

Assignment 5 Memo

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2025-05-19

Q1.

```
# Step 1: Load the necessary libraries
library(mlbench)      # For the dataset
library(neuralnet)    # For neural network modeling
library(NeuralNetTools) # For neural network visualization
library(dplyr)        # For data manipulation
library(caret)        # For data splitting and pre-processing

# Step 2: Load the dataset
data("BostonHousing")
dataset <- BostonHousing

# Step 3: Convert the 'chas' variable to numeric
dataset$chas <- as.numeric(dataset$chas)

# Step 4: Split the dataset into training and test sets
set.seed(123) # For reproducibility
training_rows <- createDataPartition(dataset$medv, p = 0.7, list = FALSE)
training_data <- dataset[training_rows, ]
test_data <- dataset[-training_rows, ]

# Step 5: Scale the dataset
preprocess_params <- preProcess(training_data, method = c("range"))
training_data_scaled <- predict(preprocess_params, training_data)
test_data_scaled <- predict(preprocess_params, test_data)

# Step 6: Create a neural network model
vars <- colnames(training_data_scaled)
formula <- as.formula(paste("medv ~", paste(vars[!vars %in% "medv"], collapse
= " + ")))
nn_model <- neuralnet(formula, training_data_scaled, linear.output = TRUE)

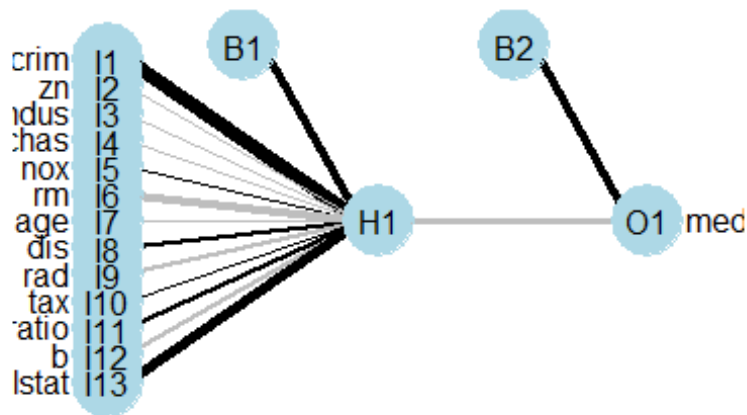
# Step 7: Print the summary of the model
summary(nn_model)
```

##	Length	Class	Mode
## call	4	-none-	call
## response	356	-none-	numeric
## covariate	4628	-none-	numeric
## model.list	2	-none-	list
## err.fct	1	-none-	function
## act.fct	1	-none-	function

```
## linear.output      1 -none-    logical
## data               14 data.frame list
## exclude            0 -none-    NULL
## net.result         1 -none-    list
## weights            1 -none-    list
## generalized.weights 1 -none-    list
## startweights       1 -none-    list
## result.matrix      19 -none-    numeric
```

Step 8: Predict 'medv' using the neural network model
 predictions <- **predict**(nn_model, test_data_scaled)

Step 9: Plot the neural network
plotnet(nn_model)



Step 10: Calculate Mean Squared Error (MSE)
 actual <- test_data_scaled\$medv
 mse <- **mean**((predictions - actual)^2)
print(**paste**("Mean Squared Error (MSE):", mse))
 ## [1] "Mean Squared Error (MSE): 0.0111148801165191"

Q2.

Continue from the previous setup (assuming all libraries are loaded and data is prepared)

```

# Define the different configurations for the neural networks
configurations <- list(
  c(10, 10),
  c(5, 5, 5),
  c(10, 10, 10)
)

# Initialize a list to store results
results <- list()

# Loop through each configuration
for (config in configurations) {
  # Train the neural network model
  nn_model <- neuralnet(formula, training_data_scaled, hidden = config,
linear.output = TRUE)

  # Print the summary of the model
  summary(nn_model)

  # Predict 'medv' using the neural network model
  predictions <- predict(nn_model, test_data_scaled)

  # Calculate Mean Squared Error (MSE)
  actual <- test_data_scaled$medv
  mse <- mean((predictions - actual)^2)

  # Store the results
  results[[paste("Hidden layers:", paste(config, collapse = "-"))]] <- mse
}

# Print all MSE results
print(results)

## $`Hidden layers: 10-10`
## [1] 0.008600956
##
## $`Hidden layers: 5-5-5`
## [1] 0.006295382
##
## $`Hidden layers: 10-10-10`
## [1] 0.005964214

```