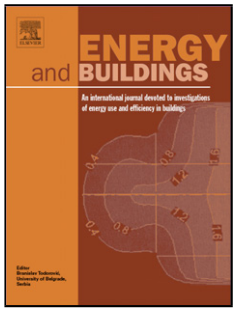

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Household Electricity Demand Forecasting Using Adaptive Conditional Density Estimation

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Abstract

Large-scale deployment of advanced smart grid technologies bolsters load forecasting as a vital requirement for deregulated power systems. In this regard, providing an accurate Short-Term Load Forecasting (STLF) can facilitate demand response applications and real-time electricity dispatch. STLF is mainly influenced by meteorological conditions among which investigating the relationship between temperature and household total electricity consumption is notably important due to their strong correlation. Accordingly, in this paper, we estimate the total electricity consumption to explore the impact of temperature in terms of a non-linear relationship with electricity demand. We propose the Adaptive Conditional Density Estimation (ACDE) method on the basis of Kernel Density Estimation (KDE) to enhance the load forecast accuracy. The aim of the suggested approach is to decompose and examine the mentioned relationship in the context of both temperature-related, and residual components of the total consumption. The performance of the model to forecast the electricity demand is evaluated using a comparison study. The results prove that an ACDE model can significantly improve the recognition capability of the temperature-related component of aggregated power. Finally, the efficacy of the ACDE method is examined via numerical analysis of real data.

keywords: Short-term load forecasting, Adaptive load forecasting, Density forecasting, Building thermal performance.

1 Introduction

ELECTRIC load forecasting is a fundamental business priority in the electric power industry. Energy generation and planning strategies regard electricity demand