Deep Learning for Feature Extraction in Residential and Commercial Electricity Usage Applications

Context: Feature extraction governs the rules, algorithms, and methodologies we use to abstractly quantify the contents of a dataset using only a list of numbers, called a feature vector. The task of feature extraction is defined as the activity to locate relevant features. The overall procedure of feature extraction is to input a dataset, execute a feature extraction algorithm on the data, and produce a list of numbers (feature vectors).

Problem: A tool support system is required for the majority of industrial-strength software systems because they are too complex for developers to perform manual feature extraction efficiently. Over time, a slew of strategies has emerged. Python's tsfresh package, which extracts hundreds of features from time-series data, is a good example. The problem in practical classification is identifying and extracting the combination of the input features that contributes the most. The classification problems for this project include, but are not limited to, the detection of power failure and faults in the electrical grid. The student is expected to work on feature extraction and feature selection for such problems.

Task: The purpose of this thesis is to investigate the use of machine learning techniques, in particular deep learning, to see if these techniques can lead to more effective feature extraction or feature selection strategies in residential and commercial electricity usage applications. The student is expected to work within the two datasets provided for energy usage of an anergy provider company. A hybrid technique based upon a deep learning approach shall be developed and evaluated.

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