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An Overview and Comparative Analysis

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Preface

The key component in forecasting demand and consumption of resources in a supply network is an accurate prediction of real-valued time series. Indeed, both service interruptions and resource waste can be reduced with the implementation of an effective forecasting system. Significant research has thus been devoted to the design and development of methodologies for short-term load forecasting over the past decades. A class of mathematical models, called recurrent neural networks, are nowadays gaining renewed interest among researchers and they are replacing many practical implementations of the forecasting systems, previously based mostly on statistical methods. Despite the undeniable expressive power of these architectures, their recurrent nature complicates their understanding and poses challenges in the training procedures. Although recently different kinds of recurrent neural networks have been successfully applied in fields like natural language processing or text translation, a systematic evaluation of their performance in the context of load forecasting is still lacking. In this work, we perform a comparative study on the problem of short-term load forecast, by using different classes of state-of-the-art recurrent neural networks. We provide a general overview of the most important architectures and we define guidelines for configuring the recurrent networks to predict real-valued time series. We test the reviewed models on controlled synthetic tasks and on real-world datasets, covering important practical case studies. It is our hope that this essay can become a useful resource for data scientists in academia and industry to keep up-to-date with the latest developments in the field of deep learning and time series prediction.

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