Prophet for Time Series

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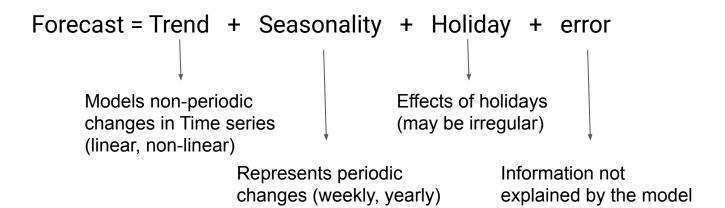
- Time Series Forecasting Model by Facebook Research

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- Prophet algortihm has three components:

  Forecast = Trend + Seasonality + Holiday + error

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- Prophet algortihm has three components:

Forecast = Trend + Seasonality + Holiday + error

Models non-periodic changes in Time series (linear, non-linear)

Represents periodic changes (weekly, yearly)

Effects of holidays (may be irregular)

Information not explained by the model

Trend in Prophet

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$$g(t) = \frac{C}{1 + e^{-k(t-m)}},$$

- C is the carrying capacity
- k is the growth rate
- m an offset parameter

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$$g(t) = \frac{C(t)}{1 + \exp(-(k + \mathbf{a}(t)^\mathsf{T}\boldsymbol{\delta})(t - (m + \mathbf{a}(t)^\mathsf{T}\boldsymbol{\gamma})))}$$

Analytics Vidhya

Trend in Prophet

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- For non-linear growth, trend is calculated as

$$g(t) = \frac{C(t)}{1 + \exp(-(k + \mathbf{a}(t)^\intercal \boldsymbol{\delta})(t - (m + \mathbf{a}(t)^\intercal \boldsymbol{\gamma})))}$$

- For linear growth:

$$g(t) = (k + \mathbf{a}(t)^\intercal \boldsymbol{\delta})t + (m + \mathbf{a}(t)^\intercal \boldsymbol{\gamma}),$$

- ***k*** is the growth rate
- ***δ*** has the rate adjustments
- ***m*** is the offset parameter

Seasonal Component in Prophet

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- Different patterns on weekdays, weekends, summer holidays etc

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$$s(t) = \sum_{n=1}^{N} \left(a_n \cos\left(\frac{2\pi nt}{P}\right) + b_n \sin\left(\frac{2\pi nt}{P}\right) \right)$$

- P is the period

- N is order of fourier series

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Holiday Component in Prophet

Holiday Component in Prophet

- Some holidays might be irregular, like Diwali or thanksgiving

- To include these, provide list of holidays as a dataframe

Holiday	Country	Year	Date
Thanksgiving	US	2015	26 Nov 2015
Thanksgiving	US	2016	24 Nov 2016
Thanksgiving	US	2017	23 Nov 2017
Thanksgiving	US	2018	22 Nov 2018
Christmas	*	2015	25 Dec 2015
Christmas	*	2016	25 Dec 2016
Christmas	*	2017	25 Dec 2017
Christmas	*	2018	25 Dec 2018

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Vidhya

Prophet for Time Series

- Prophet requires the input in a specific form

ds	y
2012-08-25	3
2012-08-26	3
2012-08-27	2
2012-08-28	2
2012-08-29	2

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Prophet for Time Series

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ds	y
2012-08-25	3
2012-08-26	3
2012-08-27	2
2012-08-28	2
2012-08-29	2

- $ pip install fbprophet

Notebook

Thank You