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Ground Surface Temperature History Prediction Using Long-Short Term Memory Neural Network Architecture

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Abstract : Ground surface temperature history prediction model plays a vital role in determining standards for international nuclear waste management. International standards for borehole based nuclear waste disposal require paleoclimate cycle predictions on scale of a million forward years for the place of waste disposal. This research focuses on developing a paleoclimate cycle prediction model using Bayesian long-short term memory (LSTM) neural architecture operated on accumulated borehole temperature history data. Bayesian models have been previously used for paleoclimate cycle prediction based on Monte-Carlo weight method, but due to limitations pertaining model coupling with certain other prediction networks, Bayesian models in past couldn't accommodate prediction cycle's over 1000 years. LSTM has provided frontier to couple developed models with other prediction networks with ease. Paleoclimate cycle developed using this process will be trained on existing borehole data and then will be coupled to surface temperature history prediction networks which give endpoints for backpropagation of LSTM network and optimize the cycle of prediction for larger prediction time scales. Trained LSTM will be tested on past data for validation and then propagated for forward prediction of temperatures at borehole locations. This research will be beneficial for study pertaining to nuclear waste management, anthropological cycle predictions and geophysical features

Keywords : Bayesian long-short term memory neural network, borehole temperature, ground surface temperature history, paleoclimate cycle
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