A Deep Learning Approach to Forecast Electricity Demand in Sylhet of Bangladesh

Publisher: IEEE Cite This PDF

Nripendro Biswas ; Munaem Ahmed Mahdi ; Tasmia Islam **All Authors**

Abstract:
Electricity demand forecasting is essential for efficient resource allocation, infrastructure planning, and sustainable energy management. However, achieving a precise prediction of electricity demand is difficult due to noise and randomness. This paper presents a comparative analysis of deep learning and machine learning models for forecasting electricity demand in Sylhet, a rapidly developing urban area in Bangladesh. We applied Time Series Dense Encoder (TiDE), which has not been used in this field before, to achieve higher accuracy in electricity demand forecasting. To assess the performance of the proposed approach, we compared it with three different machine learning models: linear regression, XGBoost, and an ensemble of linear regression and XGBoost. Each model's accuracy was evaluated using MAPE, RMSE, MAE, and the coefficient of determination $\left(r^{2}\right)$. Based on the research outcomes, the TiDE model had MAPE values of $1.139\%, \mathbf{1.672\%}, 2.887\%$; RMSE values of 0.0081, $0.0139, 0.0230$; MAE values of $0.0065, 0.00972, 0.0162$; and Coefficient of Determination values of $0.91, 0.814, 0.717$ for the three forecast horizons in these order-days seven, fifteen and thirty.

Published in: 2024 International Conference on Innovations in Science, Engineering and Technology (ICISET)

Date of Conference: 26-27 October 2024

DOI: 10.1109/ICISET62123.2024.10939731

Date Added to IEEE *Xplore*: 01 April 2025

Publisher: IEEE

ISBN Information:

Conference Location: Chittagong, Bangladesh

I. Introduction

The necessity for energy production has increased due to population growth, economic expansion and improved living standards [1]. When an energy plant has to produce more energy, its efficiency drops and starts releasing harmful emissions. Thus, if a plant is required to produce more energy immediately, it will operate with lower efficiency and produce harmful emissions. 'Plants' negative effects can thus be mitigated by strategic energy production [2]. Load forecasting is a very important topic in power system development, as the demand for electricity is highly uncertain and variable [3]. Time series load forecasting is forecasting future load demand using historical & real-time data [4]. Commonly three segments are used to classify load forecasting. STLF is the first category of load forecasting, where energy demand is predicted up to several days ahead [5], [6]. While, MTLF predicts energy demand over a week to a year [7]. LTLF projects energy demand beyond a year [8]. The development of power system infrastructure is facilitated by long-term electricity demand predictions. STLF and MTLF is essential for effective system operation management [9]. Precise load forecasting facilitates more efficient distribution and transmission network const

ering investment costs [10]. Even a 1% increase in accuracy leads to significant reductions in operating costs [11]. Distributed renewable energy sources (DRES) are becoming more prevalent in the power grid, which is making it more unstable and complex. Meeting this challenge requires dynamic operation and control. Load electricity demand forecasting is crucial for modern intelligent energy management systems [12], with its applications burgeoning daily. Consequently, the field of electricity demand prediction has received substantial attention from publications [13], [14]. Climatic factors and seasonal characteristics might have an impact on energy consumption. Factors such as temperature, humidity, rainfall [15] in addition to demographic and socioeconomic variables recommended by research studies [16]. Given

Authors

Figures

References

Keywords

Metrics