Package 'autoann'

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Title Neural Network–Based Model Selection and Forecasting

Type Package

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Description
Provides a systematic framework for neural network–based model selection and forecasting using single hidden layer feed-forward networks. It evaluates all possible combinations of predictor variables and hidden layer configurations, selecting the optimal model based on predictive accuracy criteria such as root mean squared error (RMSE) and mean absolute percentage error (MAPE). Predictors are automatically standardized, and model performance is assessed using out-of-sample validation. The package is designed for empirical modelling and forecasting in economics, agriculture, trade, climate, and related applied research domains where nonlinear relationships and robust predictive performance are of primary interest.

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Encoding UTF-8

Imports nnet

RoxygenNote 7.3.3

NeedsCompilation no

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Contents

nn_model_selector *Neural Network Model Selector*

Description

Fits multiple single-hidden-layer neural network models by evaluating all possible predictor combinations and hidden node sizes. The best model is selected based on minimum RMSE on test data.

Usage

```
nn_model_selector(
  data,
  response_var,
  train_ratio = 0.75,
  max_nodes = 10,
  maxit = 500,
  seed = 123
)
```

Arguments

data	A data frame containing the response and predictor variables.
response_var	Character string specifying the response variable name.
train_ratio	Proportion of data used for training (default = 0.75).
max_nodes	Maximum number of hidden layer nodes to evaluate (default = 10).
maxit	Maximum number of iterations for neural network training (default = 500).
seed	Random seed for reproducibility (default = 123).

Details

Predictors are standardized before model fitting. Model performance is evaluated using RMSE and MAPE.

Value

A list containing:

- best_predictors: Predictor variables of the best model
- best_hidden_nodes: Optimal number of hidden nodes
- best_performance: RMSE and MAPE of the best model
- performance_table: Performance metrics for all model combinations
- fitted: Actual vs fitted values for training data
- forecast: Actual vs forecasted values for test data

Examples

```
data_nn <- data.frame(
  y = c(
    239.7255591, 239.6504622, 239.5848569, 239.5296290,
    239.4858835, 239.4547257, 239.4372607, 239.4345936,
    239.4478298, 239.4780743, 239.5264322, 239.5940089,
    239.6819094, 239.7912389, 239.9231027, 240.0786057,
    240.2588534, 240.4649507, 240.6980029, 240.9591152,
    241.2493927, 241.5699405, 241.9218640, 242.3062682
  ),
  x1 = c(
    9.968768102, 9.160298963, 7.294994564, 5.374395163,
    4.640671747, 5.495752064, 7.155488888, 8.532368787,
    8.032804811, 10.32506916, 12.17319856, 0.571302071,
    12.20714387, 27.13871523, 35.05310057, 42.40476672,
    46.28262184, 3.089076495, 40.31650327, 20.83471700,
    25.71428597, 21.06398002, 20.26911914, 22.17299909
  ),
  x2 = c(
    0.929946922, 4.246863796, 2.895052481, 6.827712819,
    11.53788333, 5.688668709, 26.08913871, 30.14926832,
    22.77412794, 4.519550904, 18.38195203, 40.50655053,
    58.61381025, 69.95404513, 76.08779720, 86.86779542,
    79.92326273, 32.26071629, 27.67652481, 66.80672448,
    86.54120883, 97.53881465, 95.49058569, 43.06666626
  ),
  x3 = c(
    143.7114315, 153.7664088, 158.5007862, 158.7973830,
    155.8340003, 150.2453258, 142.4471949, 132.8380705,
    121.6890278, 108.8662730, 94.52734991, 78.93448337,
    62.31616514, 44.76595425, 26.34367655, 7.109157889,
    12.72227903, 32.31332405, 50.67117014, 66.80301029,
    79.71603746, 88.41744464, 92.01533759, 90.21350491
  )
)

result <- nn_model_selector(
  data = data_nn,
  response_var = "y",
  train_ratio = 0.75,
  max_nodes = 5,
  seed = 123
)

result$best_performance
```

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