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IoT Solutions

Use Cases

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Business Advancements with Machine Learning: The New Frontier of Data-Driven Competitive Advantages

Use Cases

Businesses keep investing in technology to have a competitive edge and remain resilient. These goals are now being fulfilled through data manipulation, the scope of which is growing daily. As a result, efficient data analysis, processing, and usage lead to enhanced agility, more accurate decision-making, a superior user experience, and optimized costs. To sift through and work with the extraordinary amount of data that is constantly being generated, businesses use machine learning (ML), the benefits of which will be examined in this White Paper.
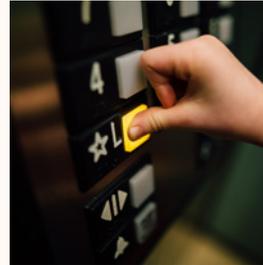
USE CASE 1

Iot-Based System for the Prediction of Possible Malfunctions in Elevators

Client
A European elevator maintenance company.

Challenge

◇ The Client needs to optimize and increase the effectiveness of technicians' on-site visits.

◇ Implement an IoT/ML system for collecting and analyzing real-time statistics.

Benefits and Results

★ Intetics has developed an **ML algorithm and implemented sensors** that collect and analyze data in real time **without any human intervention**, allowing relationships to be found between historical data and current readings.

★ Now technicians are **notified of possible risks of failure in advance**, which allows them to fix everything beforehand, making their on-site visits more productive.

★ The time required for maintenance planning has been **reduced by 20-50%**, and overall maintenance costs have been **reduced by 10%**.

USE CASE 2

ML-Powered Monitoring Software for Preventive Car Diagnostics

Client
European car manufacturer.

Challenge

◇ Develop an IoT solution for preventive car maintenance management, requests handling, scheduling, and remote diagnosis.

◇ Collect, analyze, store, and visualize a large amount of data about the perfomance of vehicles' individual parts.

TECHNOLOGY STACK: AWS Cloud / ML / C++ / Python

Benefits and Results

★ Intetics developed an AWS-based Cloud solution that could process maintenance requests, connect the dealer's service centers with clients, order required parts, schedule services, and provide remote car diagnostics based on data from car telemetry.

★ Cloud-based ML algorithms ensured the prediction and operative determination of such malfunctions as drops in air pressure, overheating, drained batteries, and broken sensors.

★ The supporting mobile application provides car owners with information on their car parts' performance, as well as real-time malfunction notifications and the ability to plan/request routine and on-demand maintenance.

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USE CASE 3

Optimization of Quality Control With an ML Solution

Client
Public transport manufacturer.

Challenge

◇ Increase the speed and quality of the inspection process during the production of bus parts; support employees' visual inspections with AI-based technologies.

◇ Ensure highly precise detection of darkened parts, rust, and the differences between gaps, among other defects.
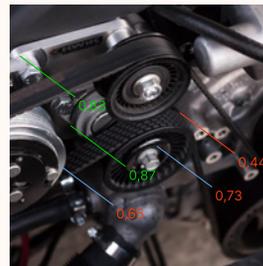
TECHNOLOGY STACK: ML / Python / TensorFlow

Benefits and Results

★ The developed software enabled operative AI-based analysis of imagery obtained from cameras.

★ Intetics' team used proven in-house methodology to effectively label data in large datasets and trained the ML algorithm with pixel precision.

★ The software provided precise detection and marking of such defects as incomplete or faulty assemblies and cracks to confirm that all components are present, correctly placed in their location, and completely assembled.

USE CASE 4

Iot-Based Fleet Maintenance

Client
A Norway logistics company.

Challenge

◇ Missed appointments for service providers led to lost revenue.

◇ Improve ordinary preventive maintenance by considering such reasons for breakdown as accidents and force majeure situations.

◇ Prevent idle workers, lost revenue, and angry customers.

TECHNOLOGY STACK: Python / H2O 3.0 / MongoDB

Benefits and Results

★ Uses data from **IoT sensors** embedded in vehicles to determine which components should be replaced.

★ Looks for patterns in data that indicate failure modes for specific components or generate more **accurate predictions of the lifespan**.

★ When specific failure signals are observed, **the client is notified that components may fail soon**, so they can take maintenance measures.

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USE CASE 5

Predictive Iot Maintenance in the Chemical Industry

Client

A Turkish chemical company.

Challenge

- Apply predictive analytics algorithms to provide insights for reducing downtime.
- Integrate business data from ERP and MES systems to provide context to the production asset data.
- Include industrial data integration and data analytics algorithms to detect patterns in machine data for investigating the derived insights.

TECHNOLOGY STACK: Python / Anaconda / PostgreSQL

Benefits and Results

★ Automatic reports for strategic maintenance scheduling and proactive repairs alone **reduces maintenance time by 20–50 percent** and decreases overall maintenance costs **by 5–10 percent**.

★ Analytics-driven insights **improve OEE** (overall equipment effectiveness) by reducing unnecessary maintenance, extending asset life, and enabling root cause analysis of a system to uncover issues ahead of failure.

USE CASE 6

Real-Time Data Analytics for Aircraft Maintenance

Client

An international freight company.

Challenge

- Combine real-time data from sensors with advanced analytics to monitor aircraft parts in real time.
- Predict the remaining lifespan of engine components.
- Schedule maintenance in a timely manner to prevent mechanical failures.

TECHNOLOGY STACK: Microsoft Azure (Web Job, AeroDataGenerator, Power BI dashboard, Stream Analytics, Azure SQL)

Benefits and Results

★ An end-to-end solution that includes data ingestion, data storage, data processing and advanced analytics.

★ While it is customized for aircraft monitoring, it **can easily be generalized** for other predictive maintenance scenarios.

★ The data source of this solution is comprised of or derived from publicly available data from the **NASA data repository** using the **Turbofan Engine Degradation Simulation Data Set**.

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USE CASE 7

Predictive Onshore Wind Turbine Maintenance

Client

One of the largest onshore wind farms in Western Europe.

Challenge

◇ Some of the earliest-installed wind turbines are approaching the end of their life cycle, which leads to more failures, malfunctions, etc.

◇ Critical parts should be monitored with sensors providing data at regular intervals.

◇ The Client must know about the impending breakdowns in advance in order to take action.

Benefits and Results

★ The developed solution has three steps: **pre-processing of raw input data, anomaly detection, and root-cause analysis**. A model based on the KNIME workflow is designed to predict faults and anomalies, and it determines the severity level of the problem.

★ Algorithms can predict breakdowns up to 10 weeks in advance; the client **saved 30% of maintenance costs**.

TECHNOLOGY STACK: KNIME software / Python / AWS / Kibana

USE CASE 8

Maintenance of Traditional Property

Client

A large construction company.

Challenge

◇ The Client was unable to control, foresee, and mitigate possible issues via traditional property monitoring.

◇ Create a predictive maintenance algorithm that can predict system failures before they occur, thereby maximizing the runtime of facilities.

Benefits and Results

★ The predictive algorithms use historical and real-time data to aid in explorative analysis and complex visualization of repair protocols. This algorithm helped identify and mitigate the root causes of failures.

★ The Client **reduced 10% of overall maintenance costs and 50% of maintenance planning time, while also increasing the facilities' runtime and availability by 15%**.

TECHNOLOGY STACK: Python Flask / AWS / C++

USE CASE 9

Predictive IoT Maintenance in the Oil & Gas Industry

Client

An oil & gas company.

Challenge

◇ Apply predictive analytics algorithms to provide insights for reducing downtime.

◇ Integrate business data from ERP and MES systems to provide context to the production asset data.

◇ Include industrial data integration and data analytics algorithms to detect patterns in machine data for investigating the derived insights.

Benefits and Results

★ Automatic reports for strategic maintenance scheduling and proactive repairs alone **reduces maintenance time by 20–50 percent** and decreases overall maintenance costs **by 5–10 percent**.

★ Analytics-driven insights **improve OEE** (overall equipment effectiveness) by reducing unnecessary maintenance, extending asset life, and enabling root cause analysis of a system to uncover issues ahead of failure.

TECHNOLOGY STACK: Python / Anaconda / PostgreSQL

Learn More about IoT Sensors and Their Benefits

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Toll Free: +1 (877) SOFTDEV

US: +1 (239) 217-4907

DE: +49 (211) 3878-9350

UK: +44 (20) 3514-1416

www.intetics.com