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Study on the state prediction of the superconducting magnet system for a nuclear fusion experimental device by machine learning

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In the superconducting magnet system, which is the core equipment of the fusion experimental device, a large number of measuring equipment are installed in the system for the operation and monitoring of the system. Although each measuring equipment is inspected and repaired during the maintenance period of the experimental device, there is a concern that trouble may occur in the measuring equipment that has been used for a long period of time. If a problem occurs in a measuring equipment that is important for system operation, it is necessary to stop the plasma experiment, raise the temperature of the superconducting magnet system to room temperature, and repair or replace the measuring equipment. Therefore, in this study, the development of a machine learning model was conducted to predict the state of the superconducting magnet system based on the measurement data accumulated during system operation. The object of model development in this study is the subcooling system for the Large Helical Device in the National Institute for Fusion Science. This system is suitable for the model development because it holds a huge amount of measurement data collected after about 10 years of operation.

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