An short Introduction to Time Series Analysis and Machine Learning

Jannusch Bigge

23.01.2024

Preface

- This is only an introduction
- Its ment to be a starting point
- You will need to do your own stuff to get a deeper understanding
- Without a deeper understanding and motiviation you will not be able to get good
- I'm not an expert!

Time Series Analysis

Time Series Analysis - The Problem

What we have:

Time Series Analysis - The Problem

What we have:

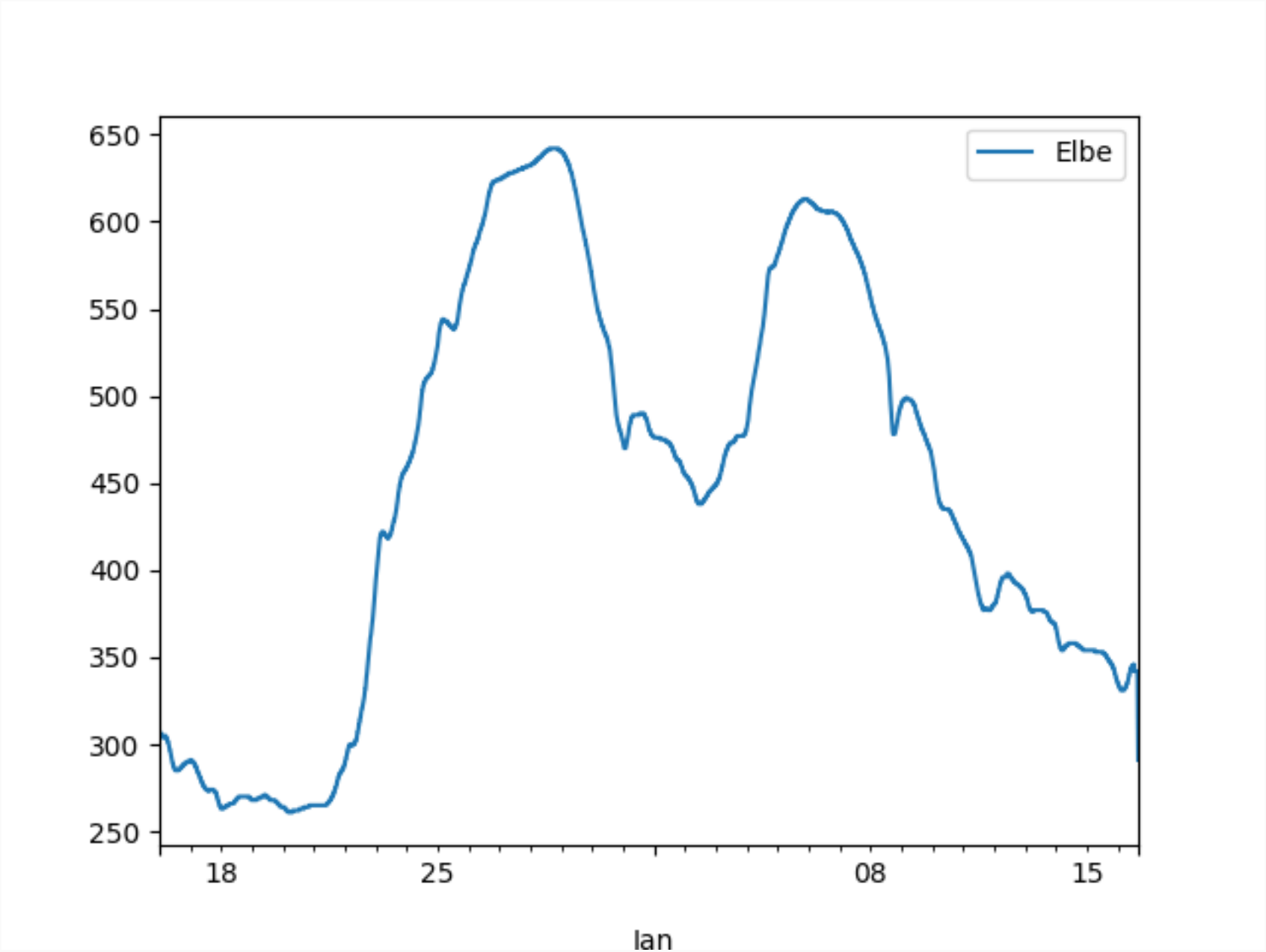
- We have a set of data points $x_1, x_2, \ldots, x_n$

Time Series Analysis - The Problem

What we have:

- We have a set of data points $x_1, x_2, \ldots, x_n$
- Each data point is associated with a time $t_1, t_2, \ldots, t_n$

Time Series Analysis - The Problem



Time Series Analysis - The Problem

What we have:

- We have a set of data points $x_1, x_2, \ldots, x_n$
- Each data point is associated with a time $t_1, t_2, \ldots, t_n$

What we want depends on the field:

- We want to forecast (predict) the next data point x_{n+1} given the previous data points

Time Series Analysis - The Problem

What we have:

- We have a set of data points $x_1, x_2, \ldots, x_n$
- Each data point is associated with a time $t_1, t_2, \ldots, t_n$

What we want depends on the field:

- We want to forecast (predict) the next data point x_{n+1} given the previous data points
- We want to detect singnals

Time Series Analysis - The Problem

What we have:

- We have a set of data points $x_1, x_2, \ldots, x_n$
- Each data point is associated with a time $t_1, t_2, \ldots, t_n$

What we want depends on the field:

- We want to forecast (predict) the next data point x_{n+1} given the previous data points
- We want to detect singnals
- We want to cluster, classify, query by content, detect anomalies, ...

Time Series Analysis - The Definition

Time series analysis *comprises methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data.*

– Wikipedia

Time Series Analysis - Our Problem

We have some data from last week.

Time Series Analysis - Our Problem

We have some data from last week.

The first thing is always to inspect and understand the data.

Time Series Analysis - Our Problem

We have some data from last week.

The first thing is always to inspect and understand the data.

Ok, but **what** is our problem we try to solve?

$\rightarrow$ Based on this facts we should choose the right method.

Machine Learning

Placeholder fo whiteboard