Chapter 3

Methodology

3.1 Machine Learning Theory Development & Software Selction

Learn about different types of Machine learning algorithms and select algorithms that seem promising. Select software, current options are Matlab and TensorFlow. I am leaning toward using Matlab.

For example, Regression learners for Load prediction and Scheduling and maybe a Classification model for Scheduling Also, learn how to make multiple predictions for hourly day-ahead predictions of load and generation

3.2 Design of Hybrid Microgrid

Use Software such as Homer Pro, Pvsyst to design a basic Hybrid Microgrid and validate that it is a feasible option with some simple simulation. Not going to spend a large amount of time optimising this. Going to settle for a reasonable option for the purpose of this paper.

3.3 Data Collection and Preperation

Already have the data for Menzies, depending on the type of ML algorithm used the data needs to be prepared correctly. Typically this includes standardisation and normalisation. Matlab has built-in features to handle this.

I would also like to find out if there is weather data available from UCT. It would be cool to also do the predictions with data collected from UCT. This would also mean that the final 'product' would be more relevant since the generation predictions could be generated from already existing measurements.

3.4 Machine Learning Process for Load and Generation Prediction

The typical process for training a machine learning algorithm involves an iterative process. Once the data has been prepared, Multiple models are selected and trained, The models that perform the best are tuned and retrained This cycle is iterated until the model is performing well enough The final model is then used to make predictions.

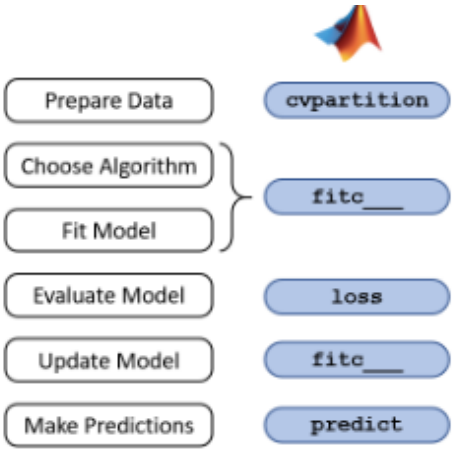

Figure 3.1: Machine Learning steps

3.5 Validation of Load and Generation Prediction

Testing and comparing the results of the Load and Generation Predictions. Maybe this should be the final step of the above section instead of its own section.

3.6 Modeling of Cases for Scheduling

I am still undecided on this! :(sorry I know its getting super late!

The scheduling will most likely be done in a decision-making tree manner such as the one below. The decisions will be designed to optimise the cost function, for example, the total cost of meeting the load demand.

3.7 Machine Learning/Linear Optimiser for schdeuling

If I use a machine learning approach to this I will separate all of the options into classes and use a classification model to make predictions of what the optimal approach is. This would be interesting and perhaps a more flexible approach, making it more applicable to other use cases.. Alternatively, the use of linear optimisers has show extremely good results as they are able to find global minimums for given problems. However, they require rigorous definitions and parameters which may make the solution less flexible

3.8 Validation of Scheduling Method

Again perhaps this should be included in the above section. This will be used to compare and validate the chosen and fitted scheduling algorithm