

Short Term Load Forecasting

Using Machine learning and Artificial Intelligence



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Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the IEEE convention for citation and referencing. Each contribution to, and quotation in, this report from the work(s) of other people has been attributed, and has been cited and referenced.
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Terms of Reference

The terms of reference page is an agreement between yourself and your supervisor outlining what is expected of you in your final year project. Please make sure that this is discussed and written at the beginning of your thesis project.

Acknowledgments

Make relevant acknowledgements to people who have helped you complete or conduct this work, including sponsors or research funders.

Abstract

- Open the **Project Report Template.tex** file and carefully follow the comments (starting with %).
- Process the file with **pdflatex**, using other processors may need you to change some features such as graphics types.
- Note the files included in the **Project Report Template.tex** (with the .tex extension excluded). You can open these files separately and modify their contents or create new ones.
- Contact the latex manual for more features in your document such as equations, subfigures, footnotes, subscripts & superscripts, special characters etc.
- I recommend using the **kile** latex IDE, as it is simple to use.

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Chapter 1

Introduction

1.1 Background to the study

A very brief background to your area of research. Start off with a general introduction to the area and then narrow it down to your focus area. Used to set the scene .

1.2 Objectives of this study

1.2.1 Problems to be investigated

Description of the main questions to be investigated in this study.

1.2.2 Purpose of the study

Give the significance of investigating these problems. It must be obvious why you are doing this study and why it is relevant.

1.3 Scope and Limitations

Scope indicates to the reader what has and has not been included in the study. Limitations tell the reader what factors influenced the study such as sample size, time etc. It is not a section for excuses as to why your project may or may not have worked.

1.4 Plan of development

Here you tell the reader how your report has been organised and what is included in each chapter.

I recommend that you write this section last. You can then tailor it to your report.

Chapter 2

Literature Review

2.0.1 Introduction

An odd power surge phenomenon was recognized during the 2008 Olympics in the UK. At certain times in the evening there would be massive power surges at what seemed like random times in the evening. Though they seemed random to the utility companies they realized something rather funny was happening at these random times. Making a cup of tea is deeply ingrained in the english culture , after looking at the data they realized that the power surge was happening during times when a TV commercial would come on. Whenever a commercial came on TV multiple families would switch on their kettles to make a cup of tea. Though a single kettle may seem harmless , but millions of kettles switched on at the same time would cause a large effect on the load of the power grid. This phenomenon was called the '***Great British Kettle Surge***' [1].*you can also talk about the blackouts mentioned in [2]*

The effect of this great kettle surge can be very harmful to the grid if necessary steps are not taken to increase the grids capacity in times when we expect the power of the grid to increase suddenly. This is where the concept of load forecasting comes into play. Electric Load forecasting is the process of predicting how much electricity will be needed at a given time and how that demand will affect the utility grid [3]. To bring this matter close to home , South Africa has been struggling with provision of power to its population. This could be accredited to the lack of proper load forecasting in the previous years. A Growing population results in a growth in the demand of electricity. If the country does not build facilities to supply enough electricity for the load requirements then load-shedding becomes the only solution to protect the grid. In a perfect country the advice

from load forecasters in the early 2000's would have been taken into consideration and built more facilities to meet this demand. The above example shows the hand in hand relationship between load forecasts and their economic impacts. Large forecasting errors may lead to either excessively risky or excessively conservative scheduling, which can in turn result in undesirable economic penalties[4]. This means that there is a massive push towards finding the best load forecasting techniques that can be reliable.

Load forecasting is separated into 3 main categories which are Short , Medium and Long term Load Forecasting. the major differentiator between the three is the duration in which the forecasting is predicted for.

Long Term Load Forecasting(LTLF) considers periods that are more than a year. LTLF mainly considers factors such as demographic changes, economic growth and energy policy impacts [3]. This forecasting helps utilities think of what can be done to improve their systems to meet the increasing demand of the grid in the future. **Medium Term Load Forecasting (MTLF)** forecasts look at periods between a few months and a year. MTLF is important for demand side management , storage maintenance and scheduling of power [5].

Finally we have short term load forecasting(STLF) which looks at shorter time periods from hourly, daily all the way up to a week of load prediction. STLF is essential in daily operation performance , such as load flow and estimating how many power generators can be used in a particular day [6]. If there is efficient model for STLF , problems such as *british kettle surge* can easily be planned for ahead by ensuring more generators are operational when the demand for power rises. STLF can also ensure that the grid has a reliable continuous power flow during power shortages or outages[7].

Chapter 3

Methodology

This is what I did to test and confirm my hypothesis.

You may want to split this chapter into sub chapters depending on your design. I suggest you change the title to something more specific to your project.

This is where you describe your design process in detail, from component/device selection to actual design implementation, to how you tested your system. Remember detail is important in technical writing. Do not just write I used a computer give the computer specifications or the oscilloscopes part number. Describe the system in enough detail so that someone else can replicate your design as well as your testing methodology.

If you use or design code for your system, represent it as flow diagrams in text.

IMPORTANT: Include a motivation for your selection of an appropriate technique, or engineering or IT tool to solve your project problem. Discuss any limitations if appropriate.

Chapter 4

Results

These are the results I found from my investigation.

Present your results in a suitable format using tables and graphs where necessary. Remember to refer to them in text and caption them properly.

4.1 Simulation Results

4.2 Experimental Results

Chapter 5

Discussion

Here is what the results mean and how they tie to existing literature...

Discuss the relevance of your results and how they fit into the theoretical work you described in your literature review.

Chapter 6

Conclusions

These are the conclusions from the investigation and how the investigation changes things in this field or contributes to current knowledge...

Draw suitable and intelligent conclusions from your results and subsequent discussion.

Chapter 7

Recommendations

Make sensible recommendations for further work.

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Appendix A

Addenda

A.1 Ethics Forms