

Data Science and IoT solutions

an insight into the digital future
of the district heating network of Vienna

Ines Lindmeier, SDEC, 25.10.2019



***SO BUNT
WIE MEIN LEBEN.***



Portfolio Wien Energie



Electricity



Gas



Heating



Cooling



Energy
Services



Energy
Efficiency



E-Mobility



Photovoltaics



Smart Services



Security



Research &
Innovation



Tele-
communications

Portfolio Wien Energie



Electricity



Gas



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Energy
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Energy
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Photovoltaics



Smart Services



Security



Research &
Innovation



Tele-
communications

District Heating System of Vienna

since 1969

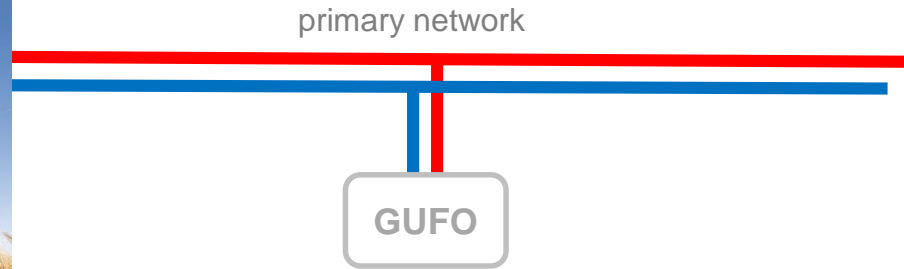
~ 5.500 GWh/a



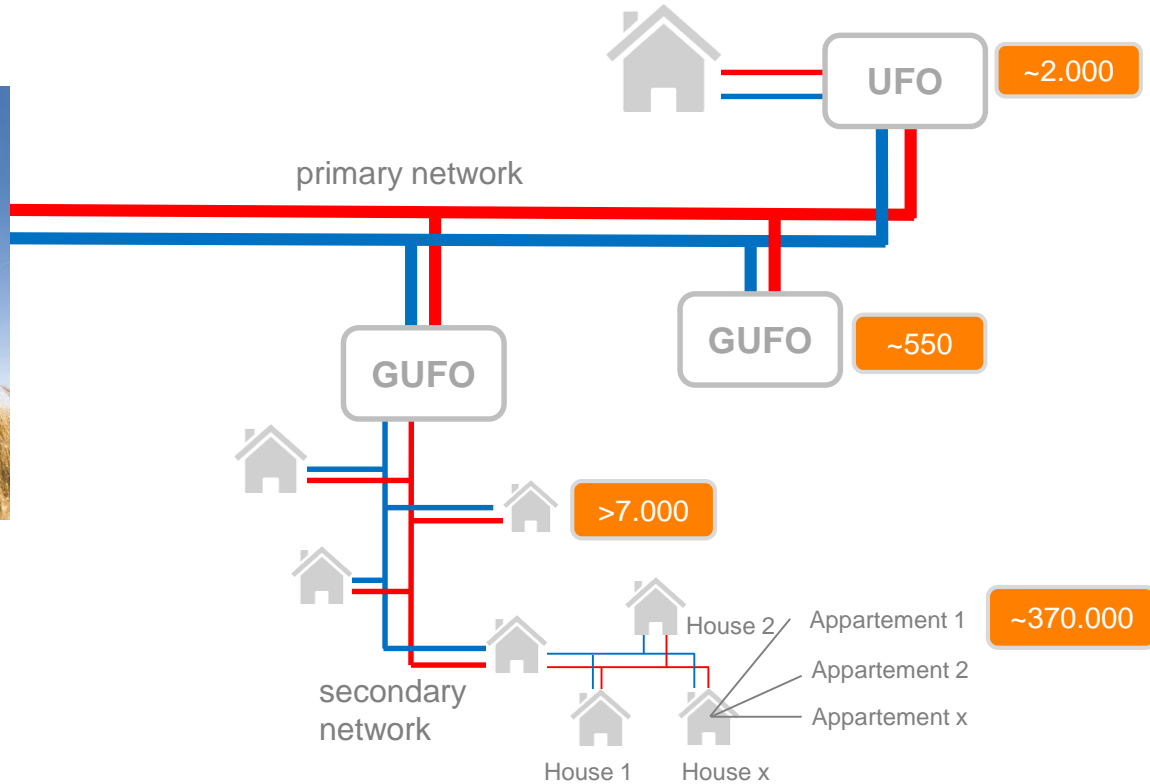
> 370.000
households

> 1.200 km
district heating
piping

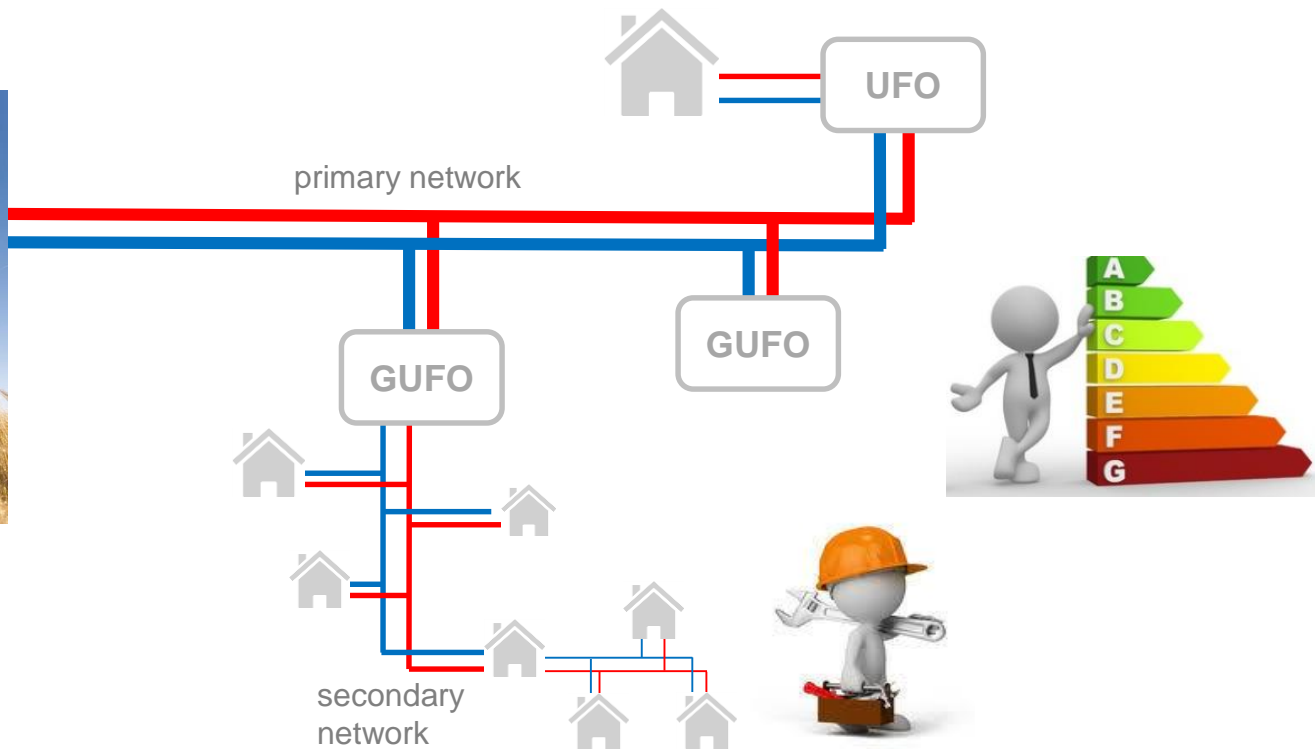
District Heating System of Vienna



District Heating System of Vienna



District Heating System of Vienna



District Heating System of Vienna

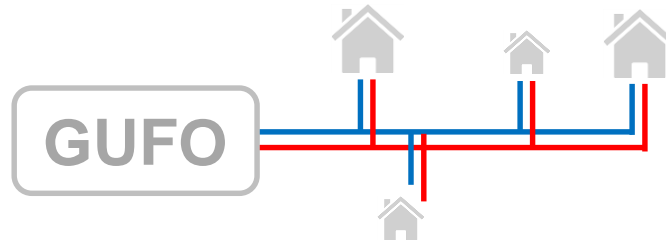
Maintenance & Efficiency



Decarbonisation

Lowering System
Temperatures

Optimising Substation
Temperature difference



District Heating System of Vienna

Maintenance & Efficiency

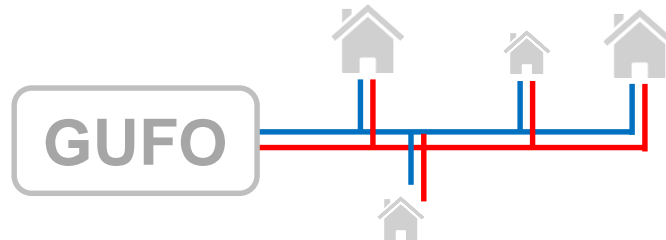


Rising number
of substations
per service
team member

preventive
maintenance
~12.000 per year

~ 5.000
Troubleshootings

~ 1.000
Service interruptions



District Heating System of Vienna

Maintenance & Efficiency



remote control of 25% GUFOS

2% real time info of all stations
in a GUFOS-network

20% 15min Heat Meter Data

District Heating System of Vienna

Maintenance & Efficiency



remote control of 25% GUFOS

2% real time info of all stations
in a GUFO-network

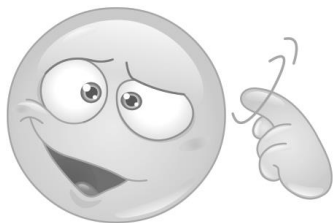
20% 15min Heat Meter Data

IoT & DataScience @ Wien Energie

Maintenance & Efficiency

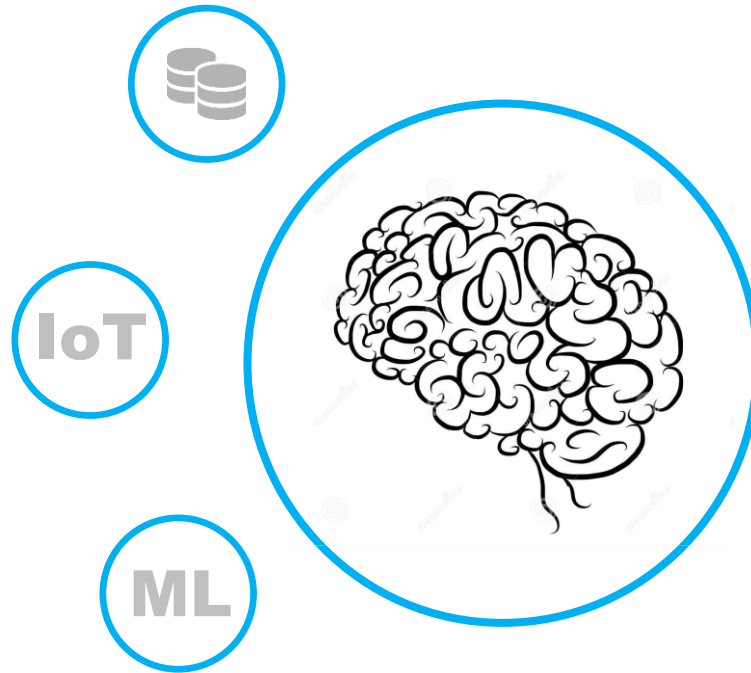


IoT & DataScience @ Wien Energie



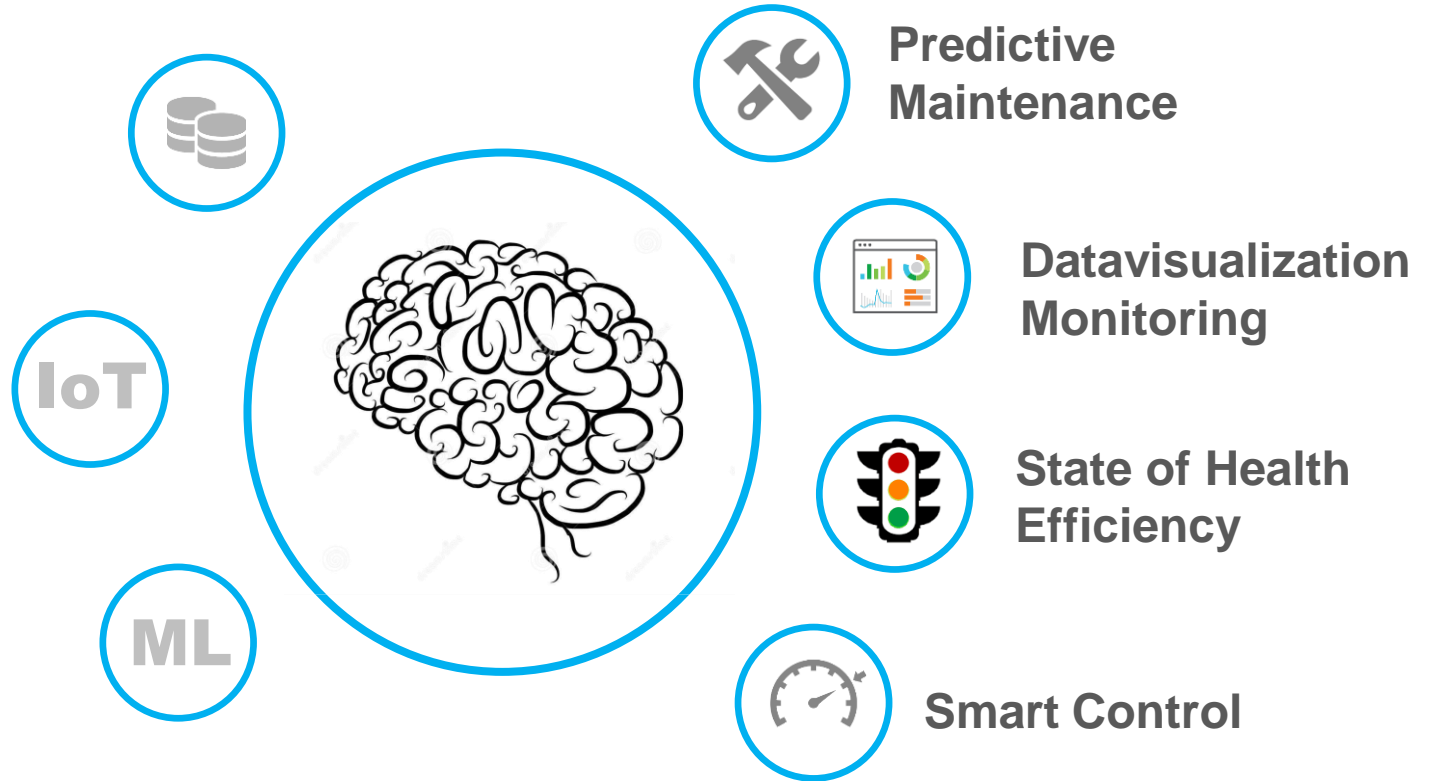
01/18

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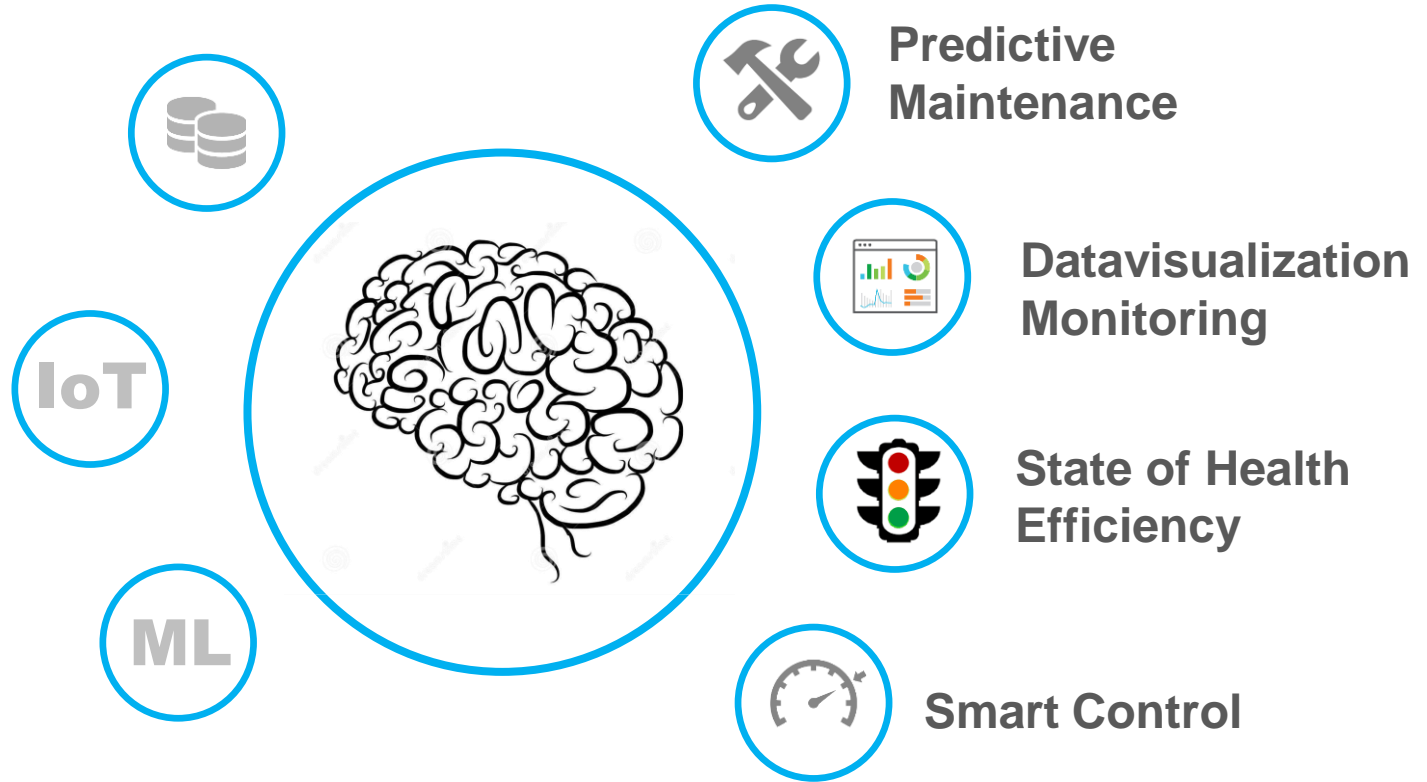


01/18

IoT & DataScience @ Wien Energie

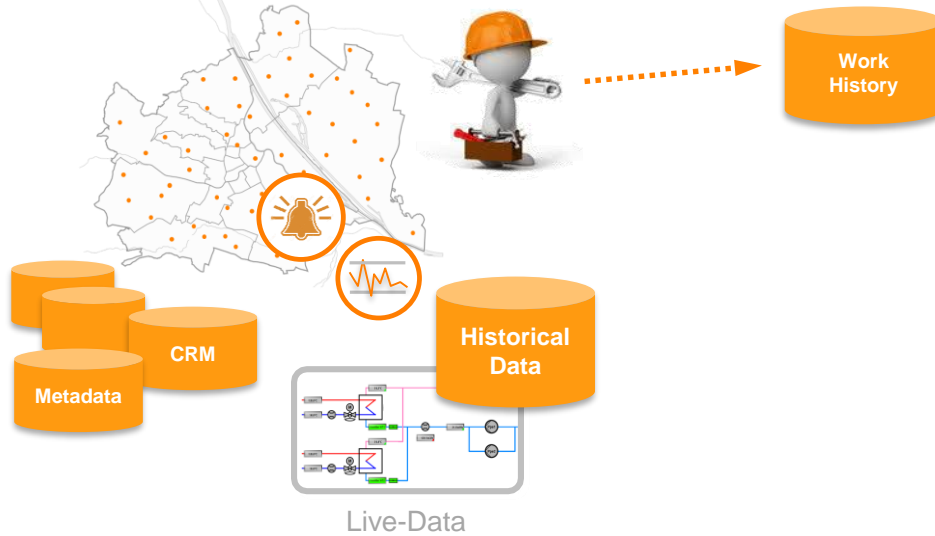


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IoT & DataScience @ Wien Energie

Pilotproject – Data Insights

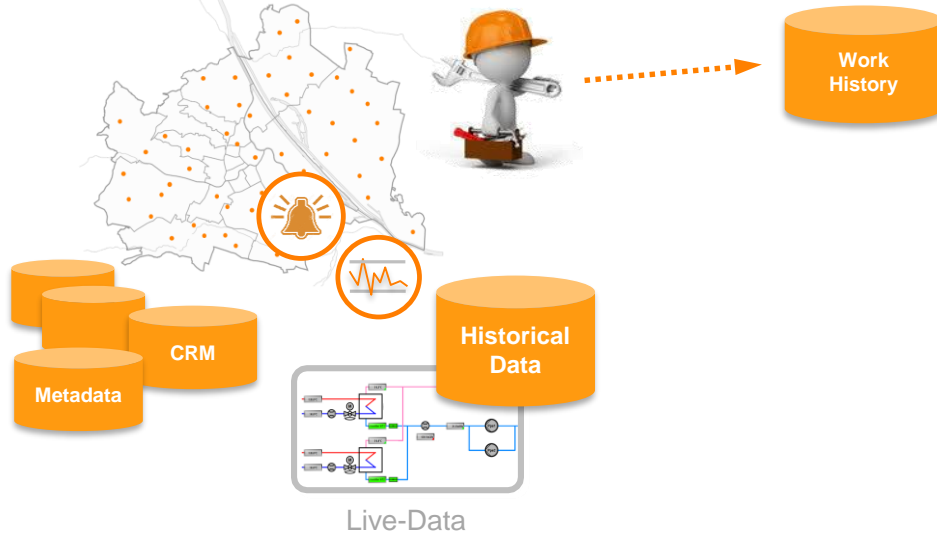


- What Data do we need?
- What Data do we have?
- Where is this Data?
- Who is the Data Owner?



IoT & DataScience @ Wien Energie

Pilotproject – Data Insights

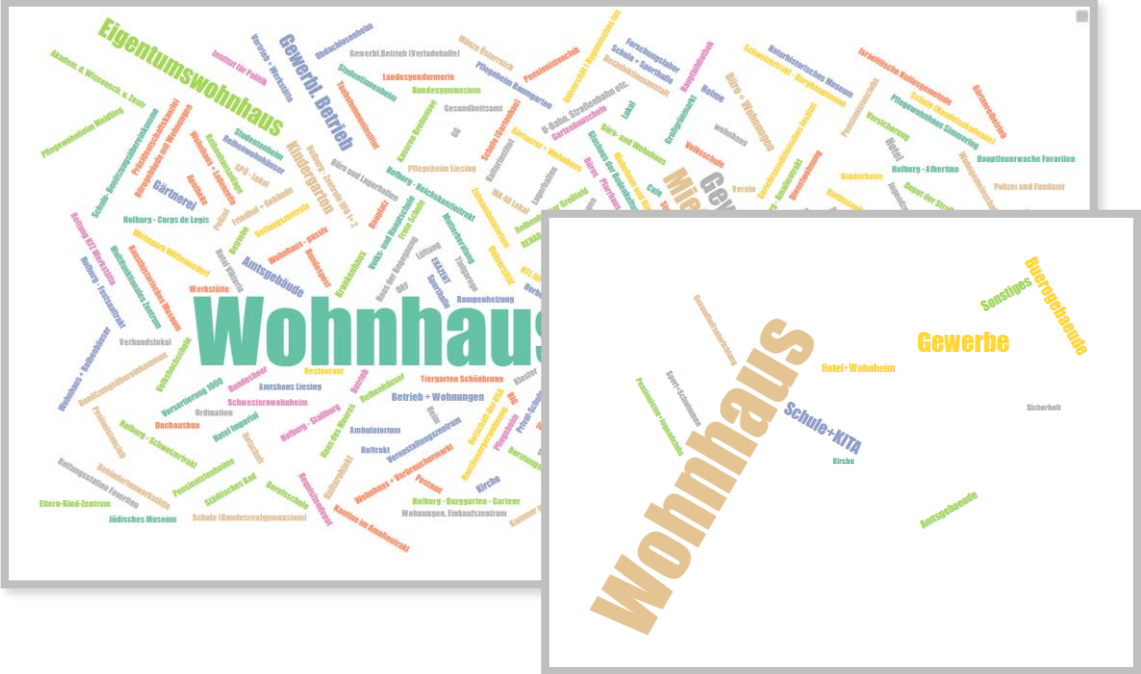
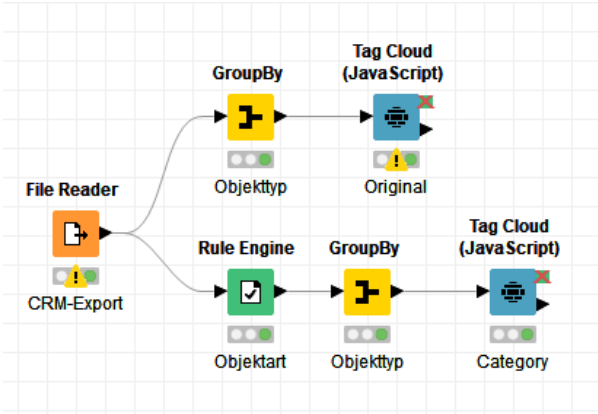


- What about Data Quality?



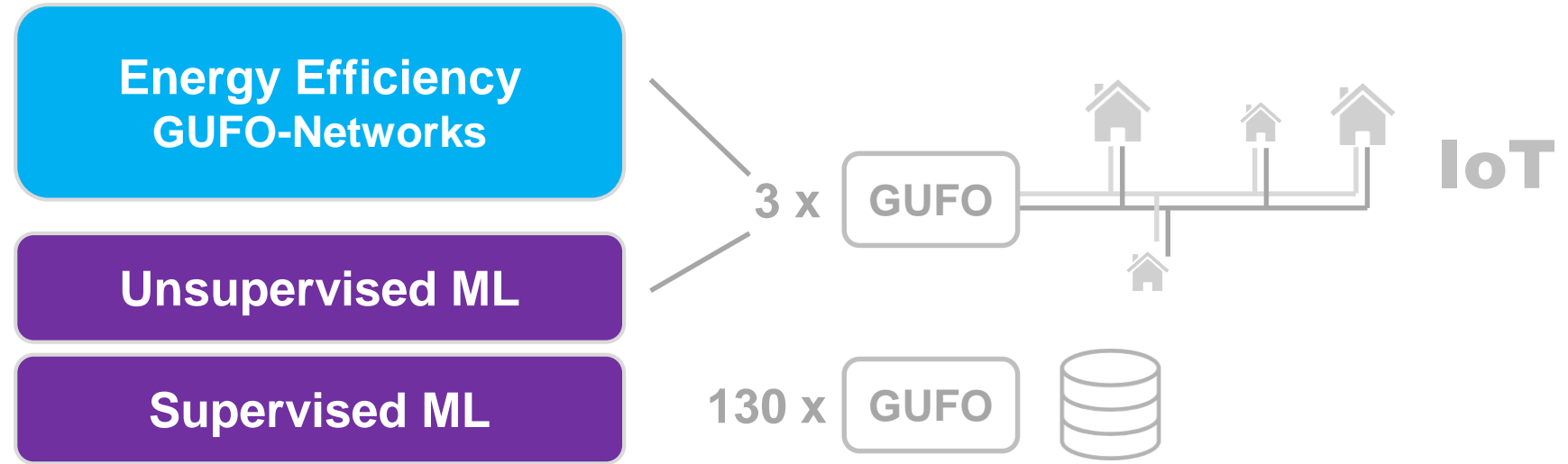
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Pilotproject – Data Insights



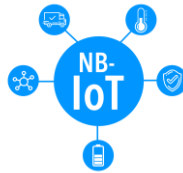
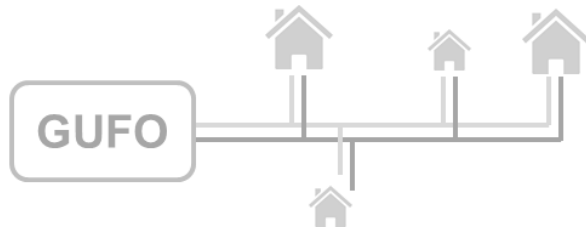
IoT & DataScience @ Wien Energie

Pilotproject



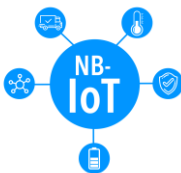
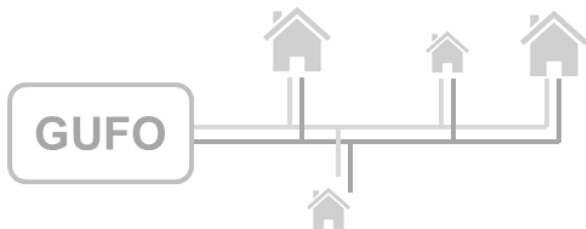
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Pilotproject – Energy Efficiency



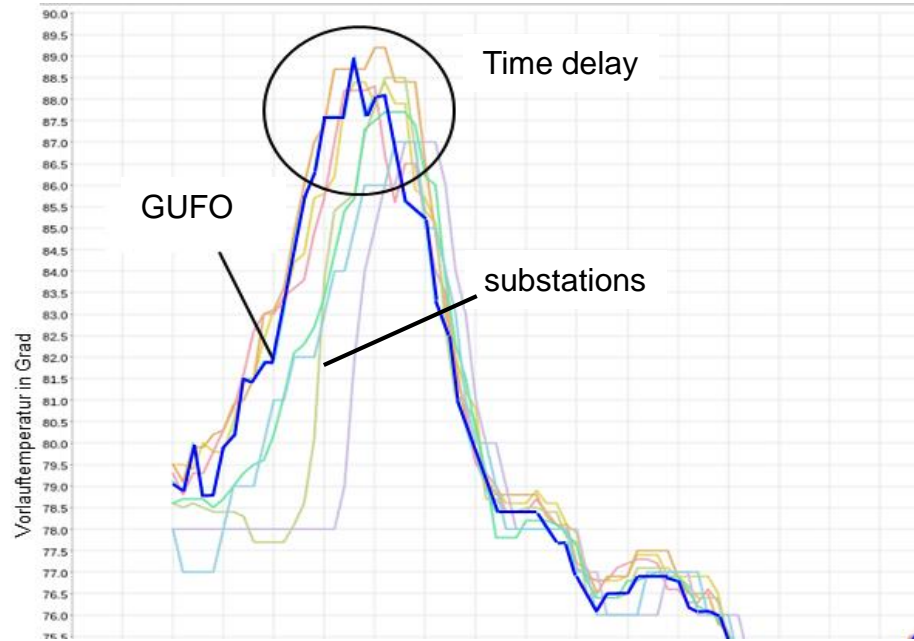
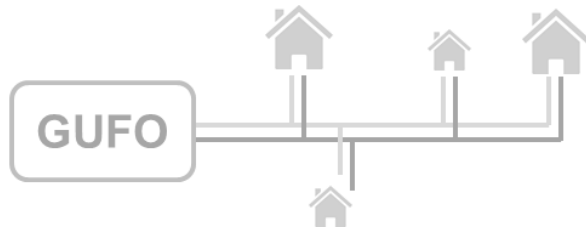
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Pilotproject – Energy Efficiency



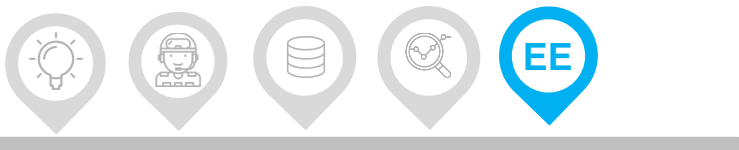
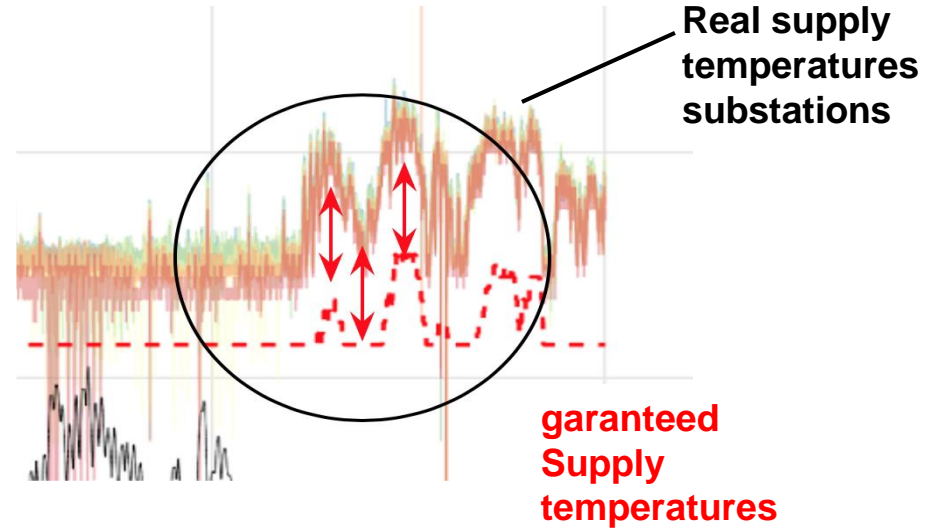
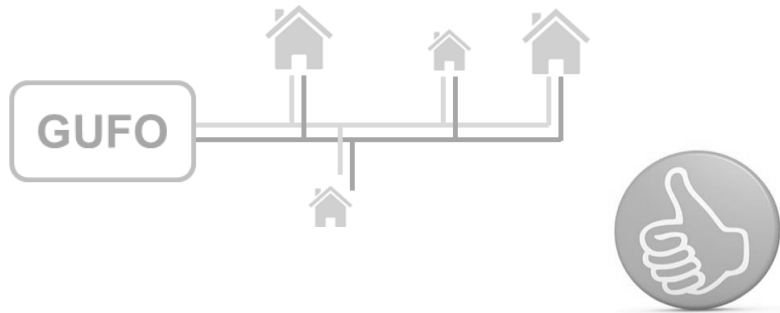
IoT & DataScience @ Wien Energie

Pilotprojekt – Energy Efficiency



IoT & DataScience @ Wien Energie

Pilotproject – Energy Efficiency



IoT & DataScience @ Wien Energie

Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

3 x GUFO



Sound
Vibration



IoT & DataScience @ Wien Energie

Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

3 x GUFO



IoT & DataScience @ Wien Energie

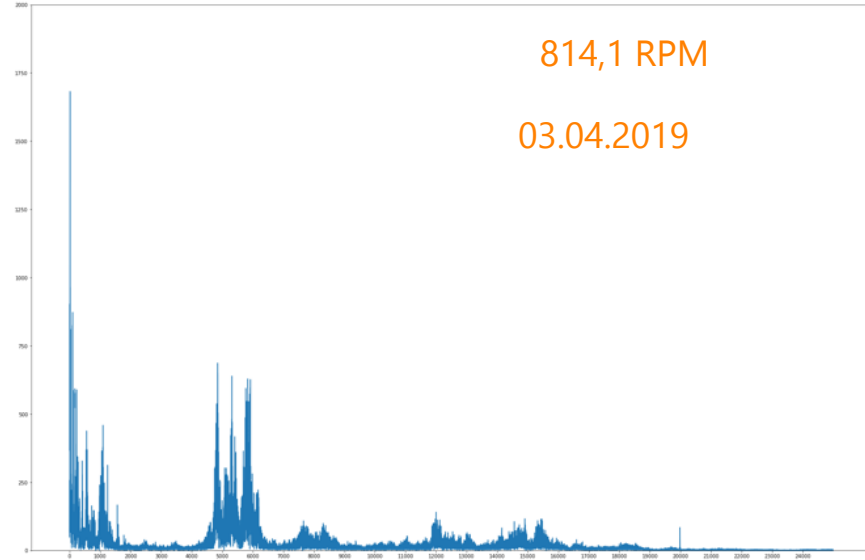
Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

3 x

GUFO



IoT & DataScience @ Wien Energie

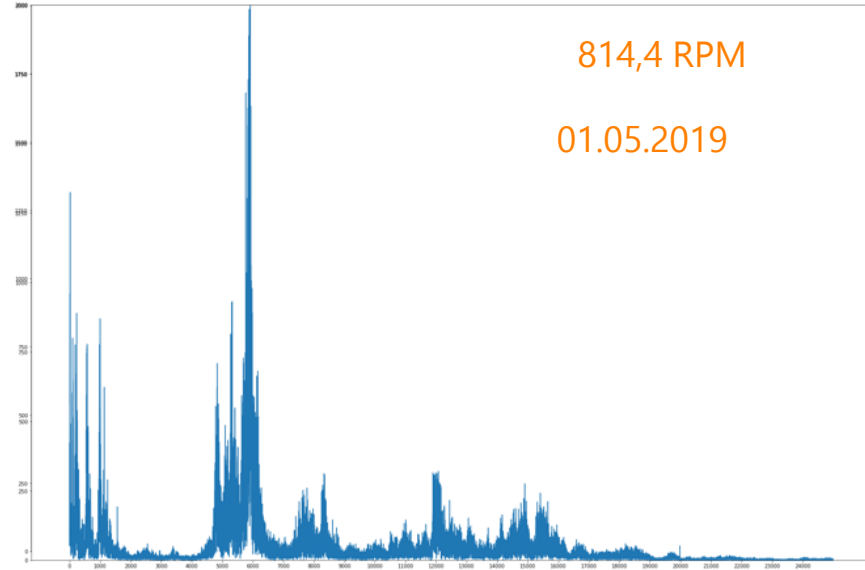
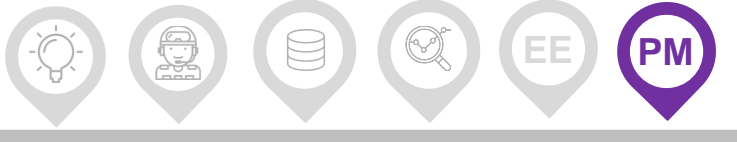
Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

3 x

GUFO



IoT & DataScience @ Wien Energie

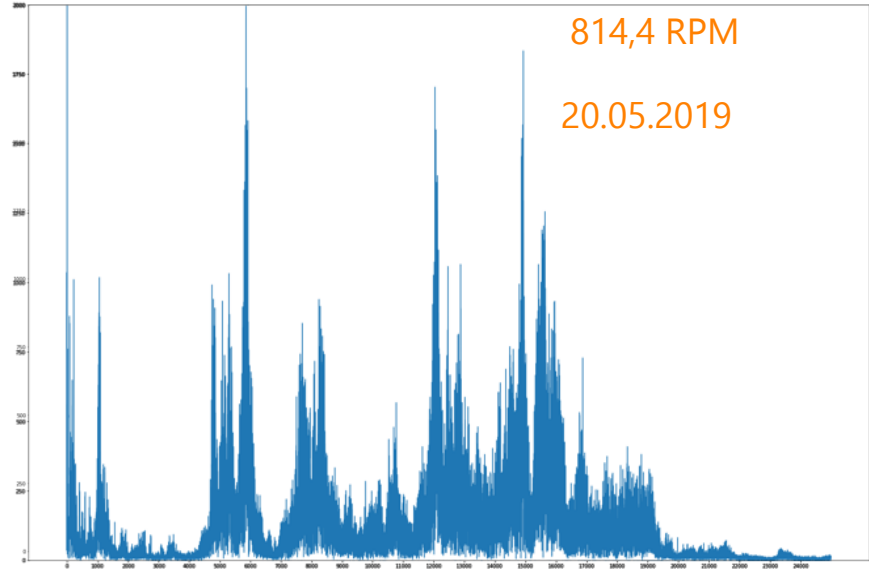
Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

3 x

GUFO



IoT & DataScience @ Wien Energie

Pilotproject – Predictive Maintenance

Unsupervised ML

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3 x

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IoT & DataScience @ Wien Energie

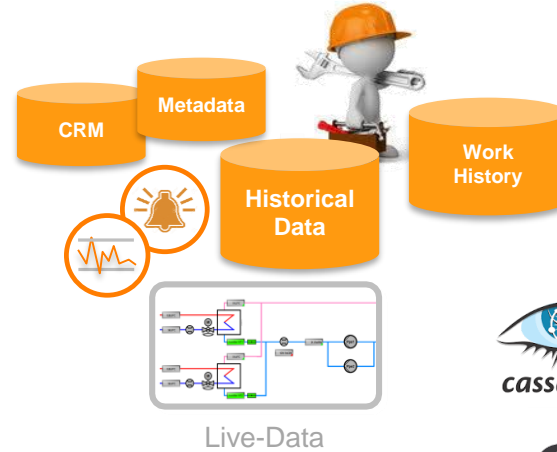
Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

130 x

GUFO



IoT & DataScience @ Wien Energie

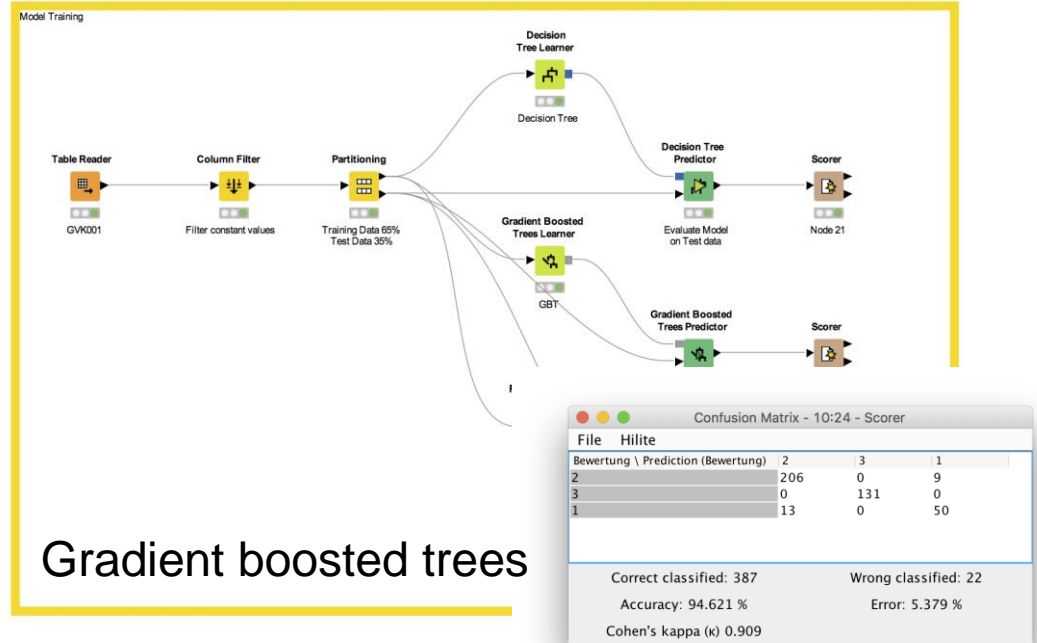
Pilotprojekt – Predictive Maintenance

Unsupervised ML

Supervised ML

130 x

GUFO



Gradient boosted trees

IoT & DataScience @ Wien Energie

Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

130 x

GUFO



Model Training

Decision
Tree Learner

~75%

of Service Interruptions
are not necessary!

Gradient boosted trees

Correct classified: 387

Wrong classified: 22

Accuracy: 94.621 %

Error: 5.379 %

Cohen's kappa (κ) 0.909

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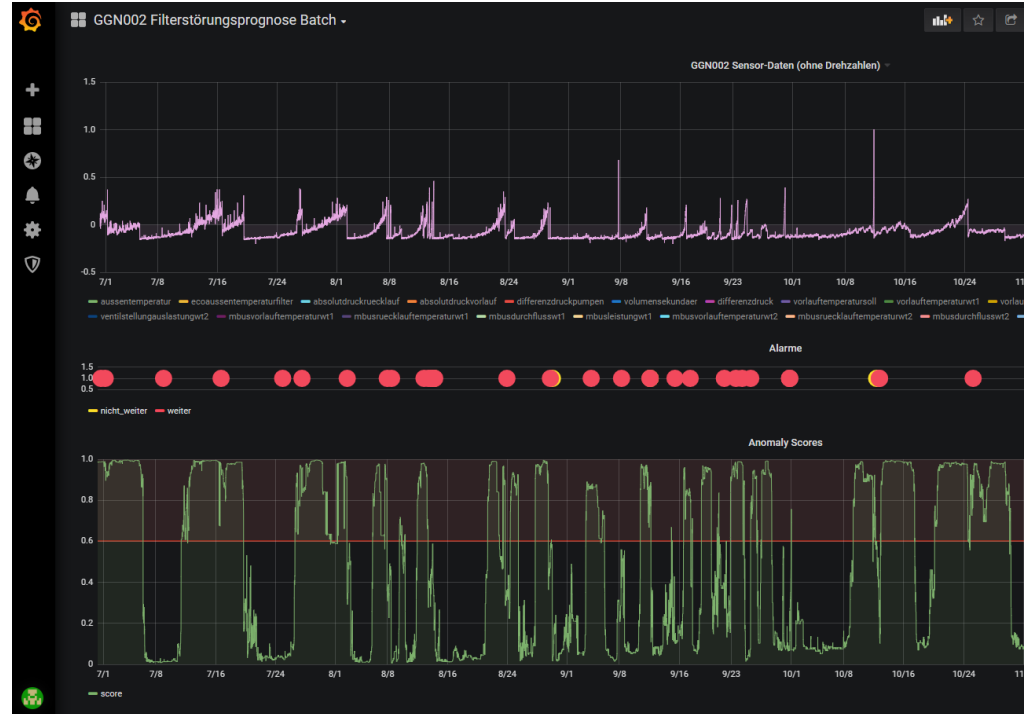
Pilotproject – Predictive Maintenance

Unsupervised ML

Supervised ML

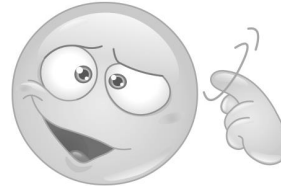
130 x

GUFO



IoT & DataScience @ Wien Energie

- Data Quality
- Data Strategy
- IoT Strategy – IoT Platform
- Modelmanagement
- Mind Setting



Predictive Maintenance



Datavisualization Monitoring



State of Health Efficiency



Smart Control



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