Time-Series-Forecasting-using-prophet- (/github/Mitali-Juvekar/Time-Series-Forecasting-using-prophet-/tree/main)
/
Time_series_forecasting_using _prophet.ipynb (/github/Mitali-Juvekar/Time-Series-Forecasting-using-prophet-/tree/main/Time_series_forecasting_using _prophet.ipynb)

## install and import dependencies

In [1]: 
```
pip install pystan
```

```
Requirement already satisfied: pystan in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages (3.3.0)
Requirement already satisfied: aiohttp<4.0,>=3.6 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from pystan) (3.8.6)
Requirement already satisfied: clikit<0.7,>=0.6 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packag
es (from pystan) (0.6.2)
Requirement already satisfied: httpstan<4.7,>=4.6 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-pack
ages (from pystan) (4.6.1)
Requirement already satisfied: numpy<2.0,>=1.7 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-package
s (from pystan) (1.21.6)
Requirement already satisfied: pysimdjson<4.0,>=3.2 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-pa
ckages (from pystan) (3.2.0)
Requirement already satisfied: attrs>=17.3.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from aiohttp<4.0,>=3.6->pystan) (23.1.0)
Requirement already satisfied: charset-normalizer<4.0,>=2.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.
7/site-packages (from aiohttp<4.0,>=3.6->pystan) (2.0.12)
Requirement already satisfied: multidict<7.0,>=4.5 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-pac
kages (from aiohttp<4.0,>=3.6->pystan) (6.0.5)
Requirement already satisfied: async-timeout<5.0,>=4.0.0a3 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/
site-packages (from aiohttp<4.0,>=3.6->pystan) (4.0.3)
Requirement already satisfied: yarl<2.0,>=1.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from aiohttp<4.0,>=3.6->pystan) (1.9.4)
Requirement already satisfied: frozenlist>=1.1.1 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from aiohttp<4.0,>=3.6->pystan) (1.3.3)
Requirement already satisfied: aiosignal>=1.1.2 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packag
es (from aiohttp<4.0,>=3.6->pystan) (1.3.1)
Requirement already satisfied: asynctest==0.13.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from aiohttp<4.0,>=3.6->pystan) (0.13.0)
Requirement already satisfied: typing-extensions>=3.7.4 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/sit
e-packages (from aiohttp<4.0,>=3.6->pystan) (4.4.0)
Requirement already satisfied: crashtest<0.4.0,>=0.3.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site
-packages (from clikit<0.7,>=0.6->pystan) (0.3.1)
Requirement already satisfied: pastel<0.3.0,>=0.2.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-pa
ckages (from clikit<0.7,>=0.6->pystan) (0.2.1)
Requirement already satisfied: pylev<2.0,>=1.3 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-package
s (from clikit<0.7,>=0.6->pystan) (1.4.0)
Requirement already satisfied: appdirs<2.0,>=1.4 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from httpstan<4.7,>=4.6->pystan) (1.4.4)
Requirement already satisfied: marshmallow<4.0,>=3.10 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-
packages (from httpstan<4.7,>=4.6->pystan) (3.19.0)
Requirement already satisfied: setuptools>=41.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packag
es (from httpstan<4.7,>=4.6->pystan) (68.0.0)
Requirement already satisfied: webargs<9.0,>=8.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from httpstan<4.7,>=4.6->pystan) (8.3.0)
Requirement already satisfied: importlib-metadata in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-pack
ages (from attrs>=17.3.0->aiohttp<4.0,>=3.6->pystan) (4.13.0)
Requirement already satisfied: packaging>=17.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-package
s (from marshmallow<4.0,>=3.10->httpstan<4.7,>=4.6->pystan) (23.2)
Requirement already satisfied: idna>=2.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages (fro
m yarl<2.0,>=1.0->aiohttp<4.0,>=3.6->pystan) (3.6)
Requirement already satisfied: zipp>=0.5 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages (fro
m importlib-metadata->attrs>=17.3.0->aiohttp<4.0,>=3.6->pystan) (3.15.0)
Note: you may need to restart the kernel to use updated packages.
```

In [2]: 
```
pip install prophet
```

```
Requirement already satisfied: prophet in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages (1.1.
5)
Requirement already satisfied: cmdstanpy>=1.0.4 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packag
es (from prophet) (1.1.0)
Requirement already satisfied: numpy>=1.15.4 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from prophet) (1.21.6)
Requirement already satisfied: matplotlib>=2.0.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from prophet) (3.5.3)
Requirement already satisfied: pandas>=1.0.4 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from prophet) (1.3.5)
Requirement already satisfied: holidays>=0.25 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from prophet) (0.27.1)
Requirement already satisfied: tqdm>=4.36.1 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from prophet) (4.66.1)
Requirement already satisfied: importlib-resources in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-pac
kages (from prophet) (5.12.0)
Requirement already satisfied: python-dateutil in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-package
s (from holidays>=0.25->prophet) (2.8.2)
Requirement already satisfied: cycler>=0.10 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from matplotlib>=2.0.0->prophet) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from matplotlib>=2.0.0->prophet) (4.38.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from matplotlib>=2.0.0->prophet) (1.4.5)
Requirement already satisfied: packaging>=20.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-package
s (from matplotlib>=2.0.0->prophet) (23.2)
Requirement already satisfied: pillow>=6.2.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from matplotlib>=2.0.0->prophet) (9.2.0)
Requirement already satisfied: pyparsing>=2.2.1 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packag
es (from matplotlib>=2.0.0->prophet) (3.1.1)
Requirement already satisfied: pytz>=2017.3 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages
(from pandas>=1.0.4->prophet) (2023.3.post1)
Requirement already satisfied: zipp>=3.1.0 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages (f
rom importlib-resources->prophet) (3.15.0)
Requirement already satisfied: typing-extensions in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packa
ges (from kiwisolver>=1.0.1->matplotlib>=2.0.0->prophet) (4.4.0)
Requirement already satisfied: six>=1.5 in /Library/Frameworks/Python.framework/Versions/3.7/lib/python3.7/site-packages (from
python-dateutil->holidays>=0.25->prophet) (1.15.0)
Note: you may need to restart the kernel to use updated packages.
```

In [3]:
```python
import warnings;
warnings.simplefilter('ignore')
```

In [4]:
```python
import pandas as pd
from prophet import Prophet
```

# preparing data

In [5]:
```python
df = pd.read_csv("/Users/mitalijuvekar/Documents/dataset.csv")
```

In [6]:
```python
df.head()
```

Out[6]:

|   | Time Date | Product | Store | Value |
|---|-----------|---------|-------|-------|
| 0 | 1012018 | 2667437 | QLD_CW_ST0203 | 2926.000 |
| 1 | 2012018 | 2667437 | QLD_CW_ST0203 | 2687.531 |
| 2 | 3012018 | 2667437 | QLD_CW_ST0203 | 2793.000 |
| 3 | 4012018 | 2667437 | QLD_CW_ST0203 | 2394.000 |
| 4 | 5012018 | 2667437 | QLD_CW_ST0203 | 2660.000 |

In [7]:
```python
df['Product'].unique()
```

Out[7]: array([2667437])

In [8]:
```python
df['Store'].unique()
```

Out[8]: array(['QLD_CW_ST0203'], dtype=object)

In [9]:
```python
df.dtypes
```

Out[9]:
```
Time Date      int64
Product        int64
Store         object
Value        float64
dtype: object
```

```
In [10]: #need to change Time Date
         df['Year'] = df['Time Date'].apply(lambda x: str(x)[-4:])
         df['Month'] = df['Time Date'].apply(lambda x: str(x)[-6:-4])
         df['Day'] = df['Time Date'].apply(lambda x: str(x)[:-6])
         df['Date'] = pd.DatetimeIndex(df['Year'] + '-' + df['Month'] + '-' + df['Day'])
```

```
In [11]: print(df)
```

```
         Time Date   Product          Store      Value   Year Month Day  \
0         1012018   2667437  QLD_CW_ST0203  2926.000000   2018    01   1
1         2012018   2667437  QLD_CW_ST0203  2687.531000   2018    01   2
2         3012018   2667437  QLD_CW_ST0203  2793.000000   2018    01   3
3         4012018   2667437  QLD_CW_ST0203  2394.000000   2018    01   4
4         5012018   2667437  QLD_CW_ST0203  2660.000000   2018    01   5
...          ...       ...            ...          ...    ...   ...  ..
1075     12122020   2667437  QLD_CW_ST0203  3167.594500   2020    12  12
1076     13122020   2667437  QLD_CW_ST0203  3167.594500   2020    12  13
1077     14122020   2667437  QLD_CW_ST0203  3383.354511   2020    12  14
1078     15122020   2667437  QLD_CW_ST0203  2714.591329   2020    12  15
1079     16122020   2667437  QLD_CW_ST0203  2585.035107   2020    12  16

            Date
0     2018-01-01
1     2018-01-02
2     2018-01-03
3     2018-01-04
4     2018-01-05
...          ...
1075  2020-12-12
1076  2020-12-13
1077  2020-12-14
1078  2020-12-15
1079  2020-12-16

[1080 rows x 8 columns]
```

```
In [12]: df.drop(['Time Date', 'Product', 'Store', 'Year', 'Month', 'Day'], axis = 1, inplace = True)
         df.columns = ['y', 'ds']
```

```
In [13]: df.head()
```

Out[13]:

|   | y | ds |
|---|---|---|
| 0 | 2926.000 | 2018-01-01 |
| 1 | 2687.531 | 2018-01-02 |
| 2 | 2793.000 | 2018-01-03 |
| 3 | 2394.000 | 2018-01-04 |
| 4 | 2660.000 | 2018-01-05 |

# training model

```
In [14]: model = Prophet(interval_width = 0.95, daily_seasonality = True)
         model.fit(df)
```

```
21:24:35 - cmdstanpy - INFO - Chain [1] start processing
21:24:35 - cmdstanpy - INFO - Chain [1] done processing
```

Out[14]: <prophet.forecaster.Prophet at 0x7fc5008347d0>

# forecasting

```
In [15]: future_dates = model.make_future_dataframe(periods=100, freq='D')
         forecast = model.predict(future_dates)
```

```
In [16]: forecast.head()
```

Out[16]:

| | ds | trend | yhat_lower | yhat_upper | trend_lower | trend_upper | additive_terms | additive_terms_lower | additive_terms_upper | daily | ... |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2018-01-01 | 3042.594103 | 758.131581 | 3915.625453 | 3042.594103 | 3042.594103 | -638.437544 | -638.437544 | -638.437544 | 472.141955 | ... |
| 1 | 2018-01-02 | 3043.322464 | 654.728697 | 4006.593000 | 3043.322464 | 3043.322464 | -648.635765 | -648.635765 | -648.635765 | 472.141955 | ... |
| 2 | 2018-01-03 | 3044.050824 | 914.789014 | 3963.827390 | 3044.050824 | 3044.050824 | -622.870532 | -622.870532 | -622.870532 | 472.141955 | ... |
| 3 | 2018-01-04 | 3044.779185 | 844.319141 | 4053.873676 | 3044.779185 | 3044.779185 | -575.980886 | -575.980886 | -575.980886 | 472.141955 | ... |
| 4 | 2018-01-05 | 3045.507545 | 828.381296 | 4098.473351 | 3045.507545 | 3045.507545 | -612.050581 | -612.050581 | -612.050581 | 472.141955 | ... |

5 rows × 22 columns

In [17]: `forecast.tail()`

Out[17]:

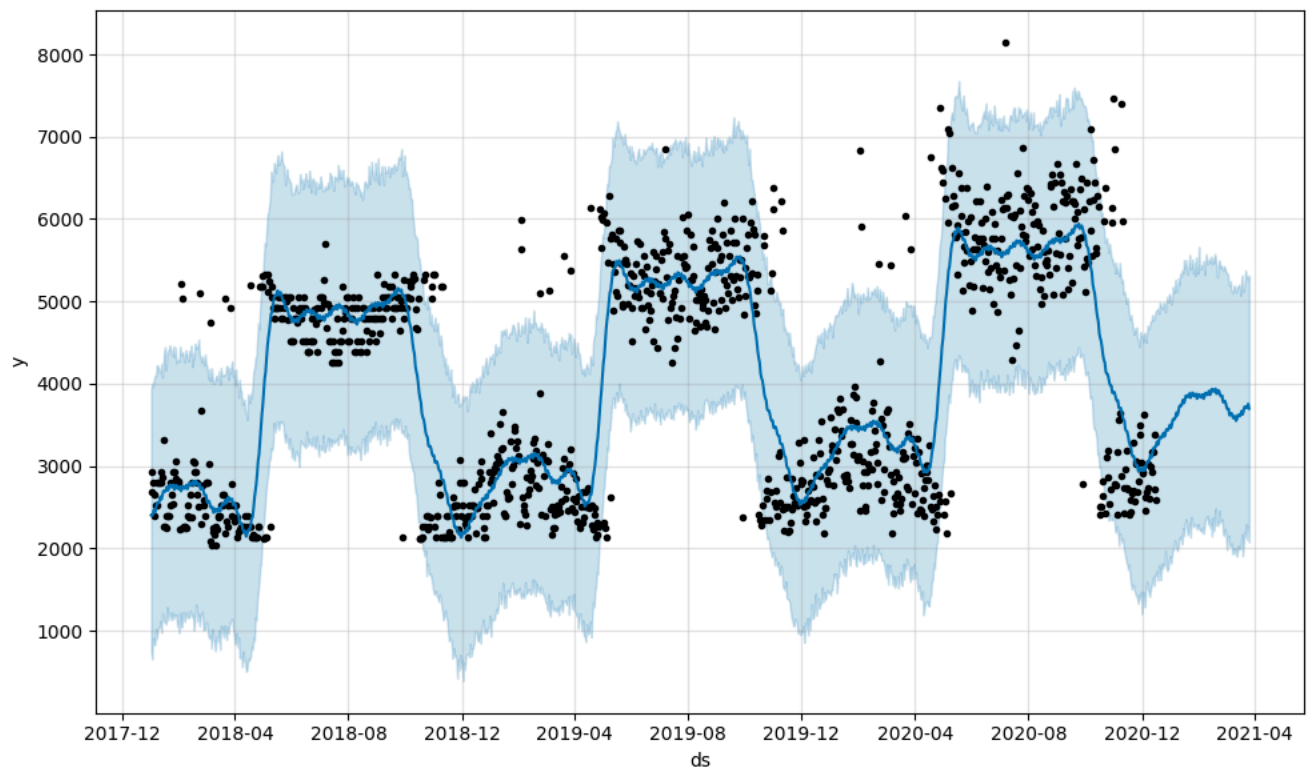| | ds | trend | yhat_lower | yhat_upper | trend_lower | trend_upper | additive_terms | additive_terms_lower | additive_terms_upper | daily |
|---|---|---|---|---|---|---|---|---|---|---|
| 1175 | 2021-03-22 | 4233.955492 | 2135.984375 | 5377.396575 | 4230.406534 | 4237.220717 | -511.103379 | -511.103379 | -511.103379 | 472.141955 |
| 1176 | 2021-03-23 | 4235.029099 | 2294.125235 | 5315.649846 | 4231.426413 | 4238.334922 | -528.550074 | -528.550074 | -528.550074 | 472.141955 |
| 1177 | 2021-03-24 | 4236.102707 | 2107.073932 | 5270.087348 | 4232.462280 | 4239.478720 | -513.999140 | -513.999140 | -513.999140 | 472.141955 |
| 1178 | 2021-03-25 | 4237.176314 | 2271.659787 | 5294.677644 | 4233.475404 | 4240.622518 | -482.796937 | -482.796937 | -482.796937 | 472.141955 |
| 1179 | 2021-03-26 | 4238.249921 | 2076.195858 | 5315.499510 | 4234.453994 | 4241.766315 | -539.396807 | -539.396807 | -539.396807 | 472.141955 |

5 rows × 22 columns

In [18]: `forecast[['ds', 'yhat']]`

Out[18]:
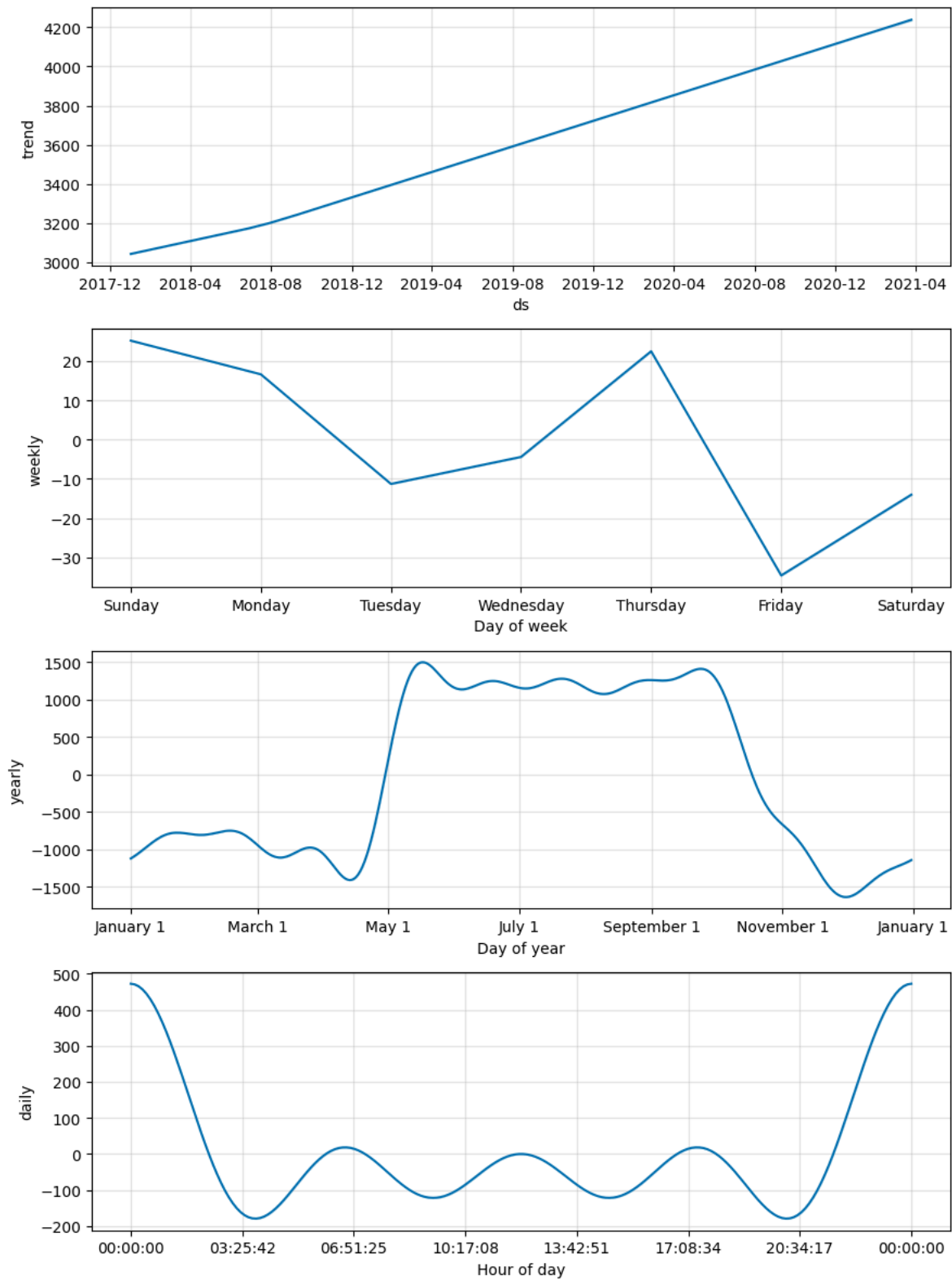
| | ds | yhat |
|---|---|---|
| 0 | 2018-01-01 | 2404.156560 |
| 1 | 2018-01-02 | 2394.686699 |
| 2 | 2018-01-03 | 2421.180292 |
| 3 | 2018-01-04 | 2468.798298 |
| 4 | 2018-01-05 | 2433.456964 |
| ... | ... | ... |
| 1175 | 2021-03-22 | 3722.852114 |
| 1176 | 2021-03-23 | 3706.479026 |
| 1177 | 2021-03-24 | 3722.103567 |
| 1178 | 2021-03-25 | 3754.379377 |
| 1179 | 2021-03-26 | 3698.853114 |

1180 rows × 2 columns

In [19]: `plot1 = model.plot(forecast)`

```
In [20]: # decomposing the above plot
         plot2 = model.plot_components(forecast)
```

In [ ]: