EinsMan prediction

-Prediction of renewable energy losses due to EinsMan

Dataset from Quadra Energy

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Introduction

Introduction

Energy market:

- Energy market is a very complex market
- Predict the right amount of energy produced
- Wrong predictions cost more money

EinsMan

- Last measure to use to overcome a bottleneck
- Protect individual sections of a distribution or transmission network
- Blades of wind turbines have to be turned out of the wind

Introduction
Progression over the years

2013

Installed wind energy in GWh - 33.500

EinsMan in GWh - 55

Cost in Mio. € - 44

2016

Installed wind energy in GWh - 49.600

EinsMan in GWh - 3.743

Cost in Mio. € - 373

2019

Installed wind energy in GWh - 61.592

EinsMan in GWh - 6.482

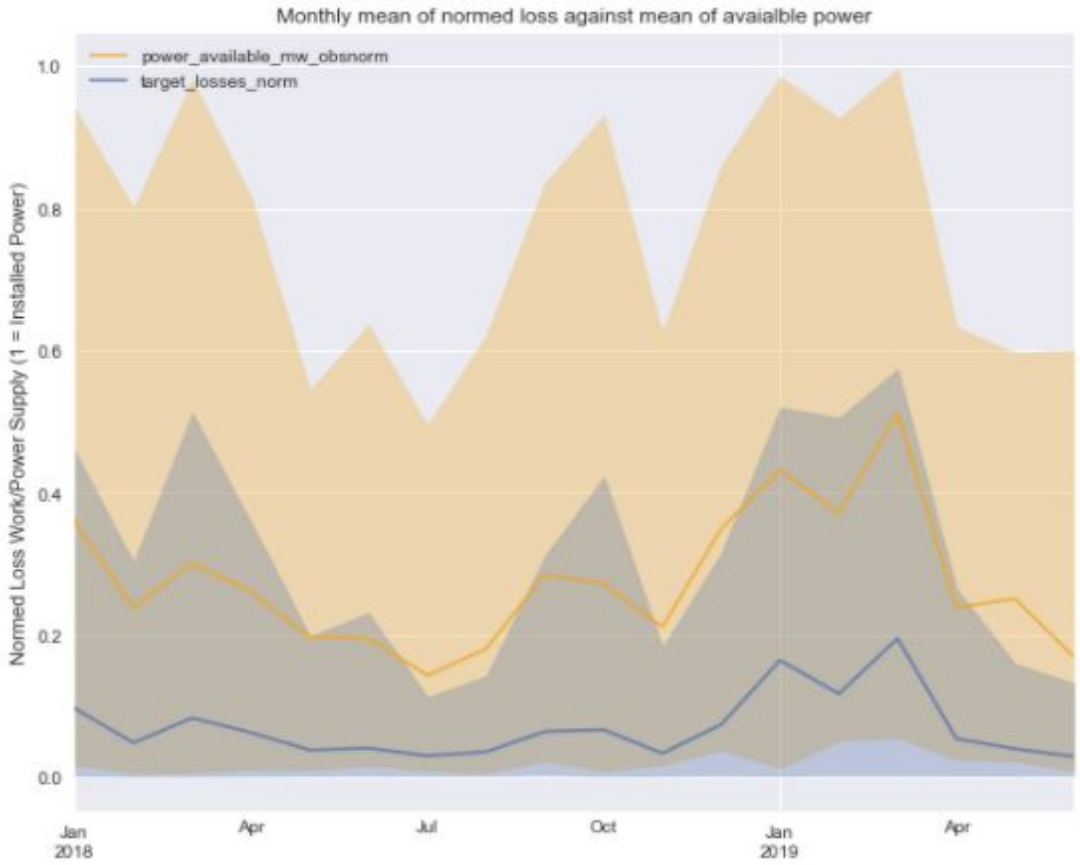
Cost in Mio. € - 709

source : bundesnetzagentur.de

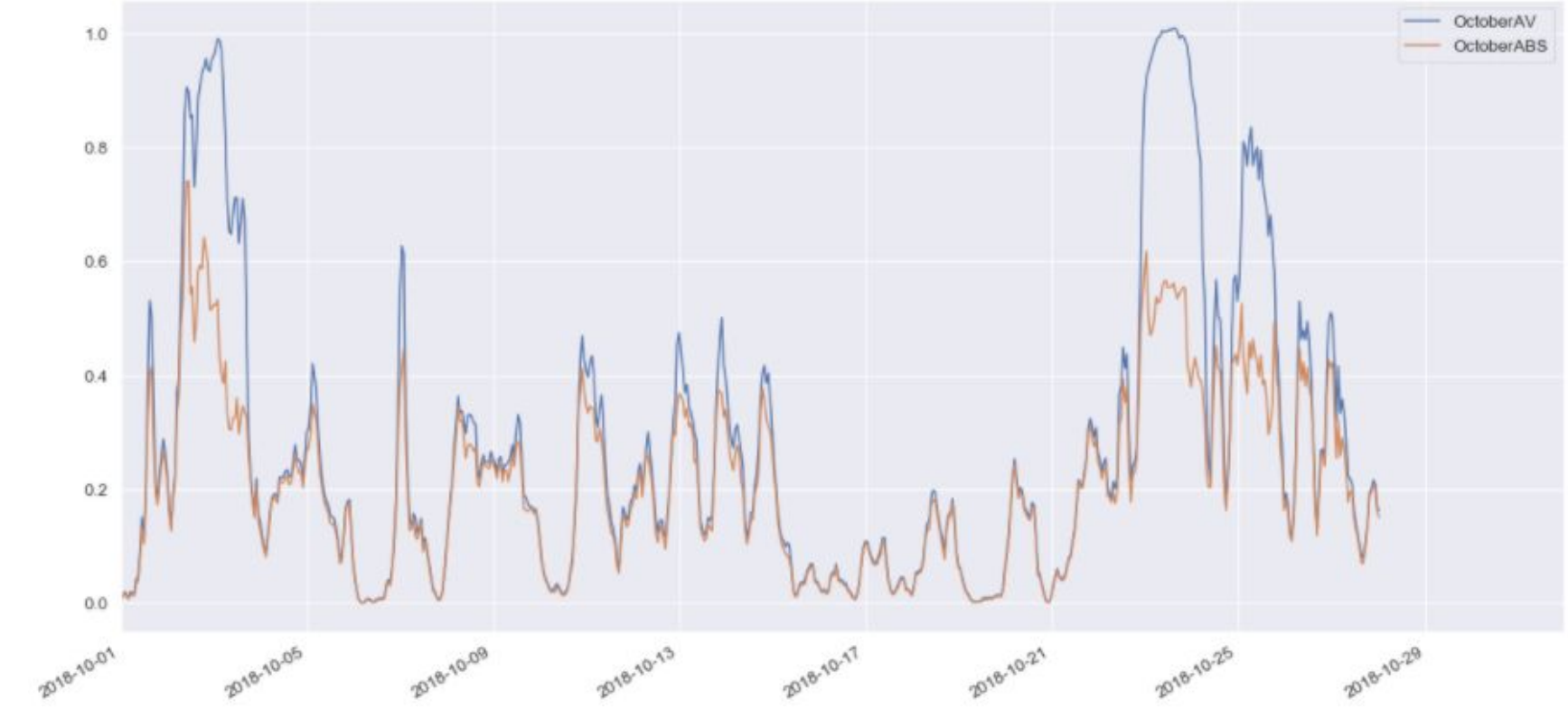
02

Exploratory Data Analysis

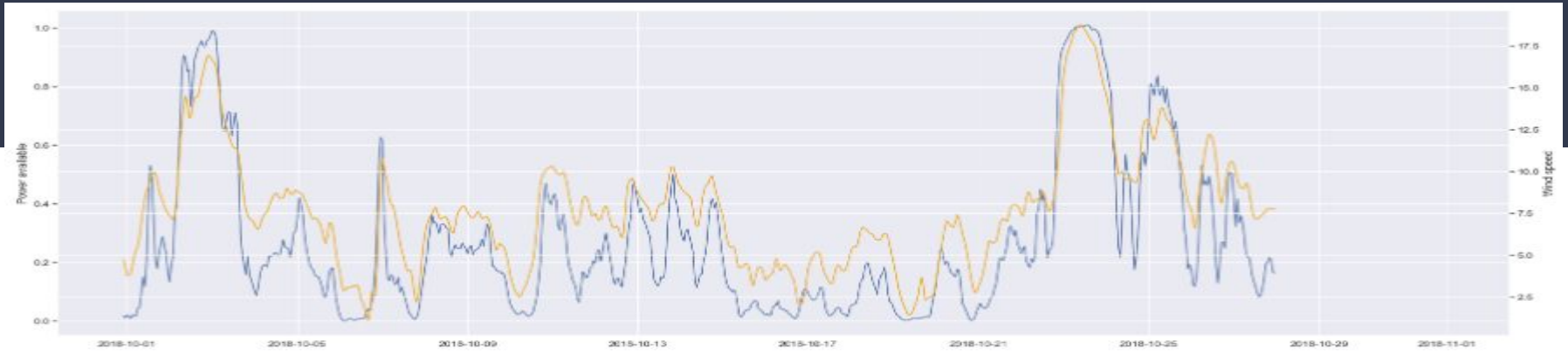
EinsMan losses vs power available - mean over month



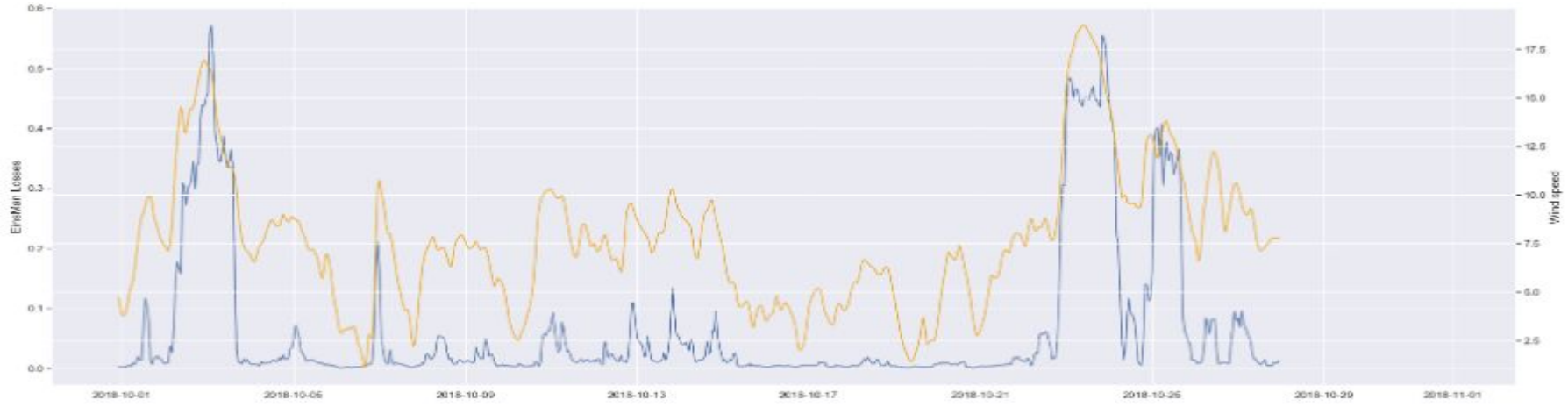
Energy available vs. energy used for October – mean over hours



Wind speed 100m vs. power available in October - mean over hours



Wind speed 100m vs. target loss in October - mean over hours



03

Modelling

List of different models

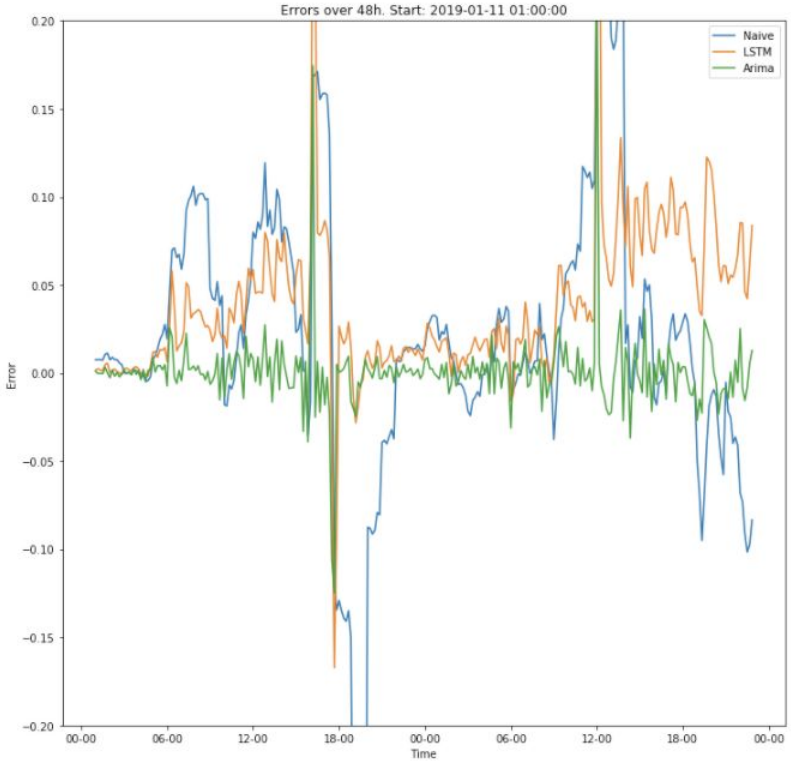
Using meteorological data

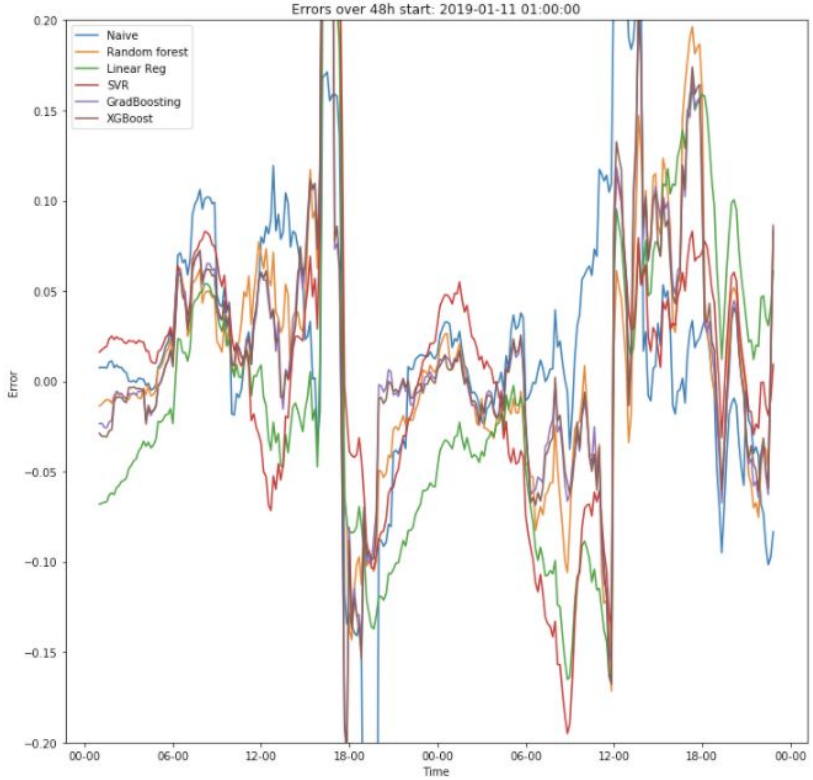
- Linear Regression
- Random Forest
- Support Vector Regression
- Gradient Boosting Regression
- XGBoost

Using only historic EinsMan data

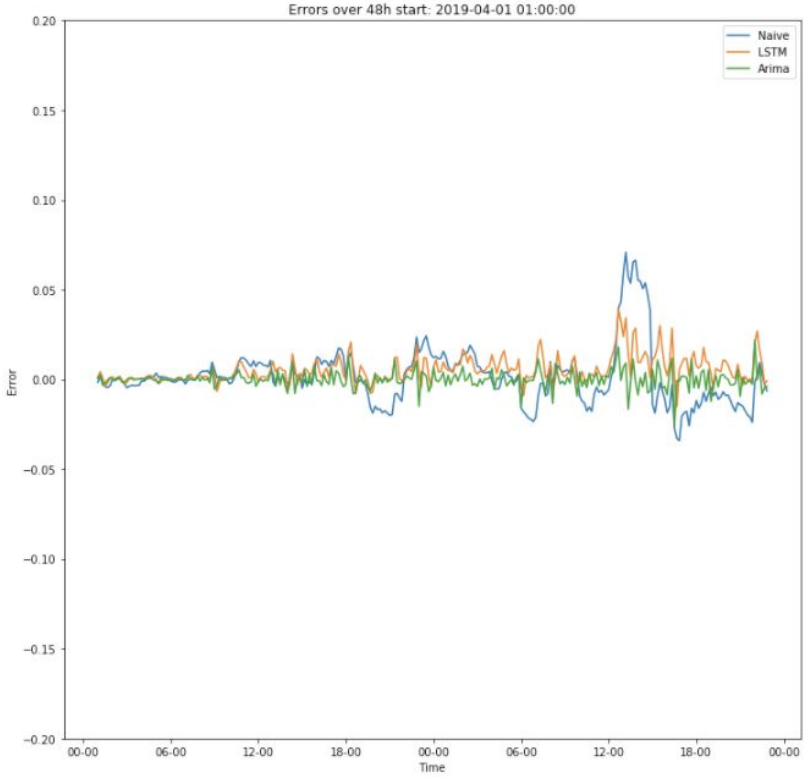
- Naive prediction
- ARIMA
- LSTM (Long Short-Term Memory)

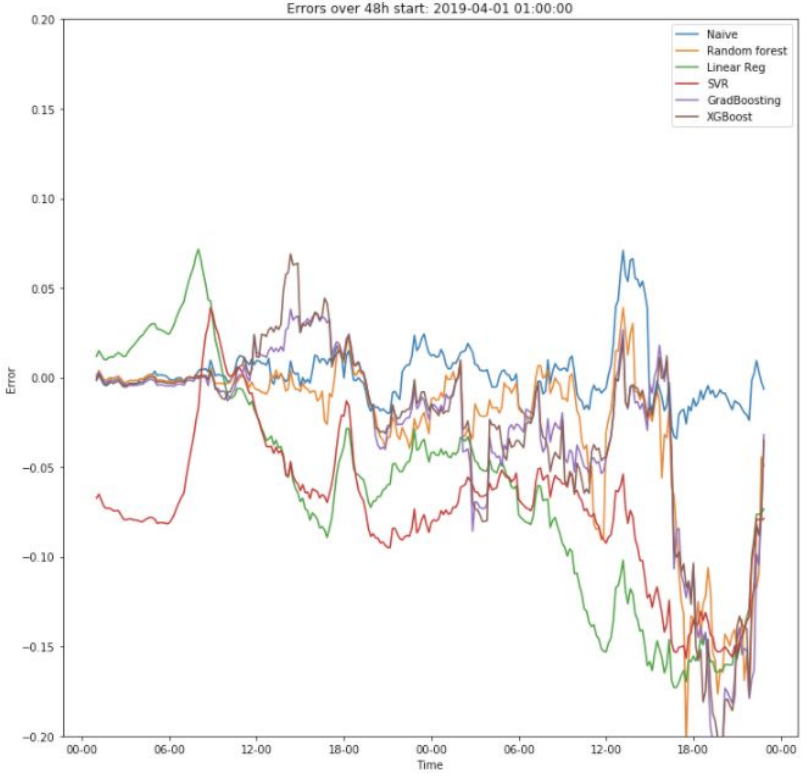
Error of different supervised models
Different starting points and 48 hour forecast





Error of different supervised models
Different starting points and 48 hour forecast





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Pros and cons of different models
Conclusion

Pros and cons of different models

Meteorological data models - Pros:

- Fast in forecasting
- Easy to implement the model itself

Meteorological data models - Cons:

- Is simply beaten by naive prediction
- Limited in prediction of time series
- Hard to integrate in time series prediction

EinsMan data models - Pros:

- Fitted for prediction of time series
- Don’t need so many different informations

EInsMan data models - Cons:

- Takes a lot of computational power
- Not so easy to implement

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Future work

Future work

- Gridsearch to optimize the parameter for each model
- Try SARIMA for prediction
- Train API models with historical data
- Get more EinsMan data to predict for other Regions
- Build a dashboard with Einsman forecast for different Regions

Thank you for your attention

Matthis Westermann

matthis.westermann@gmail.com

XING

Github