

Using Deep Learning for Time Series Regression Models in Health: A Simulation Study

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Abstract:

Introduction and objective: Finding the best model to forecast time series data is important in all sciences, especially medicine. Artificial intelligence and deep learning models are increasingly used in such data today. The aim of this study is to find the best deep learning model for time series data on heart disease deaths as well as simulated data.

Methods and Results: There were real data on heart mortality in Tehran city as a response variable and air pollution as an explanatory variable. Also, simulated data from the Autoregressive integrated moving average with explanatory variables (ARIMAX) model to determine the best model based on deep learning methods for fitting time series regression data. To reach the goal, we reviewed all models for fitting such data before using the simulated data from the ARIMAX model to determine the best model. This hybrid model, combining convolution neural networks and long short-term memory (LSTM), performed well on both training and testing datasets with a MSE values of 0.0107 for training and 0.0150 for testing.

Conclusions: As a result of this paper, it was concluded that recurrent neural network and LSTM provide appropriate results for univariate time series in comparison to other models. Additionally, the CNN-LSTM model is a good choice if other variables are included in the model and the goal is to fit a time series regression.

Keywords:

time series regression, deep learning, simulation, prediction.