A Complete Overview of the RAVE-ML Model
(Prepare – Build - Deploy)

RAVE International Workshop 2024

13 March 2024

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Agenda

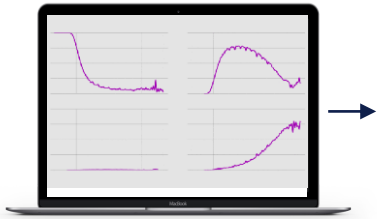
- Introduction
- Project Data – Research at Alpha Ventus (RAVE)
- Prepare – Build - Deploy
- Future Works
- Questions

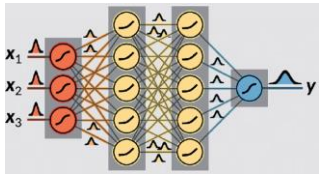
Introduction – What is RAVE-ML model

STEP 1
MODEL CREATION

MEASUREMENT LOADS DATA

SCADA DATA

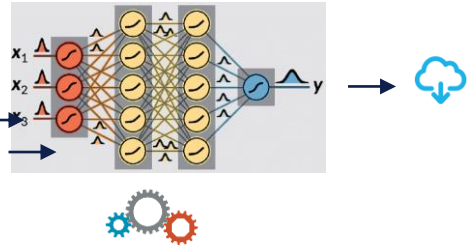


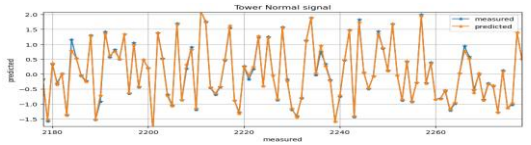


ML MODEL

STEP 2
PRODUCTION

SCADA DATA



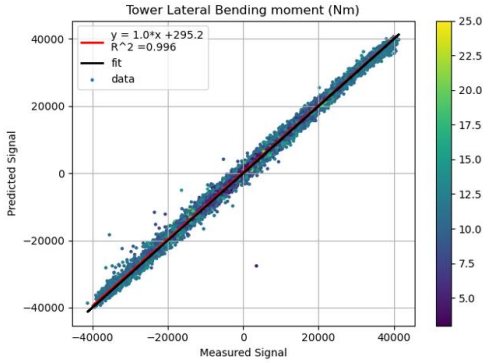


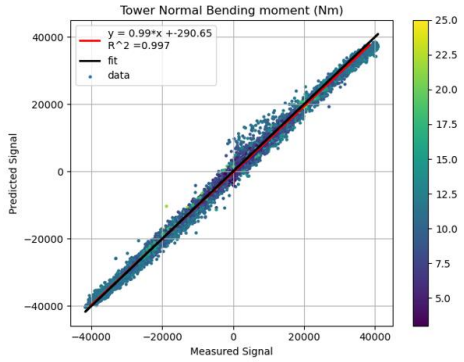
PREDICTED DATA

ADQC Output – 000000/0

No Events Found

Performance/Results





Benefits

- Automatic data quality control
- Reliable lifetime extension
- Windfarm optimization/monitoring
- Measurement data fulfilment/extrapolation
- Digital twin

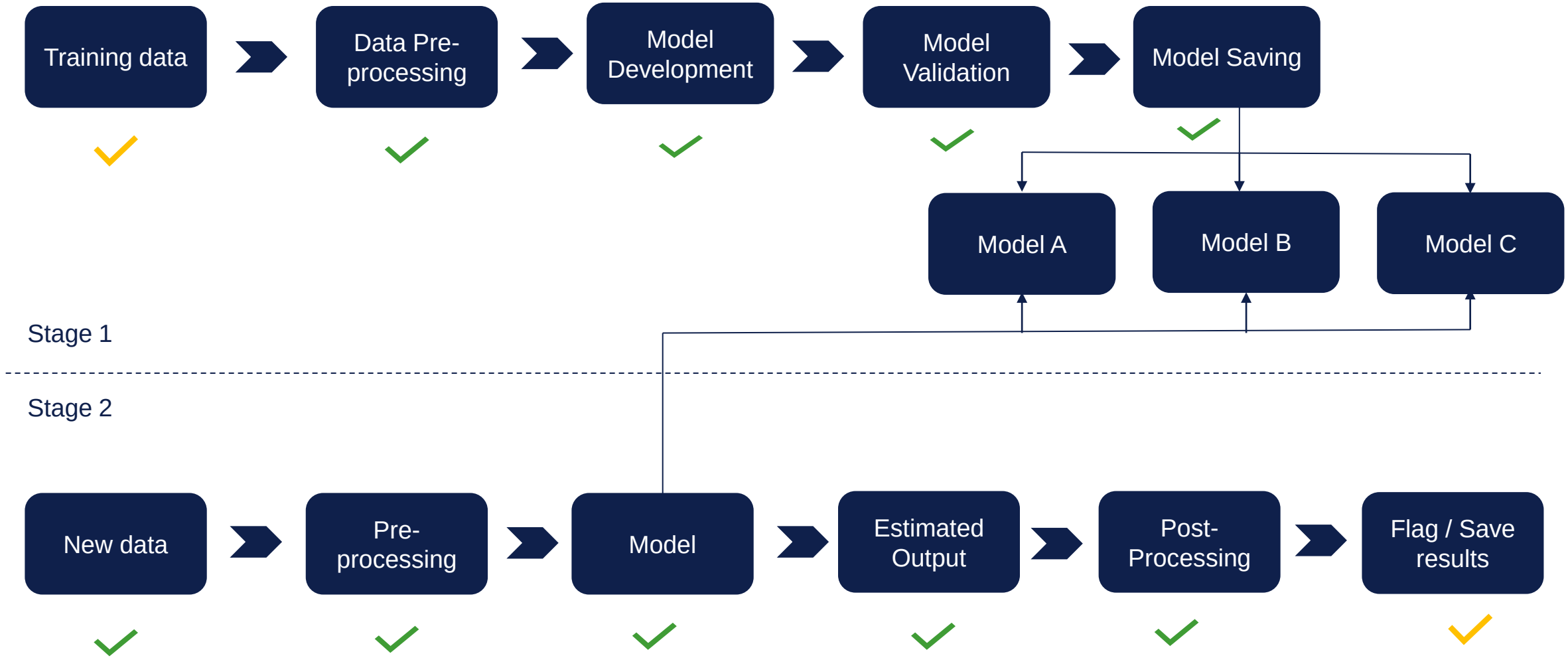
Project Data – Research at Alpha Ventus (RAVE)

- The research Initiative RAVE carries out research and development work on the offshore test field alpha Ventus.
- RAVE is funded by the Federal Ministry for Economic Affairs and Climatic Actions (BMWK) and coordinated by the Fraunhofer Institute for Wind Energy Systems (IWES).
- In more than 30 research projects, more than 60 partners from science and industry have been working on a wide range of research questions since 2008.
- The financial support from the BMWK so far amounted to more than 50 million euros.

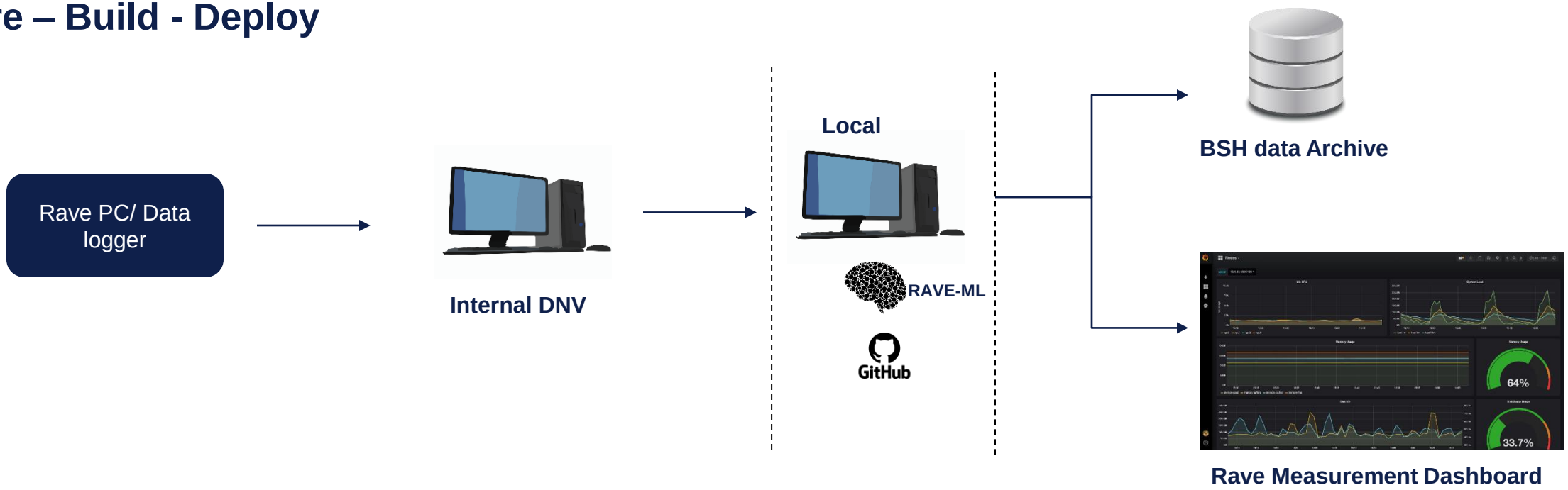
Wind Farm Outlook

- 45 Km North von Borkum
- 30 m water depth
- 12 Wind turbines
  - 6 AREVA WIND M5000
  - 6 Senvion 5M
- CAPEX : 250 Million Euros
- More than 10 years of measurement data

Prepare – Build - Deploy



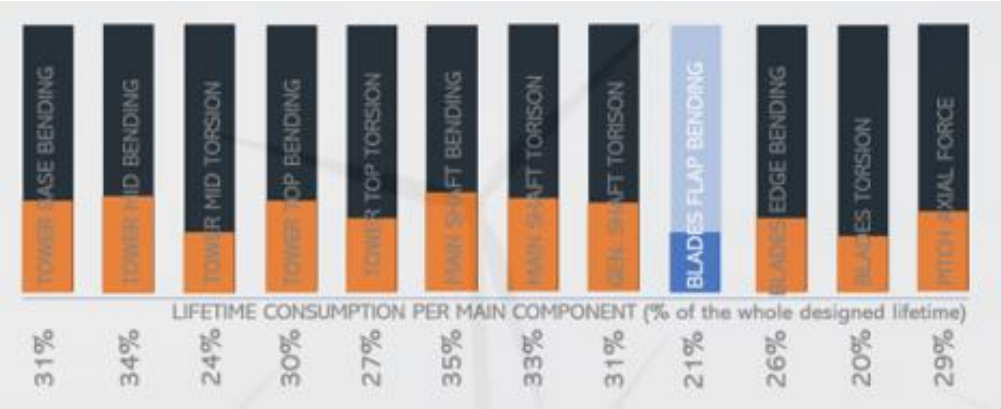
Prepare – Build - Deploy



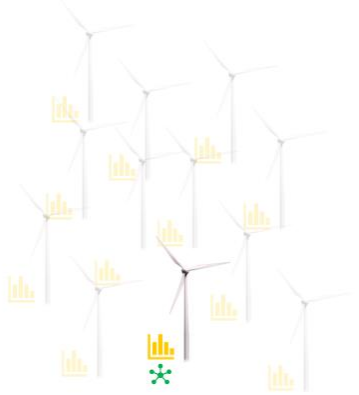
Quick demo of the dashboard …

Future Works – Potential Extended Applications

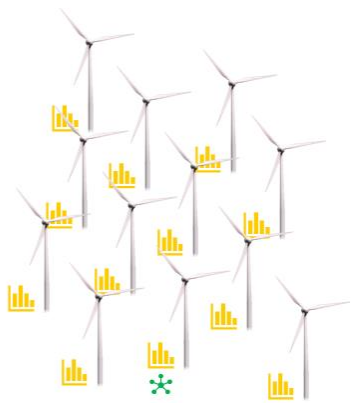
Reliable Lifetime Estimation



Wind farm optimization

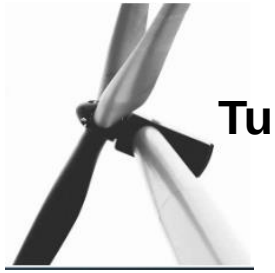


Model built based on one turbine



Transferred to other turbines

Measurement Data fulfilment/extrapolation



Turbine 1

Turbine 2

References

- https://rave-offshore.de/en/events.html - All details regarding the ML model, data preparation, network etc. can be found here
- https://github.com/RAVE-DNV/RAVE-Data-Quality-Control - Github repository
- https://iopscience.iop.org/article/10.1088/1742-6596/1618/2/022006/pdf
- https://zenodo.org/record/4923193/files/BAYESIAN%20NEURAL%20NETWORK%20FOR%20ESTIMATING%20%20FATIGUE%20LOADS%20ON%20WIND%20TURBINES.pdf

Thank You

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