CASE STUDY

Remote Monitoring and Predictive Maintenance of O&G Wells

Problem Statement

The client, one of the largest Oil & Gas production companies, sought to remotely monitor the health status of their wells and facilitate proactive maintenance. In the process, they wanted to optimize production and prevent costly downtime.

Challenges

- The client struggled to accurately identify the state of their wells, leading to a lack of timely intervention in case of issues.
- Data from the wells were diverse and complex, including dynamic card signatures, images, and numerical values, making it challenging to integrate and analyze effectively.
- Some crucial well states, like healthy/new ALS, lacked sufficient data for analysis and prediction.
- The client relied heavily on expert opinions for identifying well health, leading to potential biases and inefficiencies.

Solution

To address the challenges, Utthunga implemented a comprehensive solution that leveraged advanced machine learning techniques and data analysis tools. Key highlights include:

- Four different Machine Learning models (LSTM, GRU, bi-GRU, bi-LSTM) were employed to identify the state of each well. These models achieved an impressive accuracy of 93%, providing a solid foundation for decision-making.
- The results of the individual ML models were fed into an ensemble model, which provided a final classification output. This ensemble approach improved the overall accuracy and robustness of the well state classification.
- A novel approach to classify the dynacard signature based on both images and numerical data values was incorporated to provide a holistic view of the well state.
- In cases where certain well states, such as a healthy/new ALS, had limited or no available data, synthetic data generation techniques were employed. This ensured that the machine learning models had sufficient data for analysis and discovery.
- By correlating various field parameters, the system could accurately identify unhealthy states of wells, allowing for timely intervention and maintenance.
- The solution leveraged advanced technologies, including TensorFlow, TensorFlow Extended, and TensorFlow Serving, to effectively implement and deploy the machine learning models.
- Libraries such as NumPy, Pandas, Matplotlib, Scikit-learn, and Keras was utilized to preprocess data, train models, and visualize results.

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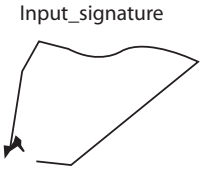
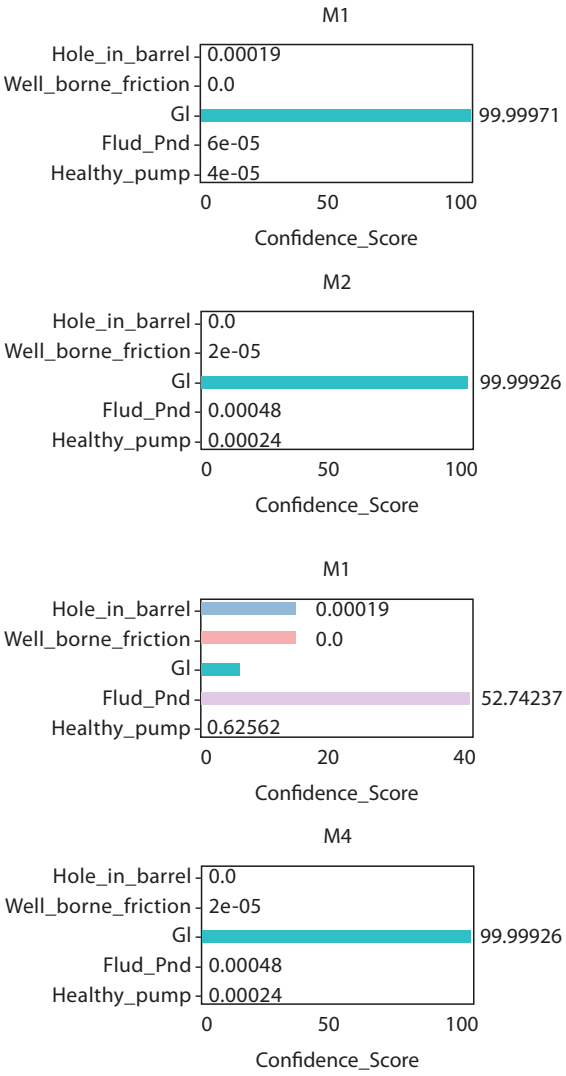
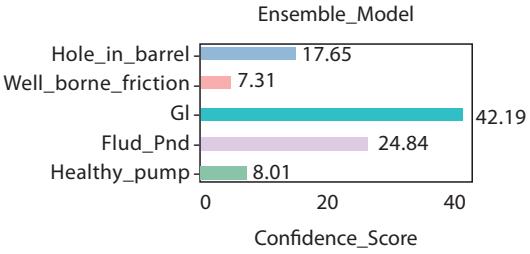
Engineering Transformation







Benefits

Utthunga's solution resulted in significant benefits for the client:

- ✓ The machine learning models achieved an accuracy rate of 93%, ensuring precise and reliable well state identification.
- ✓ The ensemble model further improved prediction accuracy, reducing false positives and negatives.
- ✓ The generation of synthetic data for previously unavailable well states expanded the capabilities of the system and improved its robustness.
- ✓ The correlation of field parameters allowed for early identification of unhealthy well states, enabling proactive maintenance and reducing downtime.
- ✓ Real-time monitoring and predictive maintenance led to a significant increase in operational efficiency, reducing production losses and maintenance costs.