

# NNAR

## Introduction

Apply a NNAR model to forecast benzene concentration levels for the next 25 days.

## Create NNAR model

```
## Series: ts_data
## Model:  NNAR(22,1,12)[7]
## Call:   nnetar(y = ts_data)
##
## Average of 20 networks, each of which is
## a 22-12-1 network with 289 weights
## options were - linear output units
##
## sigma^2 estimated as 0.04396
```

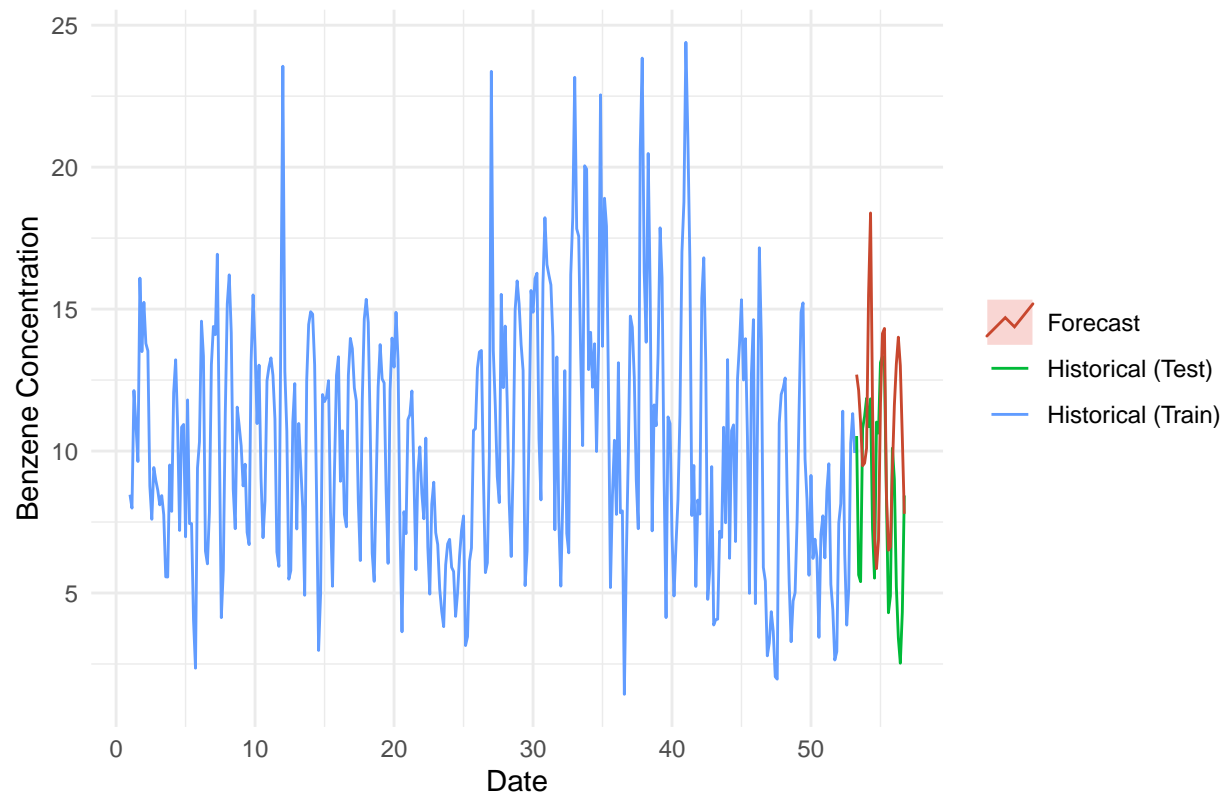
## Forecast the Next 25 Days (Test Dataset Length)

```
model_4_forecast_values <- forecast_nnar(model_4_nnar_model, forecast_horizon = nrow(ts_test_data))
save(model_4_forecast_values, file = "~/Downloads/model_4_forecast_values.RData")
```

## Plot Forecast vs Historical Data

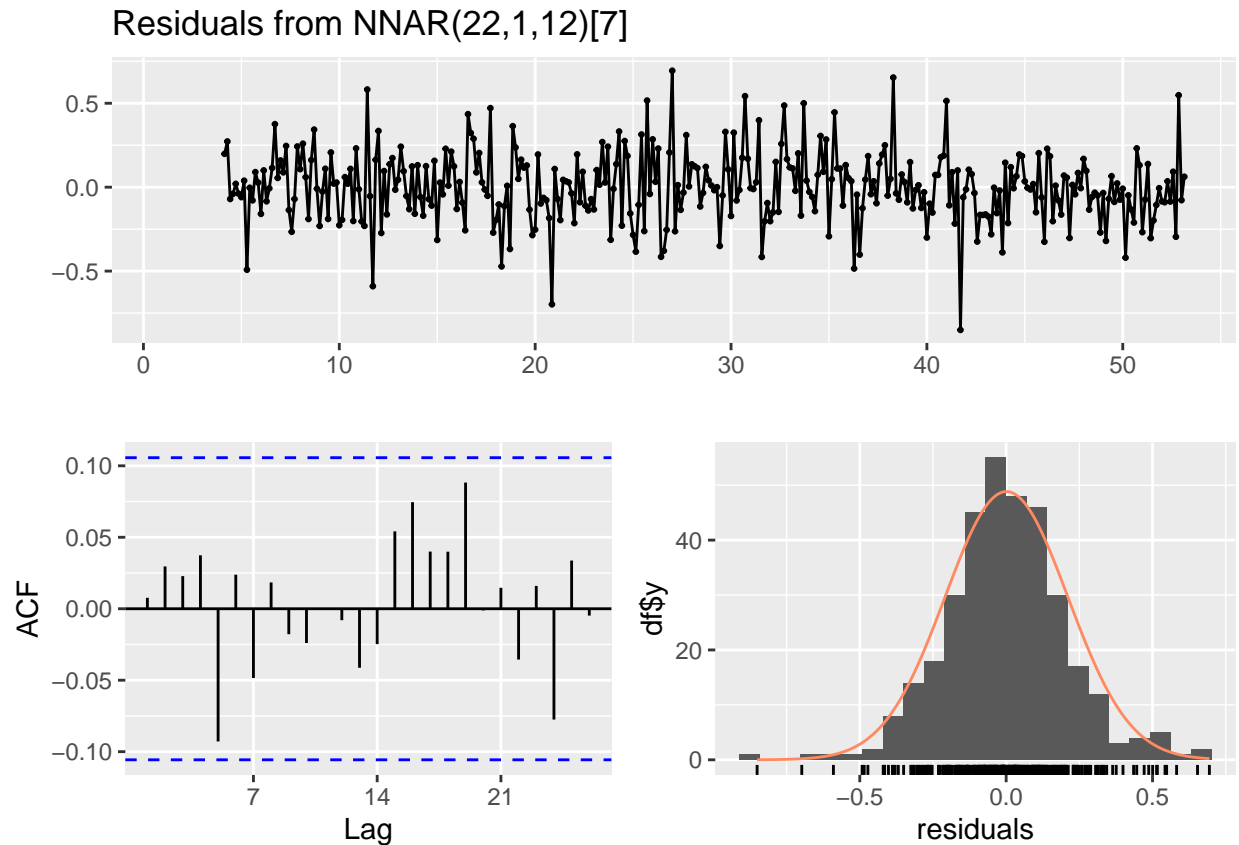
```
plot_nnar_forecast(model_4_forecast_values, ts_train_data, ts_test_data)
```

## NNAR Model Forecast vs Historical Data



## Model Residuals

```
checkresiduals(model_4_nnar_model)
```



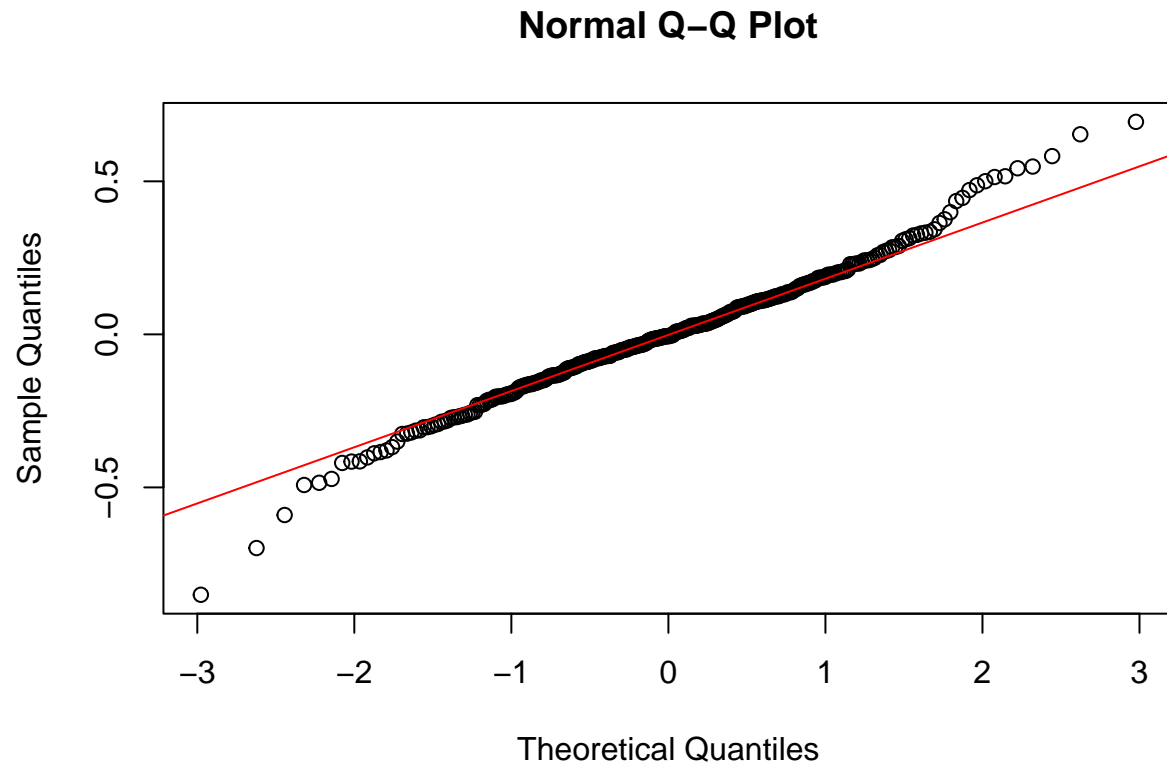
```
##
##  Ljung-Box test
##
## data:  Residuals from NNAR(22,1,12)[7]
## Q* = 6.3468, df = 14, p-value = 0.957
##
## Model df: 0.   Total lags used: 14
```

## Model Residuals Test

```
nнар_residuals <- residuals(model_4_nнар_model)
residuals_test(nнар_residuals)
```

```
##
##  Box-Ljung test
##
## data:  residuals
## X-squared = 5.0527, df = 7, p-value = 0.6535
##
##
##  Shapiro-Wilk normality test
##
```

```
## data: residuals
## W = 0.98627, p-value = 0.00237
```



## Evaluation Metrics

```
evaluation_metrics(as.numeric(ts_test_data), model_4_forecast_values$mean)
```

```
## [1] "MRE: 0.689243785669979"
## [1] "MAE: 3.66025246725283"
## [1] "MSE: 22.129263770159"
## [1] "RMSE: 4.70417514237714"
```