AI-Driven Optimization of Drilling Operations in Oil & Gas Wells

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Oil well blowouts are a major safety and economic problem in drilling operations, often caused by delays in decision-making during critical situations. In many cases, engineers require significant time to analyze data and determine the appropriate action, which can lead to escalation of the problem. This project presents an intelligent system that utilizes artificial intelligence to improve real-time decision-making and prevent blowouts before they occur. The system analyzes real-time sensor data, including pressure, temperature, and flow rate, combined with historical data from oil wells that experienced operational failures such as kick incidents and abnormal pressure increases. Machine learning models are trained on this data to detect patterns associated with high-risk conditions. The system not only predicts potential problems but also provides real-time recommendations and corrective actions, such as adjusting drilling parameters, increasing mud density, or activating safety systems like blowout preventers (BOP). Experimental results demonstrated that the system improved decision-making speed by over 60% compared to conventional methods, while achieving prediction accuracy above 96%. This enabled faster responses, reduced escalation risks, and significantly enhanced operational safety and efficiency.

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