

**SPATIAL ELECTRIC LOAD FORECASTING MODEL  
FOR SRI LANKA**

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Degree of Master of Science in Electrical Engineering

Department of Electrical Engineering

University of Moratuwa

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## **DECLARATION OF THE CANDIDATE & SUPERVISOR**

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Signature of the supervisor:

Date

Prof J. R. Lucas

Signature of the supervisor:

Date

Dr P. S. N. De Silva

## **Abstract**

With the high level of city expansion observed during the last few decades, distribution utilities currently face new challenges when planning network expansion with profitable operations. Thus distribution utilities should consider spatial electric load forecasting as the basis for the planning of the electricity distribution networks. Spatial electric load forecasting helps in determining how the increase in demand of electrical energy will be distributed geographically in the service area.

In Sri Lanka, the load forecasting in distribution planning is mainly based on trending methods which lacks the accuracy needed for present dynamic consumer market. The objective of this research is to prepare a simple yet accurate and effective spatial electric load forecasting model which can be used in the local context.

This research deals with a new method for spatial electric load forecasting using artificial neural networks. The electric load growth inside the service area of an electric utility can be expected for two reasons, natural load growth of existing consumers and addition of new loads because of new consumers. In the study, the addition of new consumers in future is regarded as the new load additions in the vacant areas. This is forecasted using the spatial electric load forecasting model implemented using artificial neural network. The growth of existing consumers is addressed with a constant growth.

The implemented model is presented and tested with data from two real mid-sized cities. The outcome is compared with the ones obtained from the utility planning department existing software. The results illustrate that the proposed model provides an accurate and user-friendly technique to predict yearly residential electrical load in Sri Lanka.

**KEYWORDS:** Spatial electric load forecasting, land use, artificial neural network, distribution planning.

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## List of Abbreviations

<b>Abbreviation</b>	<b>Description</b>
ANN	Artificial Neural Network
CSC	Customer Service Centre
GDP	Gross Domestic Product
GIS	Geographical Information System
IEC	International Electro technical Commission
IEEE	Institute of Electrical and Electronic Engineers
kWh	Kilo Watt Hour
LECO	Lanka Electricity Company (pvt) Ltd
LM	Levenberg-Marquardt
MAPE	Mean Absolute Percentage Error
SLFM	Spatial Electric Load Forecasting Model