

Unit I: Big Data in Automation Automation Systems

Welcome to 19MCT401 Data Analytics in Automation System. Today, we explore how Big Data transforms Mechatronics.

Our focus: understanding, leveraging, and validating Big Data's immense value.
value.



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The Promotion of the Value of Big Data

Why Big Data Matters in Automation

Exponential Data Growth

Industrial IoT devices generate petabytes of petabytes of sensor data. A single wind turbine generates 20-40 GB/day.

Enhanced Decision Making

Shift from reactive to proactive strategies. Siemens' MindSphere processes 100TB+ daily.

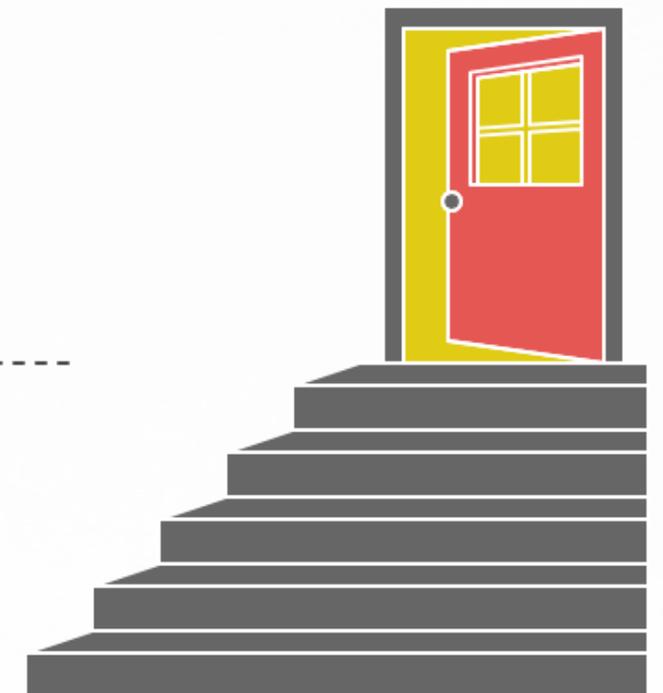
Unlock insights and drive innovation with Big Data.

**Data-driven decisions,
competitive advantage**

Open door at top

**Untapped data potential,
hidden insights**

Base of staircase



Big Data Use Case 1: Predictive Maintenance

Proactive Asset Management

- 1** Concept

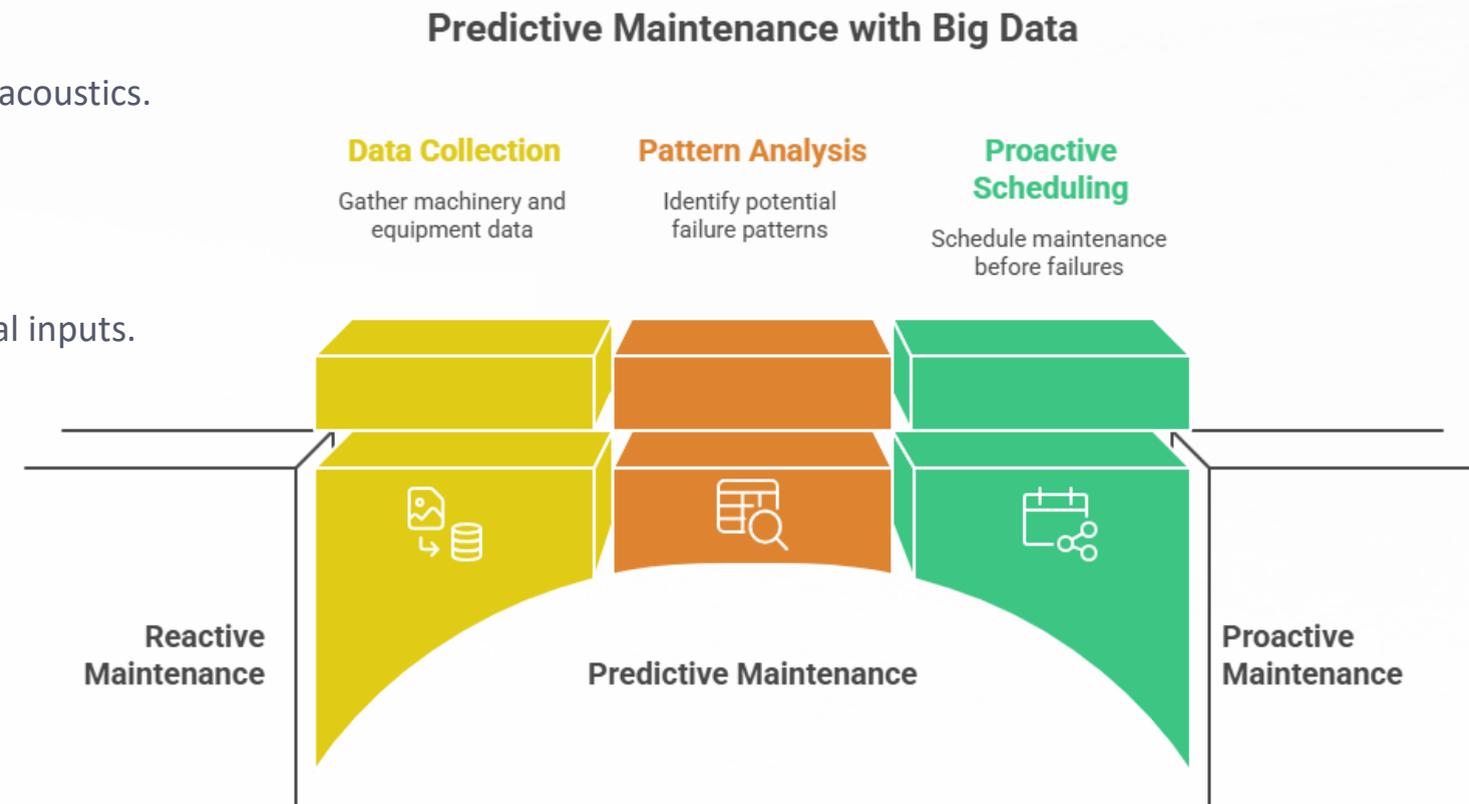
Predict equipment failure using sensor data: vibration, temperature, current, acoustics.
- 2** Data Sources

Accelerometers, thermocouples, current transformers, PLC logs provide critical inputs.
- 3** Analytics

Machine learning models predict failures. Regression and LSTM neural networks are common.
- 4** Outcomes

30-50% reduction in unplanned downtime. Asset lifespan extends 15-20%.
- 5** Example

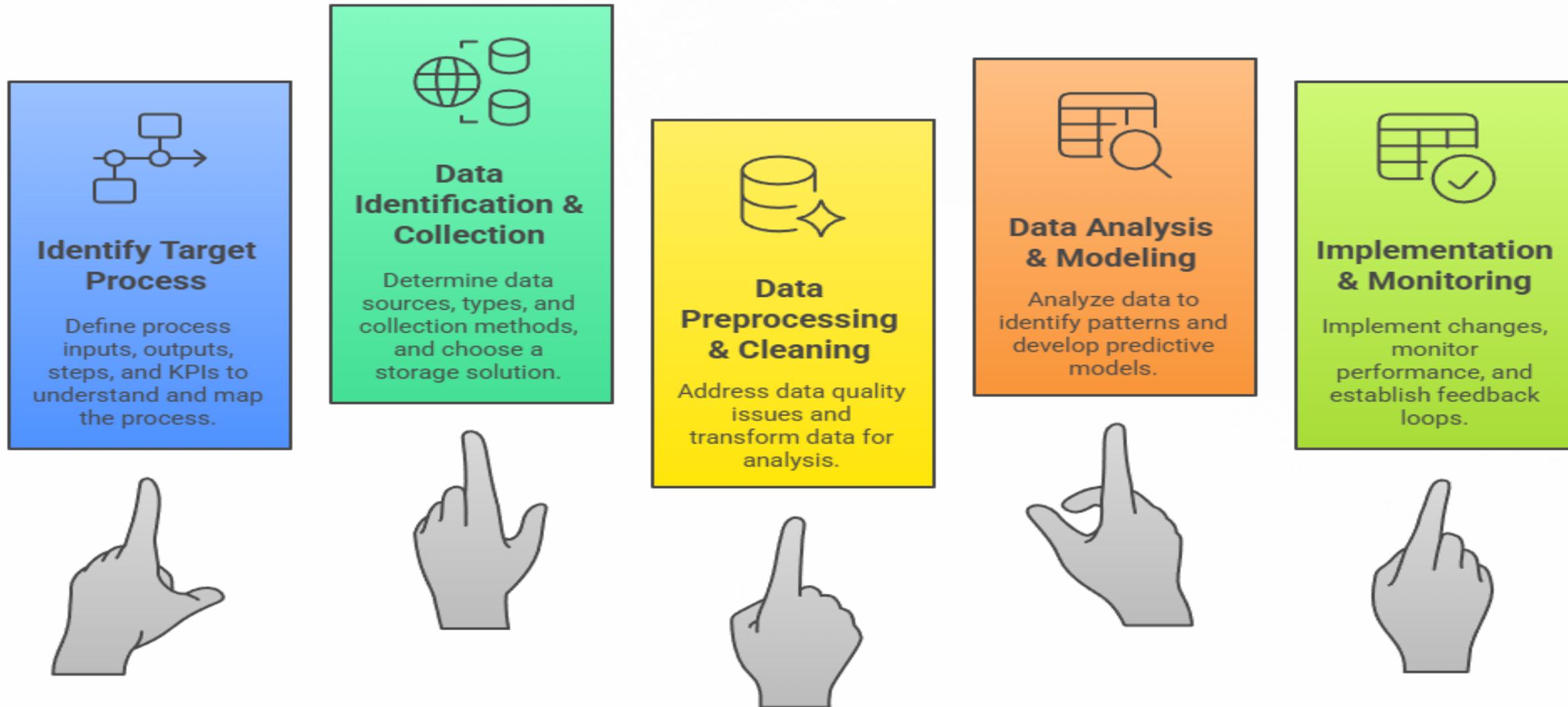
GE reduced locomotive failures by 20% using analytics on 1.7M TBs of data.



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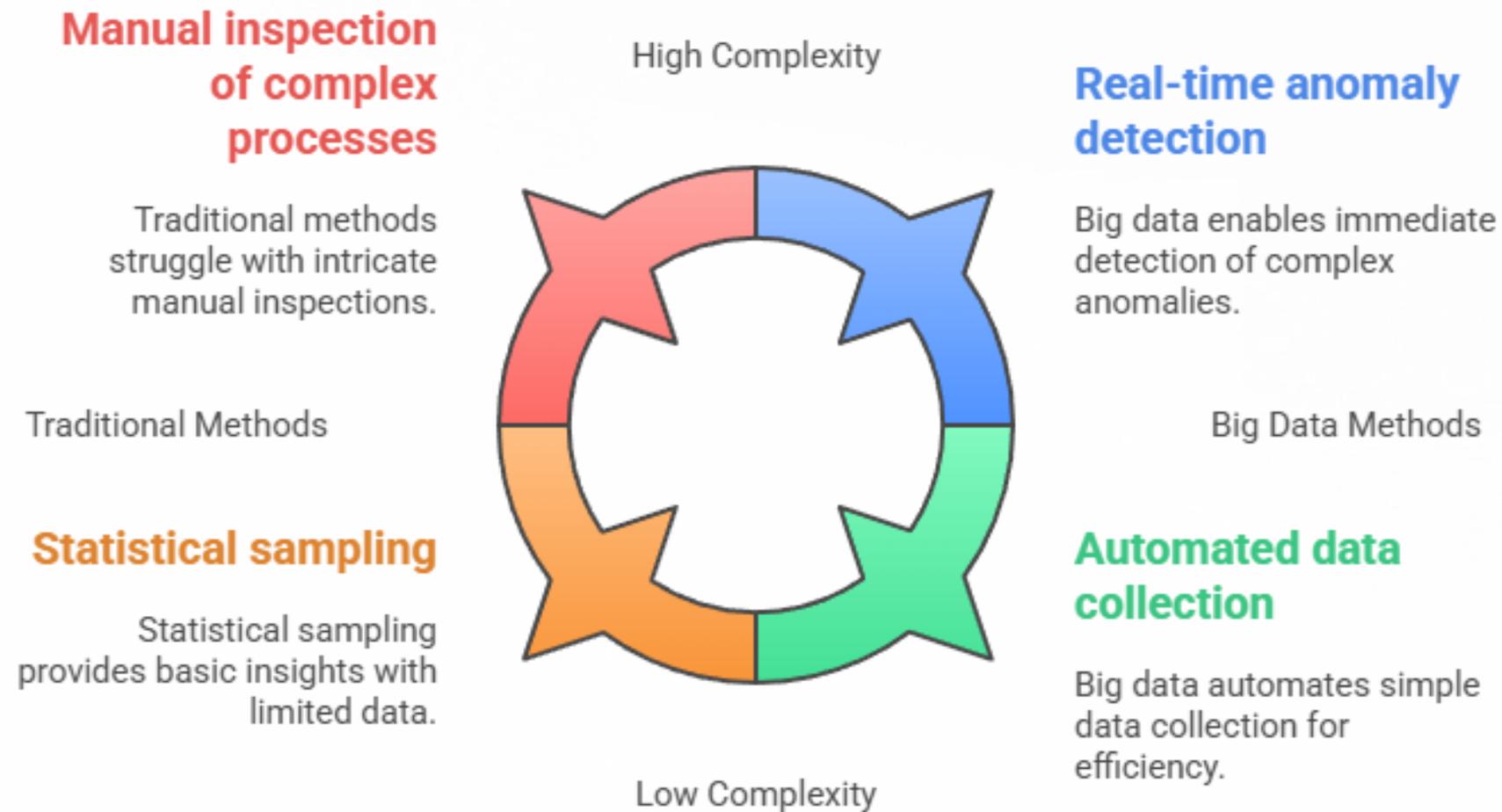
Big Data Use Case 2: Process Optimization

How to leverage big data for process optimization?



Big Data Use Case 3: Quality Control & Anomaly Detection

Big Data vs. Traditional Quality Control Methods



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Challenges & Future Trends

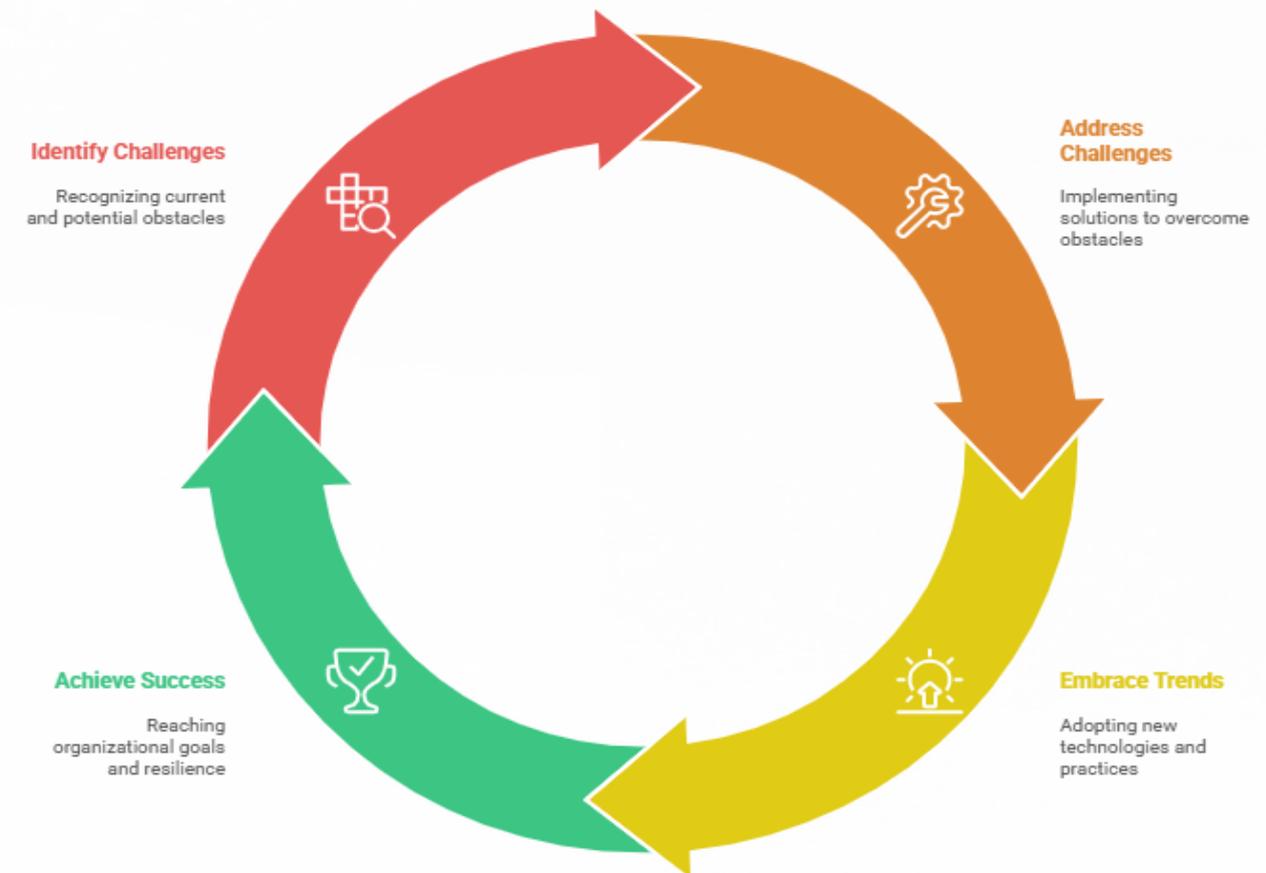
Navigating the Big Data Landscape in Automation

Challenges

- Data Governance: Quality, privacy, compliance issues.
- Cybersecurity: Protecting critical infrastructure.
- Skill Gap: Shortage of combined expertise.
- Integration Complexity: Legacy system hurdles.

Future Trends

- AI at the Edge: Faster insights closer to data.
- Digital Twins: Virtual replicas for simulation.
- Prescriptive Analytics: Guiding optimal actions.



Conclusion & References

The Future is Data-Driven Automation

- Big Data delivers quantifiable value in automation.
- The 5 Vs are fundamental to Big Data applications.
- Predictive maintenance, process optimization, quality
- Robust, scalable, and secure applications are crucial.

Further Reading:

- Loshin, D. (2013). **Big Data Analytics**.
- Marr, B. (2016). **Big Data in Practice**.

