Place and date

Energy Hackathon

Team Holsmoen

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Data Exploration

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Visualizing data

Before starting diving into prediction models our philosophy is to try to understand the problem at hand by getting an overview of the situation.

Combining both datasets and then visualizing the data gives a look into the seasonal trends of values and a more understanding of the situation.

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An unexpected change of trend in tensile strain occurs in mid-September, some fluctuations are to be expected due to different loads and seasonality but there is an independent increase in the trend of values.

Picture 1. The dark red curve is the Bolt 1 Tensile, purple Bolt 2 Tensile and the last one is the Bolt 3 Tensile

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Splitting of the dataset

- Start state/unsteady state
- *From start + 60 next minutes*
- *Standstill*

- Steady State
- *Operation mode as of 60 minutes after start is initialized*

- The philosophy behind dividing the dataset into two states as referred to as start/unsteady state and steady state in this presentation are due to the stress the system experience during a start and stop differ from an operating condition.

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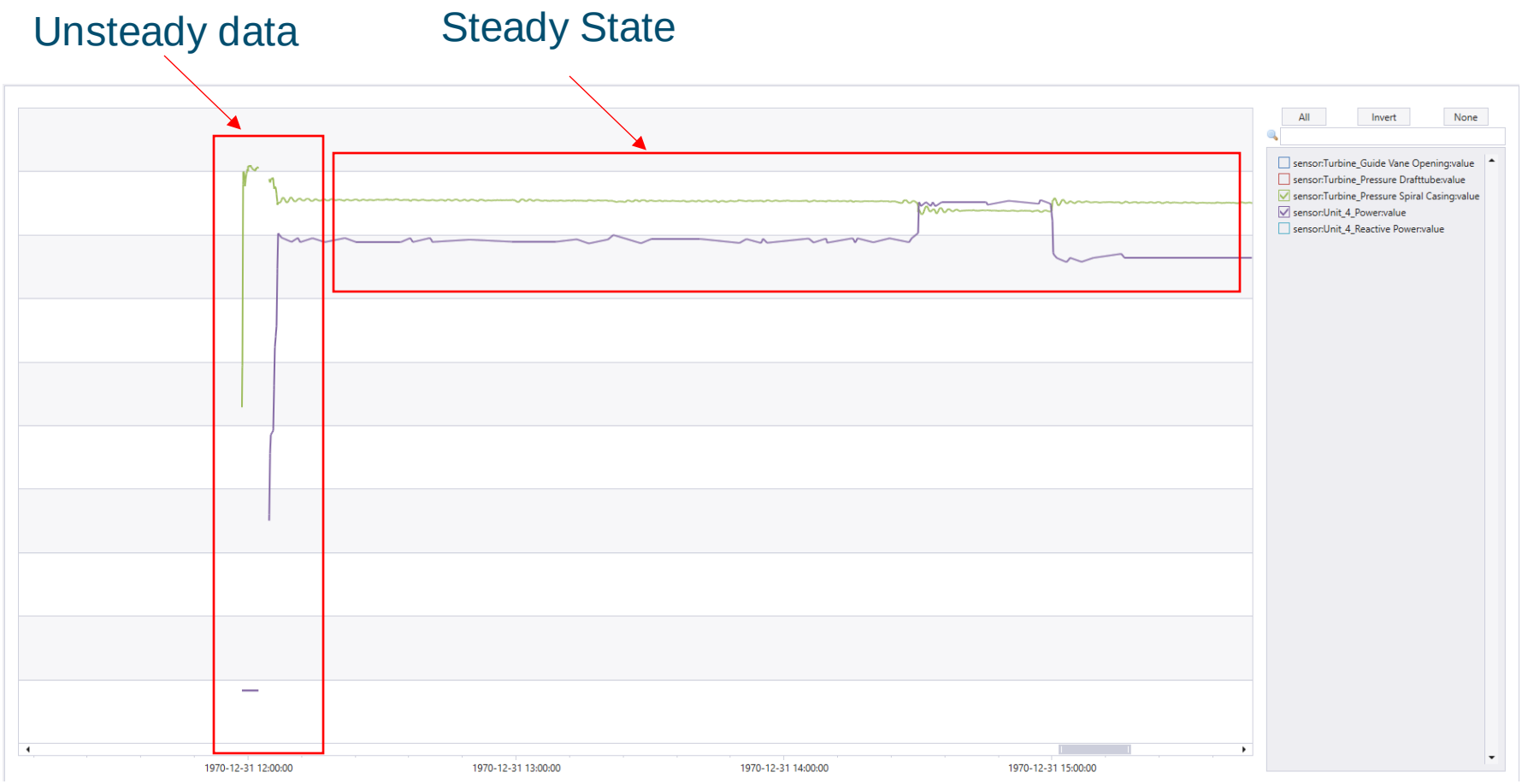

Picture 2. The green curve is the Turbine Pressure Spiral Casing and the purple one is the Unit Power

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Length of dataset

- Due to the independent changes seen in the tensile data in mid-September, the length of the dataset was altered and chosen to be from mid sept to end of the available data provided.

- If the values continues to have the same gradient as seen from mid-September or even start to increase, there are severe problems up ahead.

Model considerations

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Model considerations

- Our approach was to first create a super simple linear model using the data from mid-september, where we visually could see a change in the trend for the tensile values. We then subtracted the linear predictions from the training target data. This de-trended data was then used as prediction targets in a standard feed forward neural network.
- The motivation was that we could use the visible insight to create a intuitive baseline, subtract that "intuition" and then use a more flexible model for the remaining signal where it was hard to see any patterns with the human eye.

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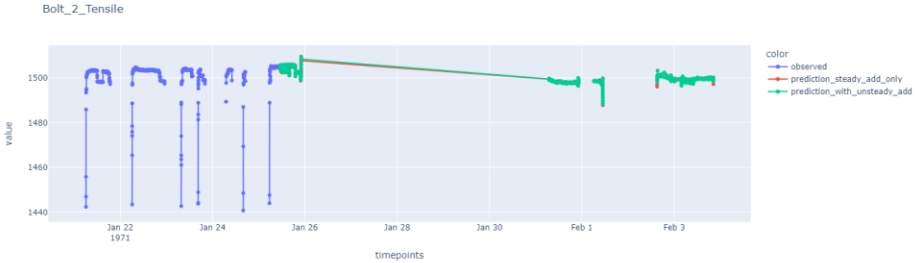
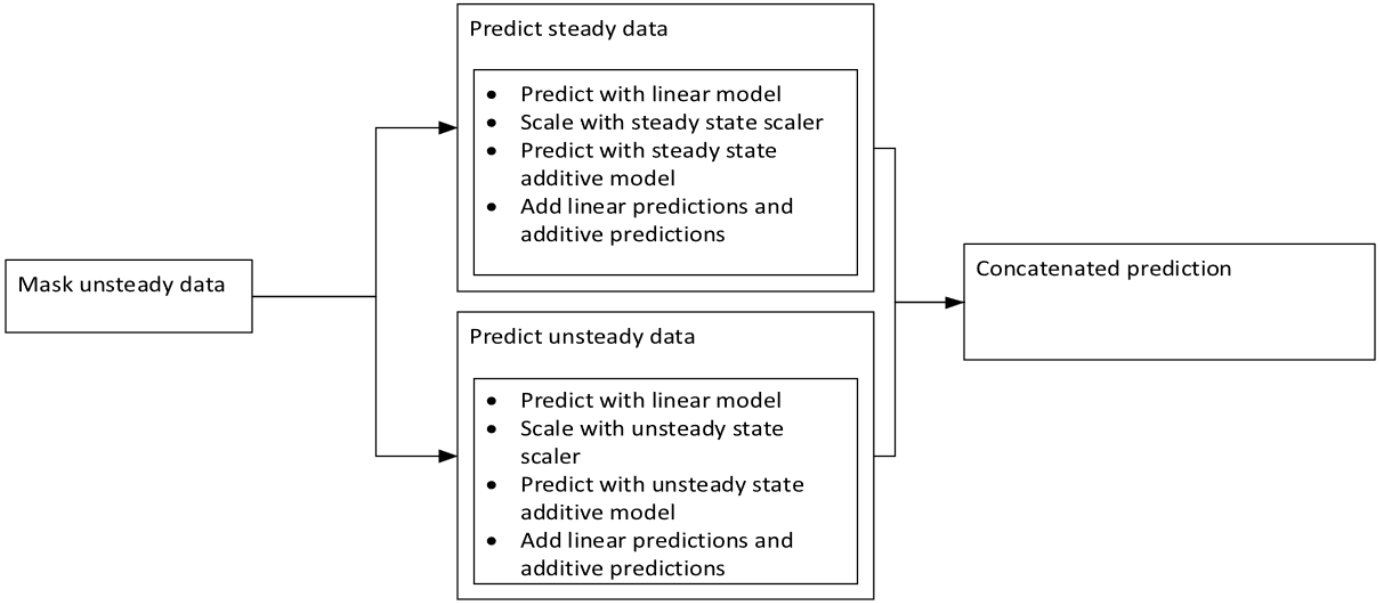
Model overview





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Production

Production

- Since the tensile values are continuously monitored, it would probably be a good idea to api, that can return single predictions or small batches. It's also important to monitor the model performance and update both the scalers and prediction models as the amount of observed data gets bigger. Using Fast API with Docker or a serverless solution using a service like Azure Functions or AWS lambda could be a possible frameworks for production.

Scalability and transferbility

- The super simple linear model provided in the script is built up by modules with the mindset of easy implementation on other datasets. Such as temperature, vibration and flow data provided by the local control system.

- This approach explained earlier in the presentation are the key here, it should be understandable for those using it at a daily basis and leaders with non-tech backgrounds. Combining an easily understood baseline model (trend, seasonality, logarithmic) and a more flexible architecture could easily be transferred to other prediction problems in the domain.


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We provide clean energy
for a sustainable society
- now and in the future