Manufacturing

Provided Foolproof Predictive Maintenance Solution For An Energy Major

Increased uptime of the overall asset

Industry
Energy

Function
Production & Maintenance

Data Sources
1. Historians
2. MES
3. External Data
4. Edge Devices

Tech Stack
1. PySpark
2. Kaftka
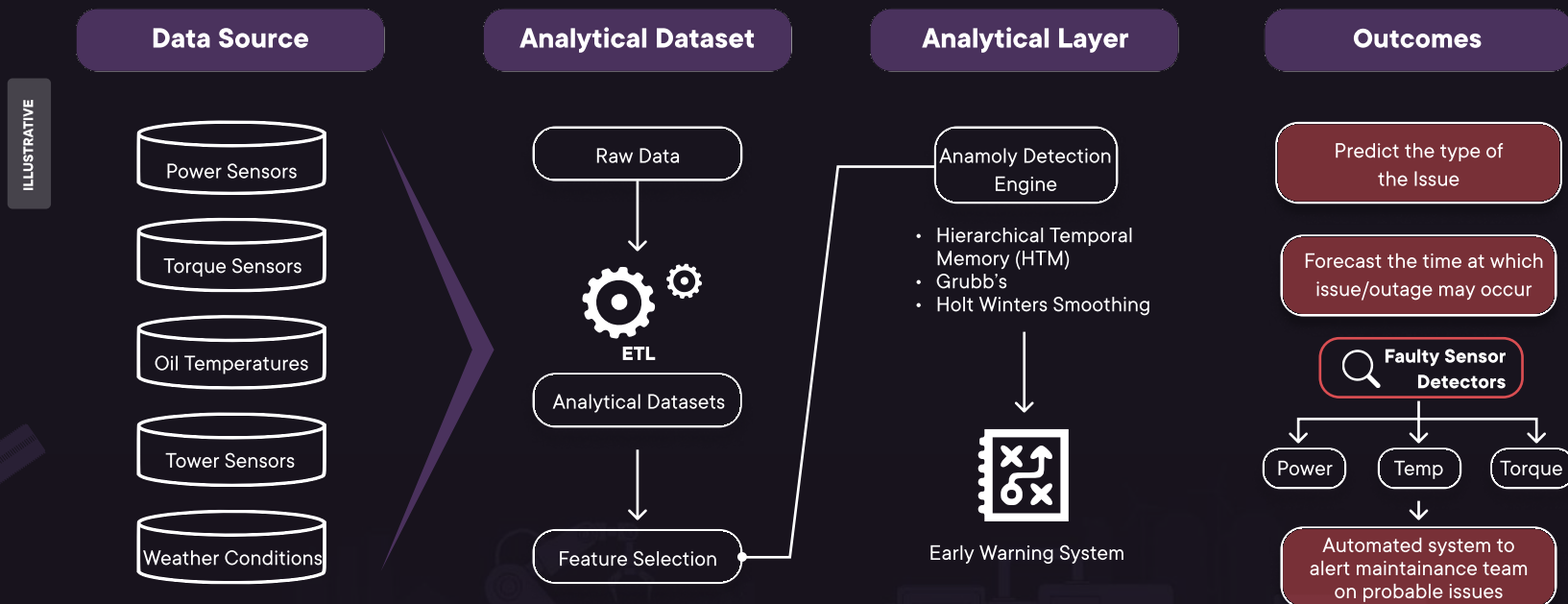3. K+TensorFlow

Who Is The Client?

The client is one of the top energy majors based in the US, pioneered in producing renewable energy using wind turbines across the country with constant innovation and technology adoption that combines energy industry domain knowledge with leading edge machine learning technologies.

Business Quandary

Monitoring the performance of wind turbines was a challenging factor for the client across multiple locations. Proactively identifying possible performance anomalies to reduce inefficient energy production and long-term machine failure was a major bottleneck. The necessity of a foolproof plan and strategy to overcome this problem was the need of the hour for the client.

How Did We Solve The Problem?

Our team of manufacturing & Data Science experts conducted a technology assessment and identified the various data sources. Later, developed the solution architecture comprising of four stages for building the predictive maintenance system.

The effort put in was powered by advanced Machine learning and Deep learning algorithms to predict the occurrence of anomalies in near real-time.

ILLUSTRATIVE

Data Source	**Analytical Dataset**	**Analytical Layer**	**Outcomes**

Data Source
- Power Sensors
- Torque Sensors
- Oil Temperatures
- Tower Sensors
- Weather Conditions

Analytical Dataset
- Raw Data
- ETL
- Analytical Datasets
- Feature Selection

Analytical Layer
- Anamoly Detection Engine
  - Hierarchical Temporal Memory (HTM)
  - Grubb's
  - Holt Winters Smoothing
- Early Warning System

Outcomes
- Predict the type of the Issue
- Forecast the time at which issue/outage may occur
- Faulty Sensor Detectors
  - Power
  - Temp
  - Torque
- Automated system to alert maintainance team on probable issues

The Pay Off

Using Affine's predictive maintenance system, our Analytics Engineering team captured the probability of failure in wind turbines. Consequently, the AI team used the same captured data to develop an automated warning system to predict the possible faults in sensors to alert the maintenance team on probable issues. The threshold values are customized for every wind turbine type and automatically identified based on historical performance and desired workload.
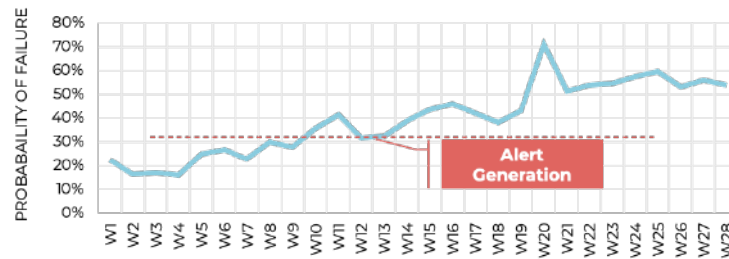
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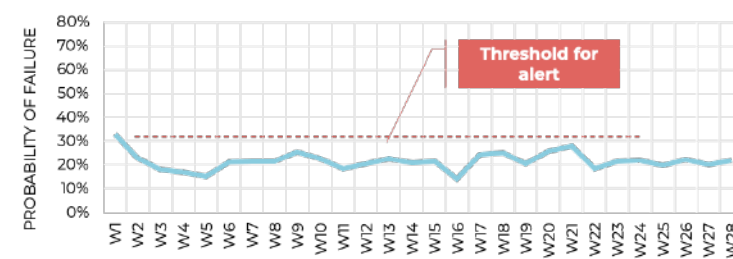
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PROBABILITY DISTRIBUTION FOR ANOMALOUS WIND TURBINE

Alert Generation

PROBABILITY DISTRIBUTION FOR NON-ANOMALOUS WIND TURBINE

Threshold for alert

Predicted the remaining useful life of the critical components & in accordance to that a maintenance ticket is raised

The probability of failure doesn't vary a lot hence identified as non-anomalous

Augmented Outcomes

↑ Improvement In OEE

↓ Reduction In Maintenance Cost

↓ Reduction In Spare Parts Inventory

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