

Sales forecasting

Estimating sales is a fundamental part of resource planning in each company. When an organisation knows how much revenue is to be expected, it can purchase resources, hire personnel and acquire other assets as necessary.

Such strategic planning of a company's investments is one of the key tasks of management. To know which direction resource planning is supposed to take therefore usually relies on accurate "guesses", usually from Sales, to estimate the upcoming revenue.

Yet, there are often hidden factors that humans can not factor in. Seasonality, a change in public perception or even political decisions can easily influence the development of expected sales.

Therefore, by using artificial intelligence we aim to provide highly accurate predictions on how many sales a company can expect. The goal is to understand the expected development of a company and be able to react to it before it happens.

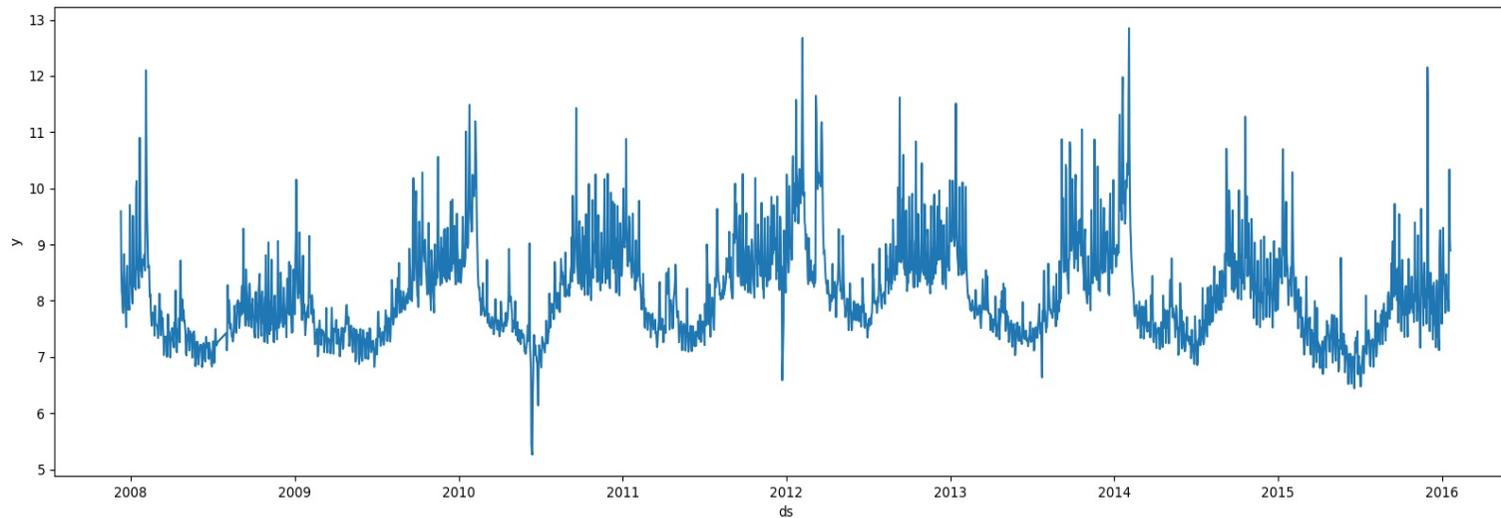
An organisation that combines human experience, current developments with statistical predictions such as our forecasting can derive the most probable outcome and therefore has a highly valid basis for decision making.

That means that such well-informed companies can book or reduce assets (e.g. wares, locations, people) in advance to achieve a high efficiency and availability.

Meta-Data

Algorithm:	Time Series Analysis
Start:	04-Jul-2021 (12:43:45.510893)
Filename:	prophet.csv
Dimensions:	(2905, 2)

GENERAL ANALYTICS



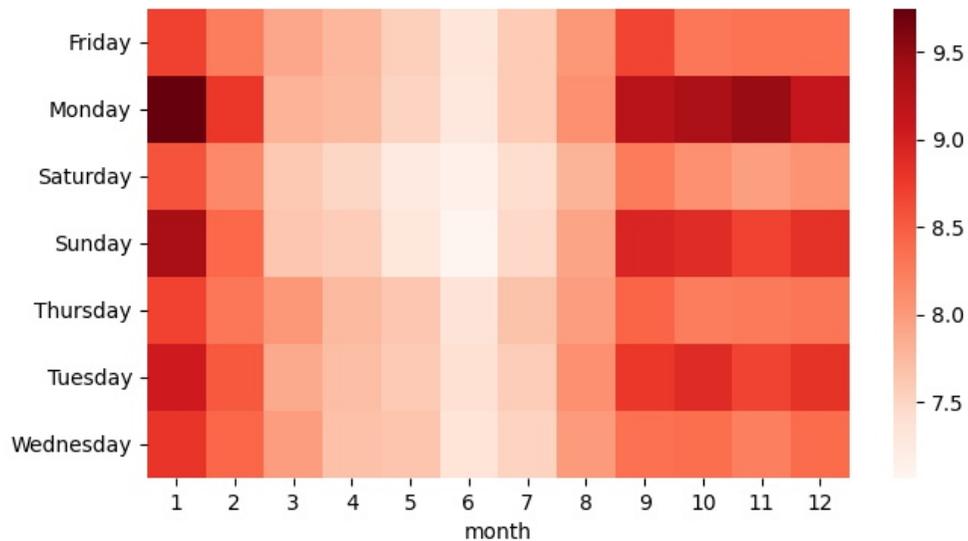
The first part of this analysis focuses on a descriptive evaluation of existing data. The goal is to find out how the data behaves, specifically with regard to seasonality and outliers, to give you a better impression on how your input data looks like.

Year	Sum	Average	High	Low
all (2007 - 2016)	23643.67	8.14	12.85	5.26
2007	182.53	8.3	9.7	7.53
2008	2618.87	7.77	12.1	6.82
2009	2813.28	7.9	10.56	6.82



Year	Sum	Average	High	Low
2010	2914.29	8.23	11.48	5.26
2011	2979.47	8.25	10.88	6.59
2012	3185.89	8.73	12.67	7.35
2013	3004.4	8.25	11.51	6.64
2014	2967.78	8.18	12.85	6.85
2015	2808.47	7.74	12.15	6.44
2016	168.69	8.43	10.33	7.59

SEASONALITY ANALYTICS



To the left you can see a so-called 'heatmap' which represents seasonality with regard to Months of the year and days of the week.

The deeper red a cell has, the higher the value within that specific month-day combination. You can observe two things:

- a) If specific days of the week tend to be of a darker color, a higher number is to be expected during that day
- b) If a Month tends to be of a darker color, yearly seasonality can be interpreted

Both seasonalities can be found in more detail in the following tables.

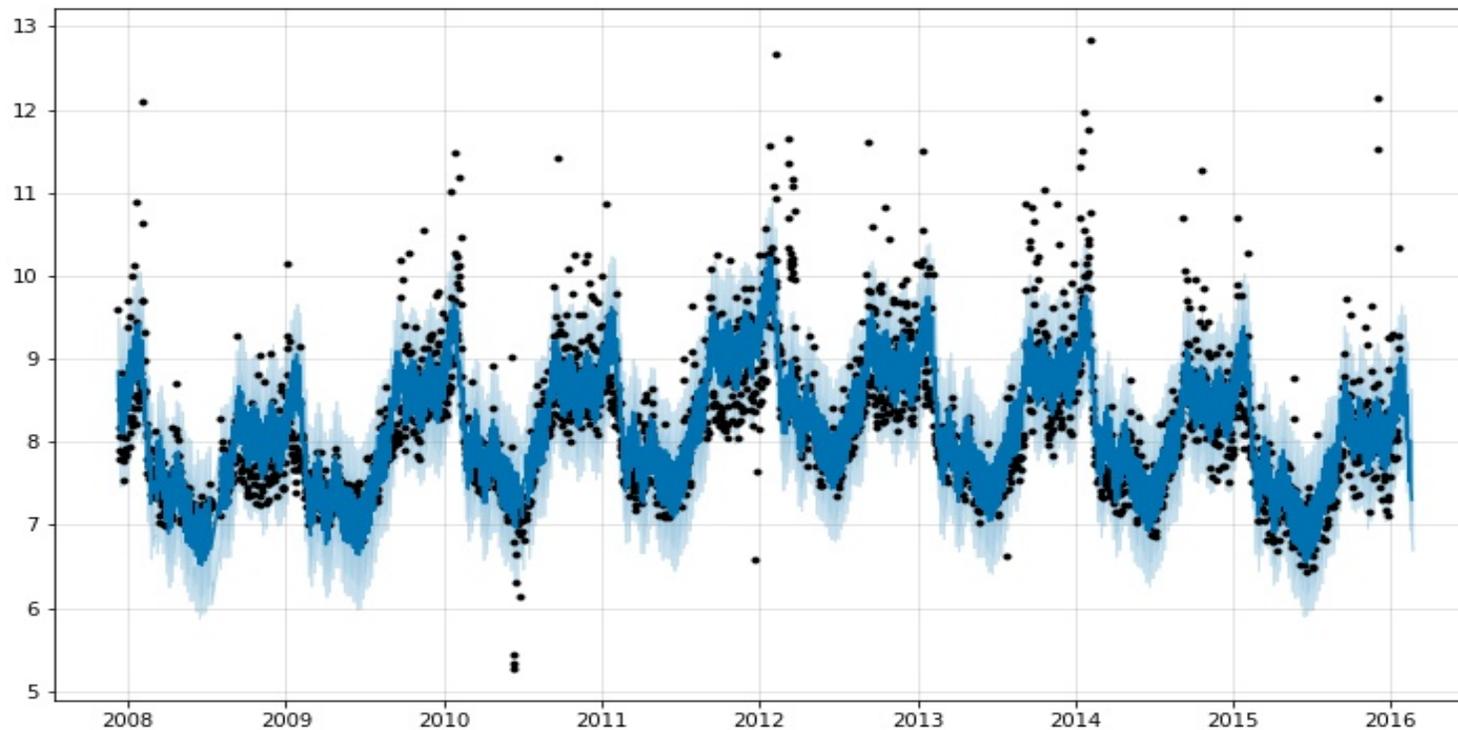
Day of week seasonality

Day of week	Value	Difference to mean
Friday	8.07	-0.90%
Monday	8.5	4.39%
Saturday	7.82	-3.86%
Sunday	8.18	0.54%
Thursday	8.06	-0.93%
Tuesday	8.27	1.57%
Wednesday	8.07	-0.81%

Monthly seasonality

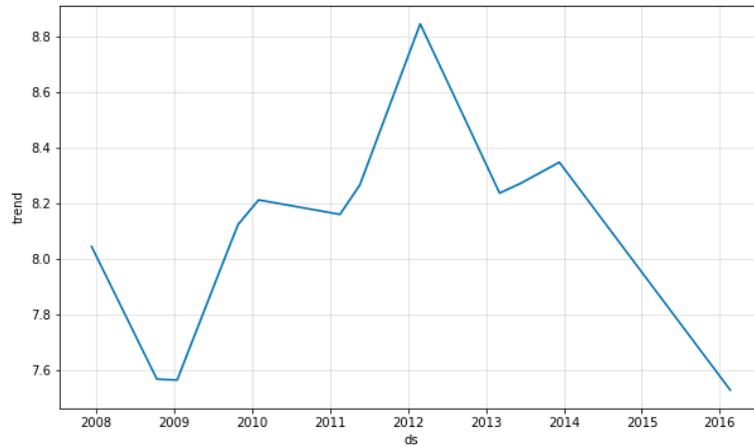
Month	Value	Difference to mean
January	8.99	10.54%
February	8.4	3.36%
March	7.83	-3.61%
April	7.68	-5.56%
May	7.5	-7.75%
June	7.27	-10.55%
July	7.55	-7.09%
August	7.99	-1.71%
September	8.67	6.73%
October	8.58	5.50%
November	8.52	4.87%
December	8.56	5.28%

TIME SERIES ANALYSIS



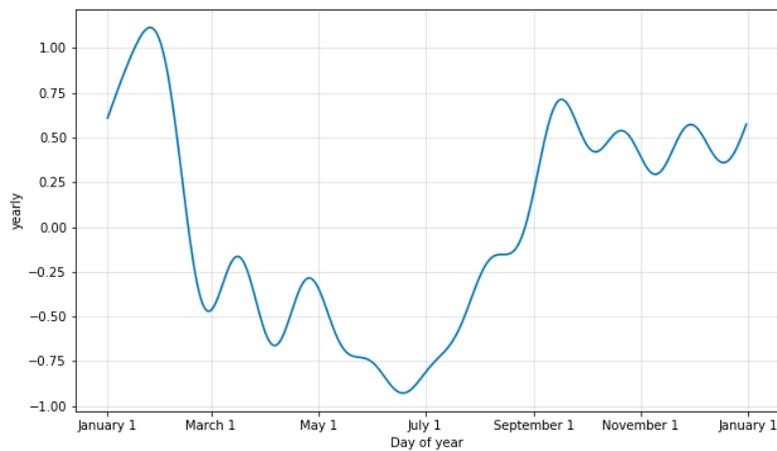
Time Series Analysis is the core of prediction future values. Above you can see the historic values (black dots), the generalised prediction model we created (dark blue) with upper and lower limits of prediction (light blue). To the end, the last values are the prediction without historic information.

The next sections go into more details about how the prediction model was created, what parts it contains and what the exact predictions are.



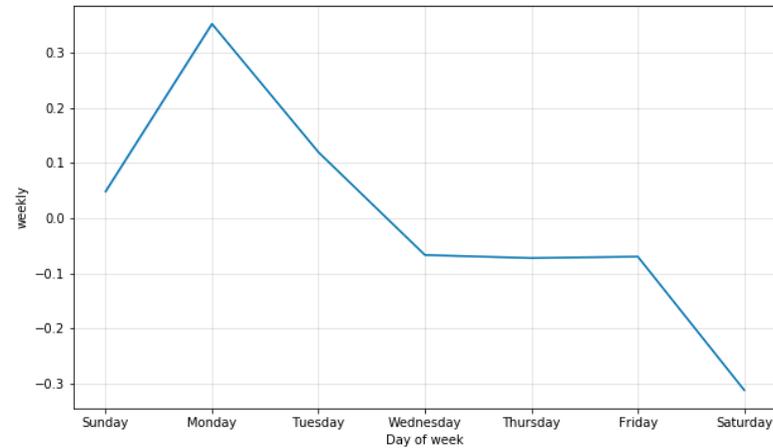
General trend

The first component is the trend. A general trend is a non-repetitive general behavior of the data. It can be interpreted as the "temporal evolution", i.e. how the data developed over time. If the general trend raises, the values increased during that time period; if they fall, the numbers declined.



Yearly seasonality

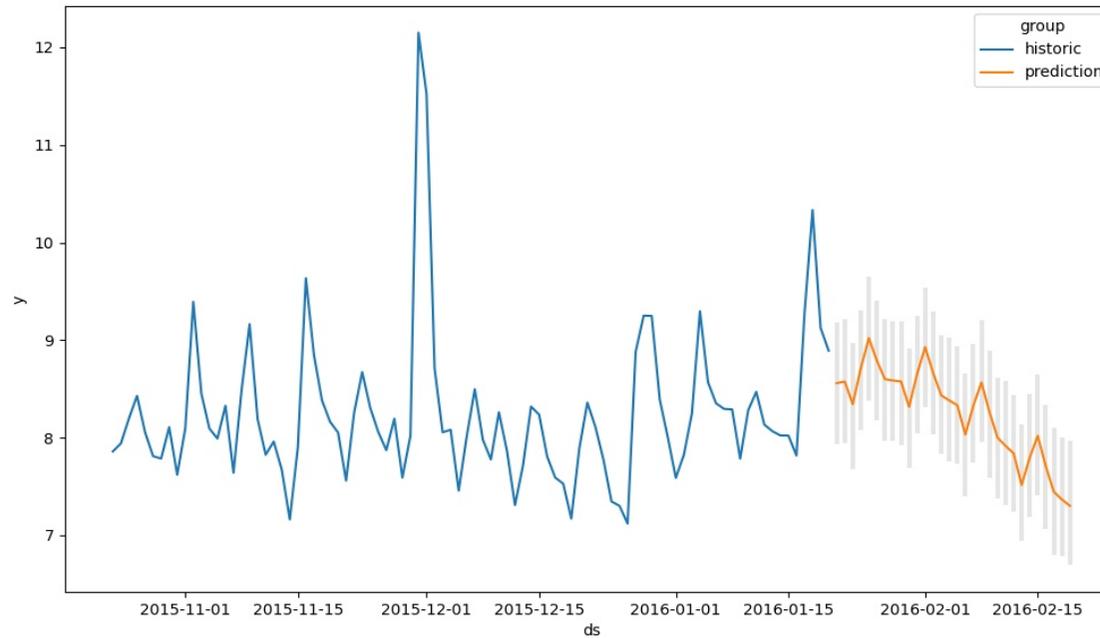
The second component is a yearly seasonality. Two classical examples for yearly seasonality are summer products or gifts for the christmas season. The yearly seasonality of your data denotes how much some Months are contributing more to the values than others, which might transfer into focus periods of your business.



Within-week seasonality

Thirdly, we extracted the within-week seasonality. Within-week seasonality is important to understand behavior, especially if there are high peaks for specific days. Depending on the use case, it might be common that there is a high incline or decline during the weekend.

PREDICTION



Finally, we combine the general trend, yearly and weekly seasonality to predict what we can expect within the next timeframe. The blue line is historic, real data, while the orange line is the predicted values based on our model. The grey bars denote the upper and lower limit of each prediction to give an estimation how much variance can be expected.

Please find the detailed predicted values and their components in the following table.

Date	Prediction	Prediction upper limit	Prediction lower limit	Trend	Yearly component	Weekly component
2016-01-21 00:00:00	8.56	9.19	7.93	7.56	1.07	-0.07
2016-01-22 00:00:00	8.58	9.22	7.95	7.56	1.09	-0.07
2016-01-23 00:00:00	8.34	8.97	7.67	7.56	1.1	-0.31
2016-01-24 00:00:00	8.71	9.3	8.08	7.56	1.11	0.05
2016-01-25 00:00:00	9.02	9.65	8.37	7.56	1.11	0.35
2016-01-26 00:00:00	8.79	9.4	8.18	7.55	1.11	0.12
2016-01-27 00:00:00	8.6	9.22	7.97	7.55	1.11	-0.07
2016-01-28 00:00:00	8.59	9.19	7.97	7.55	1.11	-0.07
2016-01-29 00:00:00	8.58	9.2	7.93	7.55	1.09	-0.07
2016-01-30 00:00:00	8.32	8.92	7.69	7.55	1.08	-0.31
2016-01-31 00:00:00	8.65	9.25	8.05	7.55	1.06	0.05
2016-02-01 00:00:00	8.93	9.53	8.31	7.55	1.03	0.35

Date	Prediction	Prediction upper limit	Prediction lower limit	Trend	Yearly component	Weekly component
2016-02-02 00:00:00	8.66	9.29	8.04	7.55	0.99	0.12
2016-02-03 00:00:00	8.43	9.05	7.83	7.55	0.95	-0.07
2016-02-04 00:00:00	8.38	9.03	7.75	7.55	0.91	-0.07
2016-02-05 00:00:00	8.33	8.94	7.73	7.54	0.86	-0.07
2016-02-06 00:00:00	8.03	8.66	7.41	7.54	0.8	-0.31
2016-02-07 00:00:00	8.33	8.96	7.74	7.54	0.74	0.05
2016-02-08 00:00:00	8.57	9.21	7.96	7.54	0.67	0.35
2016-02-09 00:00:00	8.26	8.9	7.59	7.54	0.6	0.12
2016-02-10 00:00:00	8.0	8.61	7.38	7.54	0.53	-0.07
2016-02-11 00:00:00	7.92	8.58	7.31	7.54	0.45	-0.07
2016-02-12 00:00:00	7.84	8.43	7.25	7.54	0.37	-0.07
2016-02-13 00:00:00	7.52	8.13	6.95	7.54	0.29	-0.31

Date	Prediction	Prediction upper limit	Prediction lower limit	Trend	Yearly component	Weekly component
2016-02-14 00:00:00	7.8	8.45	7.19	7.54	0.21	0.05
2016-02-15 00:00:00	8.02	8.65	7.41	7.53	0.13	0.35
2016-02-16 00:00:00	7.71	8.34	7.06	7.53	0.06	0.12
2016-02-17 00:00:00	7.45	8.1	6.8	7.53	-0.02	-0.07
2016-02-18 00:00:00	7.37	8.0	6.79	7.53	-0.09	-0.07
2016-02-19 00:00:00	7.3	7.97	6.69	7.53	-0.16	-0.07