# HINDSIGHT: An R-Based Framework Towards Long Short Term Memory (LSTM) Optimization

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#### Introduction

LSTM networks are a special type of Recurrent Neural Networks (RNN) that have been designed to handle long-term dependencies and carry on information for long intervals. LSTM networks are used for AI problems that require long range memory, such as reinforcement learning, handwriting recognition and tasks requiring precise timing.

A regular LSTM architecture is comprised of a series of connected cells named **memory blocks**. An overview architecture of a memory block can be seen below.



#### Hyperparameter Optimization

LSTM models involve a list of hyperparameters that need to be carefully specified. Hyperparameter optimization is the process of selecting an appropriate combination of hyperparameters towards improving the performance of the model.

Manual Search is the manual tuning of hyperparameters. It is a trivial approach and requires minimum coding. Manual Search is a trial an error process but can be also used when prior knowledge about the learning problem exists.

Random Search is an optimization method where random combinations in the search space are tried for a given number of iterations. It does not lead to the global optimal combination of hyperparameters but approximates it in significantly less time.



## HINDSIGHT

The code of HINDSIGHT is written in R and can be found in the Bitbucket repository<sup>1</sup>. The backbone of HINDSIGHT is the CRAN Keras package. It's current version is configured to run on Tensorflow (support with a GPU is also provided).

#### Feat.1 Feat.1 Feat.2 Feat.2 Normalization Reshaping No. lags training No. features testing Networks STM



### **Results**



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HINDSIGHT allows for **saving** LSTM models on demand using the Keras built-in functions. Moreover, users can exploit the available timers during experimentation with deep LSTM architectures.

HINDSIGHT is an R-based open-source framework that allows for easy and quick experimentation with Long Short Term Memory (LSTM) networks including hyperparameter optimization. It is applicable to datasets in different fields such as multimedia, economics and medicine. <sup>2</sup>Source: Time Series Data Library