Model Imputasi Data Intensitas Radiasi Matahari Pada Automatic Weather Station Multisite Berbasis Long Short Term Memory = Solar Radiation Intensity Data Imputation Model on Multisites Automatic Weather Station Based Long Short Term Memory

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Abstrak

Automatic Weather Station (AWS) mengalami kendala berupa kerusakan komponen dan kegagalan sistem komunikasi, sehingga menyebabkan data parameter tidak lengkap. Kerusakan komponen juga terjadi pada pyranometer. Penurunan kinerja pyranometer menghasilkan penyimpangan, ketidakpastian pengukuran intensitas radiasi matahari, serta gap data. Imputasi data menjadi salah satu solusi dalam meminimalisir penyimpangan pengukuran dan terjadinya missing data pyranometer AWS. Penelitian ini bertujuan mendesain serta menganalisis performa akurasi model imputasi data intensitas radiasi matahari pyranometer AWS multisite ketika terjadi gap data. Penelitian ini berupaya memanfaatkan kaitan spasio-temporal intensitasi radiasi matahari AWS multisite di dalam model imputasi. Algoritma Long-Short Term Memory (LSTM) digunakan sebagai estimator pada jaringan pyranometer AWS multisite. Tahap pemodelan imputasi data meliputi pengumpulan data, pra-pemrosesan data, pembuatan skenario missing data, desain LSTM dan pengujian model. Metode berbasis machine learning ini diharapkan mampu mengimputasi data AWS pada missing data dalam jangka menit maupun jam, jika AWS mengalami kerusakan sistem atau gangguan jaringan komunikasi. Nilai MAPE model LSTM untuk imputasi pyranometer AWS Cikancung untuk missing data 30 menit, 1 jam dan 3 jam berturut-turut yaitu 1,81% ; 2,72% ; dan 5,07%. Nilai MAPE model LSTM untuk AWS Cimalaka untuk missing data 30 menit, 1 jam dan 3 jam berturut-turut yaitu 0,46% ; 1,25% ; dan 3,24%. Nilai MAPE model LSTM untuk AWS Cipasung untuk missing data 30 menit, 1 jam dan 3 jam berturut-turut yaitu 2,30% ; 1,67% ; dan 0,94%.

.....Automatic Weather Station (AWS) experienced problems in the form of component damage and communication system failure, resulting in incomplete parameter data. Component damage also occurs in pyranometers. Decreased pyranometer performance results in deviations, uncertainty in measuring solar radiation intensity, and data gaps. Data imputation is one solution to minimize measurement deviations and the occurrence of missing AWS pyranometer data. This research aims to design and analyze the accuracy performance of the multisite AWS pyranometer solar radiation intensity data imputation model when a data gap occurs. This research attempts to utilize the spatio-temporal relationship of multisite AWS solar radiation intensity in the imputation model. The Long-Short Term Memory (LSTM) algorithm is used as an estimator in the multisite AWS pyranometer network. The data imputation modeling stage includes data collection, data pre-processing, creating missing data scenarios, LSTM design and model testing. This machine learning-based method is expected to be able to impute AWS data for missing data in minutes or hours, if AWS experiences system damage or communication network disruption. The MAPE value of the LSTM model for the AWS Cikancung pyranometer for missing data of 30 minutes, 1 hour and 3 hours respectively is 1.81%; 2.72% ; and 5.07%. The MAPE value of the LSTM model for AWS Cimalaka for missing data of 30 minutes, 1 hour and 3 hours respectively is 0.46%; 1.25% ; and 3.24%. The MAPE value of the LSTM model for AWS Cipasung for missing data of 30 minutes, 1 hour and 3 hours respectively is

2.30%; 1.67% ; and 0.94%.