Intel® AI for Manufacturing Certificate Course

Week 8 – Assignment Report
Case Study: Predictive Maintenance in Manufacturing

Name: Ayan Memon
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1. Introduction

Predictive maintenance is an essential application of artificial intelligence and data analytics in the manufacturing sector. It allows companies to anticipate equipment failures before they occur, minimizing downtime and improving operational efficiency.

For this assignment, we have chosen **General Electric (GE)** as our case study. GE has successfully implemented predictive maintenance in its industrial operations.

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2. Company Overview

Company Name: General Electric (GE)
Industry: Manufacturing (Industrial Equipment and Power Systems)
Location: Global operations, headquartered in Boston, Massachusetts, USA

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3. Problem Statement

GE faced frequent unplanned downtime and high maintenance costs across its manufacturing units. Traditional preventive maintenance methods were insufficient, as they did not predict failures accurately and often resulted in unnecessary maintenance activities.

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4. Proposed Solution

To address these challenges, GE adopted a predictive maintenance strategy using industrial IoT (IIoT), machine learning models, and cloud analytics. The company used sensors on machines to collect real-time operational data such as temperature, vibration, and pressure. This data was then processed using AI models to detect early signs of equipment failure.

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5. Implementation Process

- **Step 1:** Sensor installation on critical machinery
- **Step 2:** Data collection from real-time operations
- **Step 3:** Integration with cloud-based analytics platform (Predix)
- **Step 4:** Training machine learning models to predict equipment failure
- **Step 5:** Deployment of alert systems for timely maintenance decisions

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6. Results Achieved

- **Reduction in unplanned downtime by 20-25%**
- **Decrease in maintenance costs by 10-15%**
- **Improved asset lifespan and performance reliability**
- **Higher overall equipment effectiveness (OEE)**

These outcomes led to a significant improvement in production efficiency and customer satisfaction.

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7. Impact on Operations

GE experienced the following operational benefits:

- Better resource planning and scheduling
- Enhanced safety due to reduced equipment failures
- Data-driven decision-making culture across departments
- Increased competitiveness in the global market

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8. Ethical and Legal Considerations

GE ensured full data privacy compliance by:

- Following industry standards like ISO/IEC 27001 for data security
- Maintaining transparency with employees regarding sensor-based monitoring
- Ensuring ethical use of AI with explainable decision-making processes

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9. Future Trends in Predictive Maintenance

- **AI-Powered Automation:** More autonomous systems will act on predictive insights without human intervention.
- **Edge Computing:** Processing data closer to the source to reduce latency and improve response time.
- **Digital Twins:** Simulated models of real assets to improve accuracy of predictive analytics.

- **Self-Healing Systems:** Machines will take corrective actions independently in the future.

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10. Conclusion

GE’s case study demonstrates the powerful impact of predictive maintenance in the manufacturing sector. By leveraging AI and IoT, GE was able to transform its maintenance practices, reduce costs, and improve operational reliability. Future advancements will make predictive maintenance even more intelligent, scalable, and accessible to manufacturers worldwide.