     46105.790594
                                                                                   24225.0
In [44]: forecast['OLD'] = df['y']
In [57]: # forecast['predicted'] = (forecast['yhat_upper']-forecast['yhat']-forecast['yhat_lower
         forecast['predicted'] = ((forecast['yhat_upper']-forecast['trend'])-forecast['yhat_lowe
         forecast.describe()
Out [57]:
                                                                              yhat_upper
                        trend
                                trend_lower
                                               trend_upper
                                                              yhat_lower
         count
                  870.000000
                                 870.000000
                                                870.000000
                                                              870.000000
                                                                              870.000000
                                                                           123159.387494
                68034.548446
                               68033.936920
                                              68035.221111
                                                             2580.559089
         mean
         std
                 9783.244151
                                9782.856683
                                               9783.672931
                                                            12862.568998
                                                                            12868.757801
                45840.711411
                               45840.711411
                                              45840.711411 -37776.284567
                                                                            84736.035005
         min
         25%
                60250.173751
                               60250.173751
                                              60250.173751
                                                            -6604.054894
                                                                           114103.527120
                74270.475770
                               74246.691912
                                              74293.053239
                                                             4408.825960
                                                                           125391.316296
         50%
         75%
                75800.435712
                               75800.435712
                                              75800.435712
                                                            13058.428047
                                                                           133836.409045
         max
                77219.673922
                               77219.673922
                                             77219.673922
                                                            26573.447875
                                                                           146584.176373
                        daily
                                daily_lower
                                               daily_upper
                                                                           seasonal_lower
                                                                seasonal
                8.700000e+02 8.700000e+02 8.700000e+02
         count
                                                              870.000000
                                                                               870.000000
               -5.069853e+03 -5.069853e+03 -5.069853e+03
                                                            -5062.908990
                                                                             -5062.908990
         mean
         std
                1.820036e-12
                              1.820036e-12
                                             1.820036e-12
                                                             7873.455855
                                                                              7873.455855
               -5.069853e+03 -5.069853e+03 -5.069853e+03 -20342.226603
         min
                                                                            -20342.226603
         25%
               -5.069853e+03 -5.069853e+03 -5.069853e+03 -11469.246537
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               -5.069853e+03 -5.069853e+03 -5.069853e+03
         50%
                                                            -2548.516616
                                                                             -2548.516616
                -5.069853e+03 -5.069853e+03 -5.069853e+03
         75%
                                                             2111.116441
                                                                              2111.116441
               -5.069853e+03 -5.069853e+03 -5.069853e+03
                                                             4192.503105
                                                                              4192.503105
         max
                                                 seasonalities_lower
                seasonal_upper
                                 seasonalities
                     870.000000
                                    870.000000
                                                          870.000000
         count
                   -5062.908990
                                  -5062.908990
                                                        -5062.908990
         mean
                   7873.455855
                                   7873.455855
                                                         7873.455855
         std
                  -20342.226603
                                 -20342.226603
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         min
         25%
                 -11469.246537
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         50%
                   -2548.516616
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                    2111.116441
                                   2111.116441
                                                         2111.116441
         75%
                   4192.503105
                                   4192.503105
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         max
                seasonalities_upper
                                            weekly
                                                    weekly_lower
                                                                    weekly_upper
                          870.000000
                                        870.000000
                                                       870.000000
                                                                      870.000000
         count
                        -5062.908990
                                           6.943538
                                                         6.943538
                                                                        6.943538
         mean
                         7873.455855
                                       7873.455855
                                                      7873.455855
                                                                     7873.455855
         std
                       -20342.226603 -15272.374075 -15272.374075 -15272.374075
         min
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25%
                      -11469.246537 -6399.394009 -6399.394009 -6399.394009
         50%
                      -2548.516616
                                     2521.335912
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                                                                  2521.335912
        75%
                       2111.116441
                                     7180.968969
                                                   7180.968969
                                                                 7180.968969
                       4192.503105
                                     9262.355633
                                                    9262.355633
                                                                 9262.355633
         max
                       yhat
                                        OLD
                                               predicted
                 870.000000
                                 840.000000
                                               870.000000
         count
         mean
               62971.639456
                               62745.089286
                                             52544.279959
         std
               12573.311002
                               48849.474507
                                             10326.796094
        min
               25631.024399
                               2737.000000
                                            35623.349243
         25%
               54496.808807
                               36651.750000
                                             44580.913313
         50%
               64700.419616
                               52852.500000
                                             48785.229368
         75%
               73628.663118
                               74907.750000
                                             60359.941927
               81388.555218 645130.000000
                                            80990.159074
        max
In [58]: print(forecast.columns)
        forecast['OLD'].corr(forecast['predicted'])
Index(['ds', 'trend', 'trend_lower', 'trend_upper', 'yhat_lower', 'yhat_upper',
       'daily', 'daily_lower', 'daily_upper', 'seasonal', 'seasonal_lower',
       'seasonal_upper', 'seasonalities', 'seasonalities_lower',
       'seasonalities_upper', 'weekly', 'weekly_lower', 'weekly_upper', 'yhat',
       'OLD', 'predicted'],
      dtype='object')
Out [58]: -0.2046565256946557
In [60]: forecast.to_csv('sms_predicted.csv')
        forecast.tail(40)
Out[60]:
                     ds
                               trend
                                       trend_lower
                                                     trend_upper
                                                                     yhat_lower \
        830 2018-04-09
                        74503.311227 74503.311227
                                                    74503.311227
                                                                    3277.807370
        831 2018-04-10
                        74495.437940 74495.437940 74495.437940 14248.256017
        832 2018-04-11
                        74487.564653
                                      74487.564653
                                                    74487.564653
                                                                   13987.459843
        833 2018-04-12
                        74479.691367
                                      74479.691367
                                                    74479.691367
                                                                   10695.649782
        834 2018-04-13
                        74471.818080
                                      74471.818080
                                                    74471.818080
                                                                   11904.708198
        835 2018-04-14 74463.944794 74463.944794 74463.944794
                                                                   12804.175253
         836 2018-04-15
                        74456.071507
                                      74456.071507
                                                    74456.071507
                                                                   -3519.469248
        837 2018-04-16 74448.198220 74448.198220 74448.198220
                                                                    2653.421399
        838 2018-04-17
                        74440.324934 74440.324934 74440.324934
                                                                   20832.188681
        839 2018-04-18 74432.451647
                                      74432.451647
                                                    74432.451647
                                                                   11796.397746
        840 2018-04-19
                        74424.578361
                                      74424.578361 74424.578361
                                                                    9160.477302
        841 2018-04-20
                        74416.705074
                                      74416.705074
                                                    74416.705074
                                                                    5441.006959
        842 2018-04-21 74408.831787
                                      74408.831787
                                                    74408.831787
                                                                   16210.649713
        843 2018-04-22
                        74400.958501
                                      74400.958501 74400.958501 -11526.605972
        844 2018-04-23 74393.085214 74393.085214 74393.085214
                                                                    1220.203080
        845 2018-04-24
                        74385.211928 74385.211928 74385.211928
                                                                   26573.447875
        846 2018-04-25 74377.338641 74377.338641 74377.338641 16367.995301
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847 2018-04-26 74369.465354 74369.464675 74369.786846 15173.674830
848 2018-04-27
               74361.592068 74361.197749 74362.817450
                                                           5446.039510
849 2018-04-28
                            74352.401551 74356.157886
               74353.718781
                                                         15314.577125
850 2018-04-29
               74345.845495
                             74342.919636
                                           74349.756288
                                                         -9251.996007
851 2018-04-30
               74337.972208
                             74333.699844
                                           74343.324472
                                                           3258.832266
852 2018-05-01
               74330.098921
                             74324.112898
                                           74337.918775
                                                         16740.201332
853 2018-05-02
               74322.225635
                             74313.839269
                                           74332.138948
                                                         13089.545122
854 2018-05-03
               74314.352348
                            74302.898331
                                           74326.218302
                                                         11763.588910
855 2018-05-04
               74306.479062
                            74292.013954
                                           74322.249864
                                                           8806.556948
856 2018-05-05
               74298.605775
                             74281.601307
                                           74316.185695
                                                         16548.227927
857 2018-05-06
               74290.732488
                             74271.633831
                                           74309.245919
                                                         -7258.017047
858 2018-05-07
               74282.859202
                            74261.994338
                                           74303.371492
                                                           3841.205362
               74274.985915
                             74251.720829
                                           74299.557121
                                                         16852.476481
859 2018-05-08
860 2018-05-09
               74267.112629
                             74241.662996
                                           74295.427761
                                                         11826.168188
861 2018-05-10 74259.239342 74230.224297
                                           74290.678717
                                                         18896.126453
862 2018-05-11 74251.366055 74219.602466 74285.866754
                                                           9549.332444
863 2018-05-12 74243.492769
                             74209.299216 74283.163188
                                                         18251.343960
864 2018-05-13 74235.619482 74197.948824 74278.001755
                                                          -3002.902364
865 2018-05-14 74227.746195
                            74186.304619
                                           74273.908967
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866 2018-05-15 74219.872909
                             74174.677572
                                           74268.863862
                                                          22062.815414
867 2018-05-16 74211.999622
                             74163.802904
                                           74265.527125
                                                           8804.192247
868 2018-05-17 74204.126336
                            74150.779450
                                           74262.578347
                                                         11920.205716
869 2018-05-18 74196.253049 74139.934251 74258.235096
                                                           8802.371182
                          daily daily_lower daily_upper
        yhat_upper
                                                               seasonal
830
    123069.199636 -5069.852528 -5069.852528 -5069.852528 -11469.246537
    135983.717860 -5069.852528 -5069.852528 -5069.852528
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                                                            4192.503105
    139030.047072 -5069.852528 -5069.852528 -5069.852528
                                                           -1222.654126
833
    133696.614342 -5069.852528 -5069.852528 -5069.852528
                                                           -2548.516616
    131766.519972 -5069.852528 -5069.852528 -5069.852528
                                                           -6209.943361
    137012.991612 -5069.852528 -5069.852528 -5069.852528
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                                                            2111.116441
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    114371.885588 -5069.852528 -5069.852528 -5069.852528 -20342.226603
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    118287.066228 -5069.852528 -5069.852528 -5069.852528 -11469.246537
    138877.141918 -5069.852528 -5069.852528 -5069.852528
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    131976.301285 -5069.852528 -5069.852528 -5069.852528
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    129691.677773 -5069.852528 -5069.852528 -5069.852528
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841
    130035.605371 -5069.852528 -5069.852528 -5069.852528
                                                           -6209.943361
    136382.085102 -5069.852528 -5069.852528 -5069.852528
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    110342.287342 -5069.852528 -5069.852528 -5069.852528 -20342.226603
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    122810.460097 -5069.852528 -5069.852528 -5069.852528 -11469.246537
    140785.730636 -5069.852528 -5069.852528 -5069.852528
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    132959.201392 -5069.852528 -5069.852528 -5069.852528
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     128081.165874 -5069.852528 -5069.852528 -5069.852528
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    124559.747399 -5069.852528 -5069.852528 -5069.852528
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    133031.023853 -5069.852528 -5069.852528 -5069.852528
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    111063.386311 -5069.852528 -5069.852528 -5069.852528 -20342.226603
851
    121247.705697 -5069.852528 -5069.852528 -5069.852528 -11469.246537
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853
     131092.229544 -5069.852528 -5069.852528 -5069.852528
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    134452.358435 -5069.852528 -5069.852528 -5069.852528
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     128759.418798 -5069.852528 -5069.852528 -5069.852528
                                                             -6209.943361
     133215.601028 -5069.852528 -5069.852528 -5069.852528
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     115050.039071 -5069.852528 -5069.852528 -5069.852528 -20342.226603
     123555.111285 -5069.852528 -5069.852528 -5069.852528 -11469.246537
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     137704.757569 -5069.852528 -5069.852528 -5069.852528
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     135234.543398 -5069.852528 -5069.852528 -5069.852528
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     131771.137895 -5069.852528 -5069.852528 -5069.852528
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     144202.875033 -5069.852528 -5069.852528 -5069.852528
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     126430.468084 -5069.852528 -5069.852528 -5069.852528
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                     -11469.246537
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                                      4192.503105
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852
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                      -2548.516616
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                    -11469.246537
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861
                      -6209.943361
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862
863
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                     -20342.226603
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864
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                     -11469.246537
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866
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                      -1222.654126
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867
868
                      -2548.516616
                                      -2548.516616
                                                            -2548.516616
                      -6209.943361
                                      -6209.943361
                                                            -6209.943361
869
                                          weekly_lower
                                                         weekly_upper
     seasonalities_upper
                                  weekly
                                          -6399.394009
                                                         -6399.394009
830
            -11469.246537
                           -6399.394009
831
              4192.503105
                            9262.355633
                                           9262.355633
                                                          9262.355633
832
            -1222.654126
                            3847.198402
                                           3847.198402
                                                          3847.198402
833
            -2548.516616
                            2521.335912
                                           2521.335912
                                                          2521.335912
834
            -6209.943361
                           -1140.090833
                                          -1140.090833
                                                         -1140.090833
              2111.116441
                            7180.968969
                                           7180.968969
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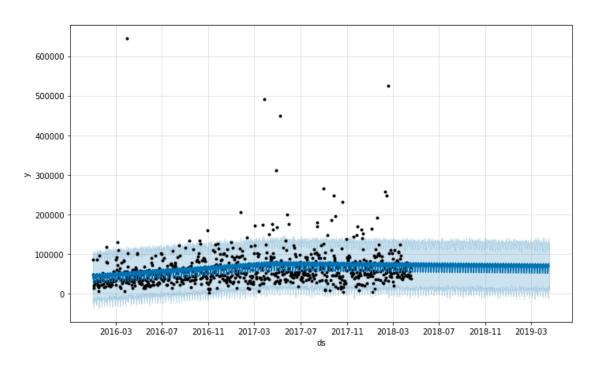
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```

```
[40 rows x 21 columns]
```

In [48]: np.mean((forecast['predicted'].head(838)-forecast['OLD'].head(838))**2)

Out[48]: 2916775116.4796305

In [32]: model.plot(forecast);



In [42]: model.plot_components(forecast);

