Time Series Prophet

Section overview

Up until now:

- We have considered parametric time-series models (e.g., AR models explicitly predict the future using **linear** combinations of past measurements)

But we can do more!

- We can explicitly model the linear, seasonal components!
- Here, we provide a short introduction to one python module, Prophet, from Facebook which lets you do precisely this!

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Prophet

Prophet is an open source time-series modeling python module developed by Facebook

The idea behind Prophet is to decompose time-series into the following components:

- Trend component, *g(t)*
- Seasonal effects, *s(t)*
- Holidays/one-off-effects (i.e., outliers), *h(t)*

Each of these components contributes *additively* to the model:

$$y(t) = g(t) + s(t) + h(t) + \epsilon(t)$$

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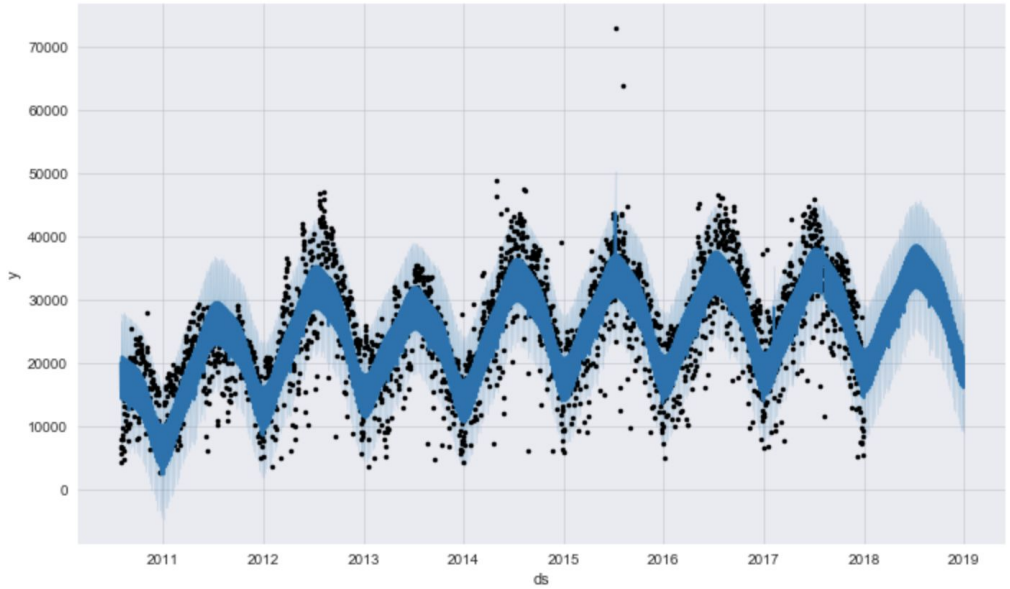
Prophet - quick taster before more details

We can use Prophet to model the number of Santander Bikes borrowed per day:



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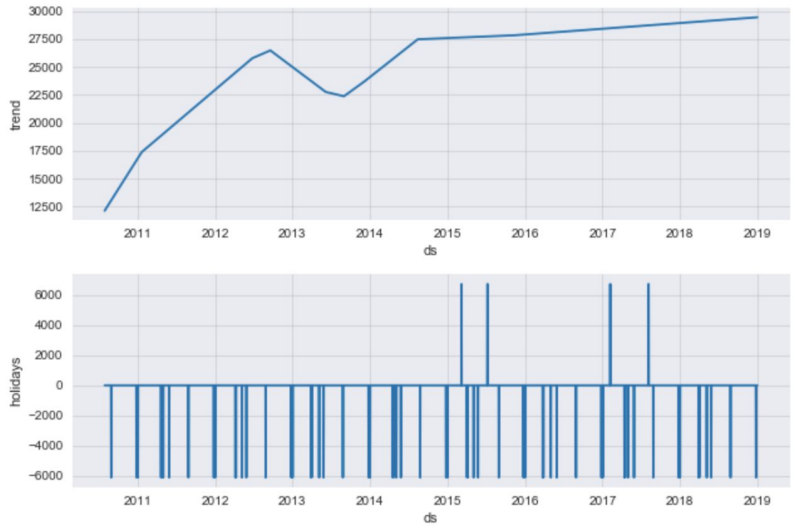
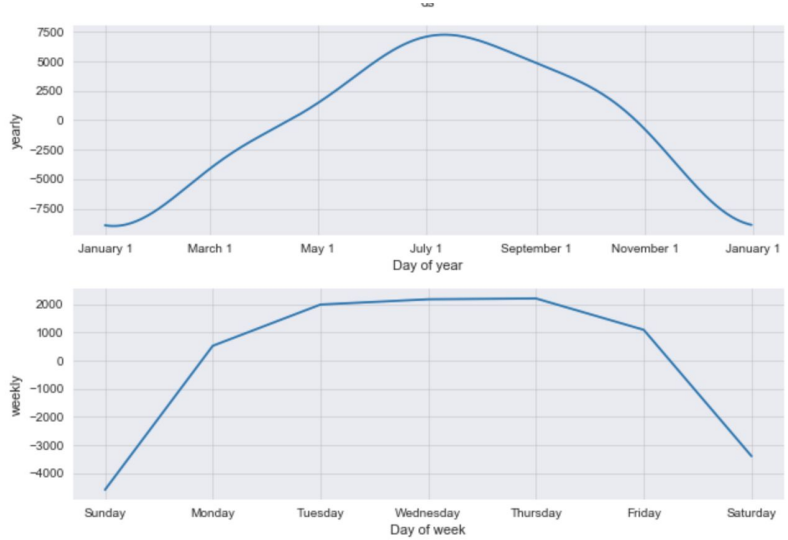
Prophet - quick taster before more details

More importantly, our time-series model consists of a linear, seasonal and holiday effects!





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Prophet - some more details

Linear component:

- uses a linear growth trend together with changepoints (automatically detected)

Seasonal component:

- various seasonal components with varying periodicities (weekly, yearly)

Holidays/outliers:

- manually provided

Prophet

```
# we can fit a Prophet model in a few lines of code!

# load in data:
dat = pd.read_excel('tfl-daily-cycle-hires.xls', sheetname='Data')

# create Prophet object:
forecast_model = Prophet( growth='linear',  weekly_seasonality=3,
yearly_seasonality=3, holidays=all_holidays_strikes )

# fit the model to data:
forecast_model.fit( dat )
```

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Prophet - summary

- Open source python module developed by Facebook
- Allows us to explicitly model time-series data as consisting of a trend, seasonal and holidays/outliers components (all combined *linearly*)

- Further details:
  - See the notebook
  - Also an example on Cambridge Spark website: https://cambridgespark.com/prophet/

Hands-on session

time_series_prophet.ipynb

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