

Predictive Maintenance for Industry 4.0

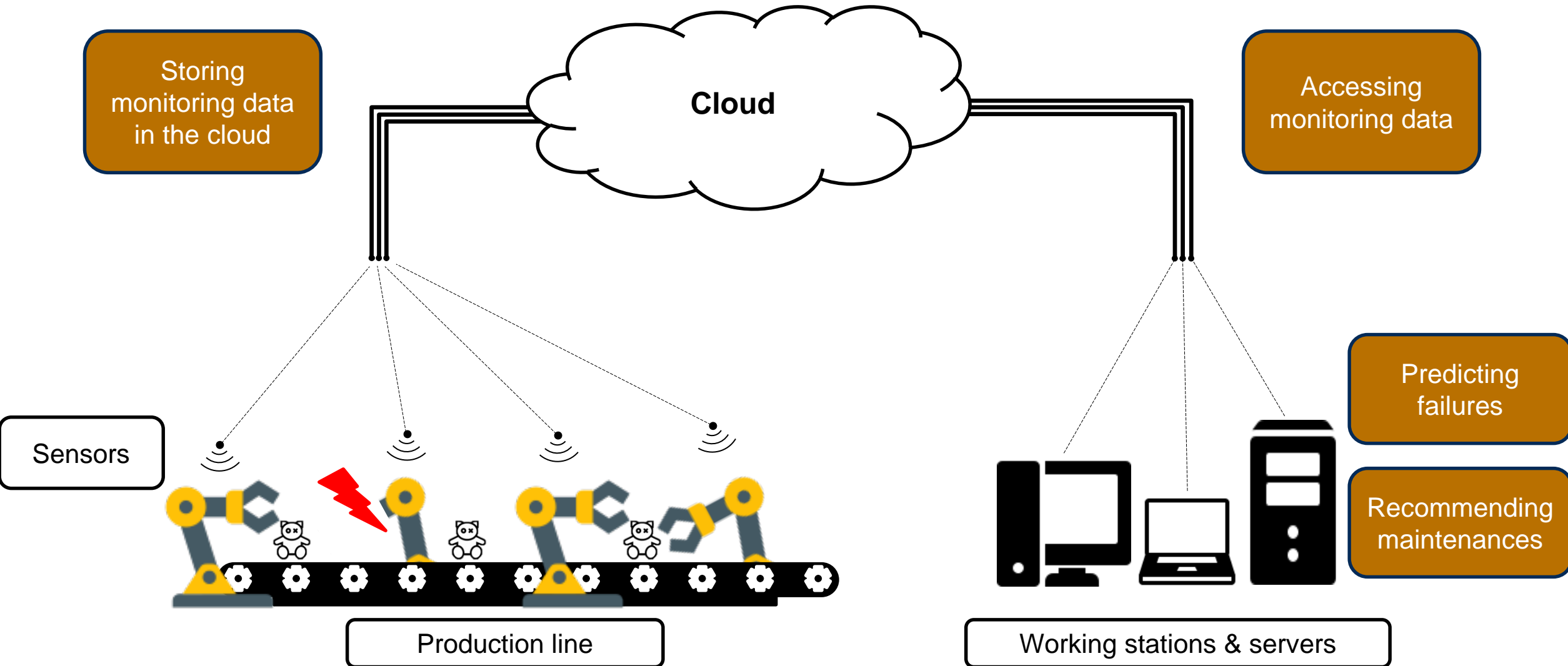
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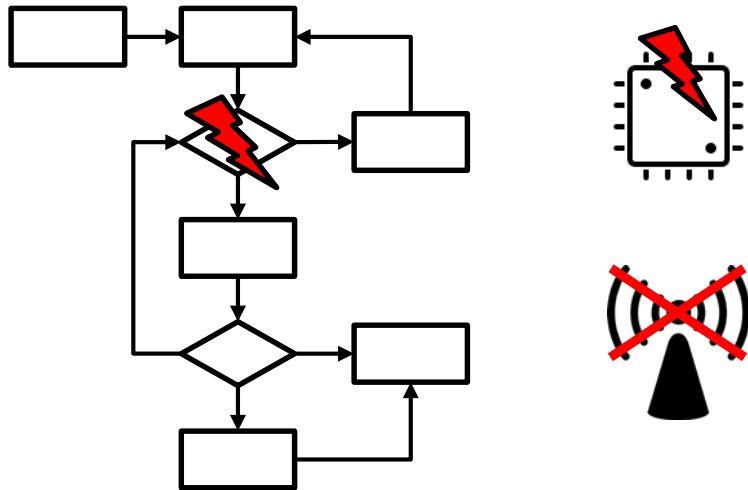
Why Predictive Maintenance?



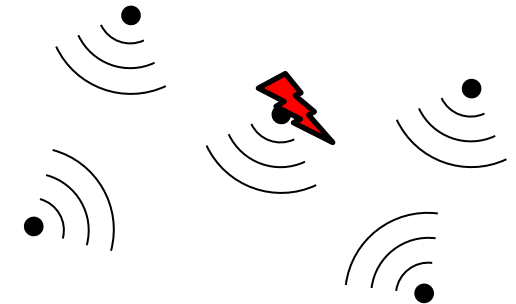
Challenges

Failures as rare events [1]

Several types of failures



Defect sensors



Lack of real world data with health information

Huge amount of sensors and data

Inconsistencies

°C ft in
°F cm

[1] Chandola, Varun, Arindam Banerjee, and Vipin Kumar. "Anomaly detection: A survey." *ACM computing surveys (CSUR)* 41.3 (2009): 15.



Envisioned Approach

Forecasting & Threshold

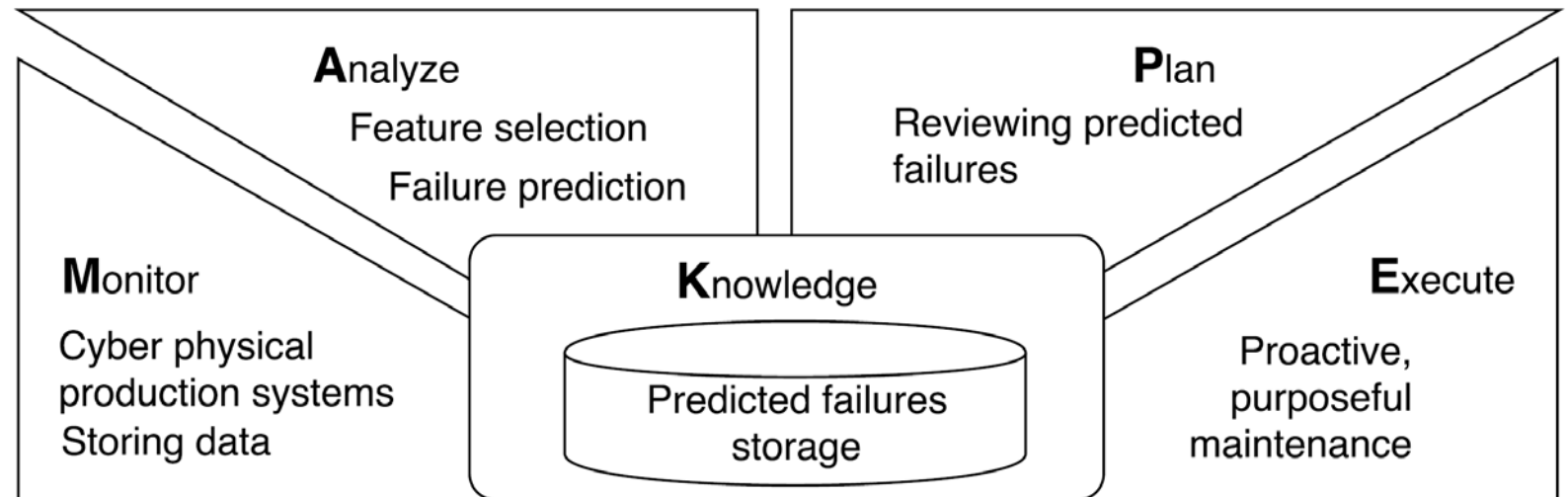
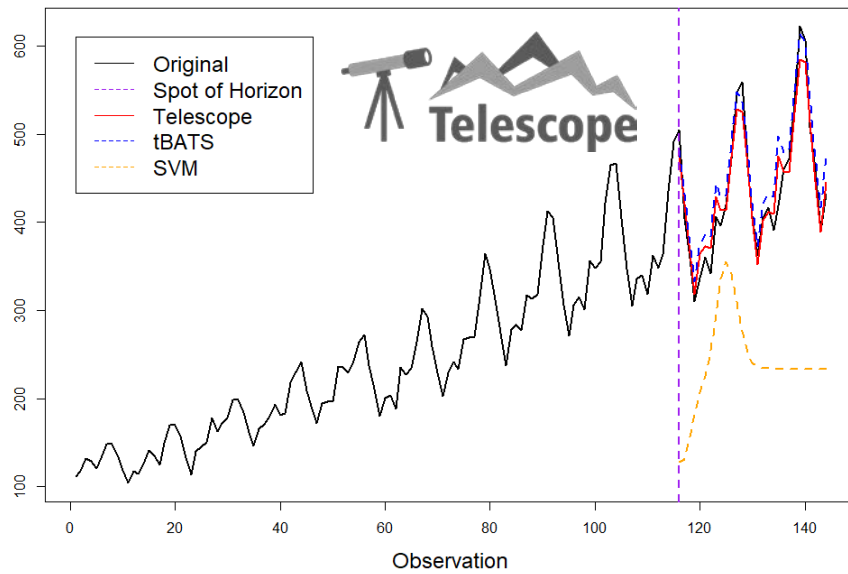
- Set/Learn threshold
- Forecast indicators to proactively send warning

Machine Learning

- Feature selection
- Learn correlation between indicators and health

Root Cause Analysis

- Determine point of failure
- Schedule purposeful maintenance



Conclusion

Problem

- Failures may cause downtime of an entire factory
- High costs for downtime and reparation

Idea

- Early detection of future failures of cyber physical production systems
- Proactive scheduling of purposeful maintenance

Approach

- Data preprocessing
- Failure prediction using time series analysis and machine learning
- Root cause analysis

Benefit

- Reduction of maintenance costs
- Improvement of factory availability



Thank you for your attention

Slides are available at
<https://descartes.tools/>

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