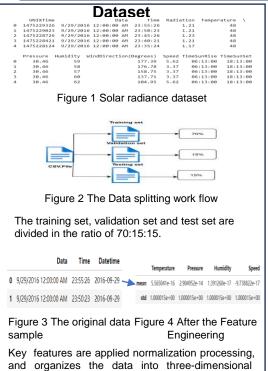


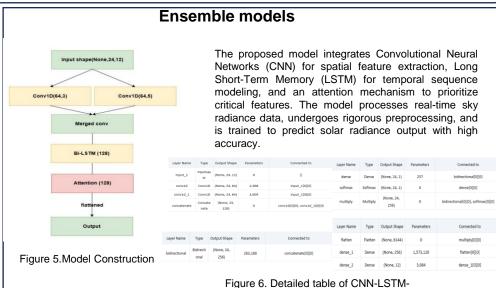
Alex Yang

Real-Time Sky Radiance Prediction for Solar Panel Angle **Optimization**

Oxford Brookes University in collaboration with Chengdu University of Technology Supervised by Dr Happy Nkanta Monday

Abstract
With the increasing importance of renewable energy such as solar energy, accurately predicting solar energy has become an important step in social exploration, especially for optimizing solar panel angle. This project investigates and designs a new deep learning conceptual model for predicting future solar energy based on past solar data, which combines LSTM, CNN and attention mechanism technology. This project investigated the performance of the new custom model and evaluated the model using regression metrics such as MAE, MSE, and R2 score. In addition, the model was also explained using Lime XAI technology. The experimental results emphasize the potential of LSTM technology, CNN technology, and attention mechanism in solar energy prediction tasks, making significant contributions to future research in the field of deep learning.





Attention mechanism's working process

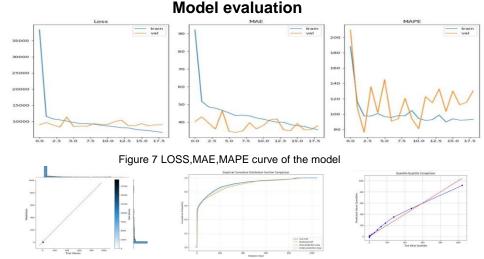
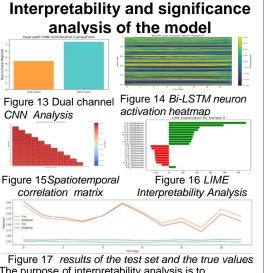


Figure 8.performance with RMSE,R2 Figure 9 .Empirical cumulative Figure 10. Quantity Comparison

The figures above show the performance with LOSS, MAE, MAPE, R2 and RMSE score of the CNN-LSTM-Attention combined model and some comparison, which used to predict radiance in the



tensors through sliding window technology to fit the CNN-LSTM framework, and captures the spatiotemporal relationship of multidimensional features

The purpose of interpretability analysis is to understand the predictive behavior of complex models on a single sample by constructing locally interpretable alternative models. What's more, focuses on identifying the features in the data that have the most influence on the model's predictions, helping to understand the model's focus and decision-making rationale.

GUI DEVELOPMENT

Figure 18 Interface to the model

Figure 19 Function of the system

The deployment runs in a small software, but only provides on computer ,also needs the matplotlib to generate figure if need details.the inference prediction runs in the local terminal

Future work

Future work will enhance the model's generalizability, test the model on datasets from other places to make it more reliable. Adding Feature datas to improve prediction accuracy. Making the model predict long time steps prediction.