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Machine Learning; New Machine Learning Findings from University of Texas Austin Reported (Real-time Prediction of Bottom-hole Circulating Temperature In Geothermal Wells Using Machine Learning Models)

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2024 JUL 1 (VerticalNews) -- By a News Reporter-Staff News Editor at Journal of Engineering -- Current study results on Machine Learning have been published. According to news reporting originating from Austin, Texas, by VerticalNews correspondents, research stated, "Drilling high-temperature geothermal wells presents technical and economic challenges. Real-time and precise estimation of bottom-hole circulating temperature (BHCT) during geothermal drilling is crucial for maximizing the working life of drill bits and temperature-limited bottom-hole assembly (BHA) components, thereby avoiding unplanned and unnecessary bit/BHA trips."

Funders for this research include University of Texas at Austin, **Bureau of Economic Geology** at the University of Texas at Ausitn.

Our news editors obtained a quote from the research from the University of Texas Austin, "This study introduces a novel machine learning (ML) model that accurately predicts BHCT in real time, enhancing proactive temperature management and mitigating thermally induced challenges during geothermal drilling operations. An integrated thermo-hydraulic model, validated using publicly available data from the Utah FORGE field, was used to generate a large dataset that simulates the transient BHCT under typical drilling conditions. This dataset was subsequently used to train and test the prediction capability of six ML models of the BHCT, including deep neural networks (DNN), support vector machines (SVR), random forests (RF), extreme gradient boosting regressor (XGBoost), ensemble (Stacked) algorithm, and long-short term memory (LSTM) networks. It was also used to generate an understanding of the non-linear relationship between the input features and the output variable (BHCT). demonstrate the benefits of implementing the LSTM model for reliable prediction of the BHCT and capturing its full-scale transient behavior in geothermal wells. The LSTM model stands out for its excellent generalization capability, stability, and precision in real-time estimation of BHCT across various geothermal drilling conditions, including both stationary and dynamic scenarios. This is achieved without the high computational costs associated with complex numerical models, thus preventing temperature-related drilling problems."

According to the news editors, the research concluded: "Among the other supervised ML models, the XGBoost model can still reliably simulate the BHCT with a mean absolute error (MAE) below 1 degrees C during geothermal drilling at constant drilling parameters, but will show overfitting when drilling parameters change."

This research has been peer-reviewed.

For more information on this research see: Real-time Prediction of Bottom-hole Circulating Temperature In Geothermal Wells Using Machine Learning Models. Geoenergy Science and Engineering, 2024;238. Geoenergy Science and Engineering can be contacted at: Elsevier, Radarweg 29, 1043 Nx Amsterdam, Netherlands.

The news editors report that additional information may be obtained by contacting Mohamed Shafik Khaled, University of Texas Austin, Bur Econ Geol, Austin, TX 78712, United States. Additional authors for this research include Ken Wisian, Ningyu Wang, Pradeepkumar Ashok and Eric van Oort.

Keywords for this news article include: Austin, Texas, United States, North and Central America, Cyborgs, Emerging Technologies, Machine Learning, University of Texas Austin.

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