# Neural Network Model and Hidden Layers Accuracy

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```
# Install necessary packages
install.packages(c('neuralnet', 'keras', 'tensorflow', 'tidyverse', 'knitr'), dependencies = TRUE)
```

```
## Installing packages into '/cloud/lib/x86_64-pc-linux-gnu-library/4.4'
## (as 'lib' is unspecified)
```

```
# Load libraries
library(neuralnet)
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::compute() masks neuralnet::compute()
## x dplyr::filter()  masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become error
```

```
library(knitr)

# Load and prepare the Iris dataset
iris <- iris %>% mutate_if(is.character, as.factor)
summary(iris)
```

```
##   Sepal.Length    Sepal.Width     Petal.Length    Petal.Width
##  Min.   :4.300   Min.   :2.000   Min.   :1.000   Min.   :0.100
##  1st Qu.:5.100   1st Qu.:2.800   1st Qu.:1.600   1st Qu.:0.300
##  Median :5.800   Median :3.000   Median :4.350   Median :1.300
##  Mean   :5.843   Mean   :3.057   Mean   :3.758   Mean   :1.199
##  3rd Qu.:6.400   3rd Qu.:3.300   3rd Qu.:5.100   3rd Qu.:1.800
##  Max.   :7.900   Max.   :4.400   Max.   :6.900   Max.   :2.500
##        Species
##  setosa    :50
##  versicolor:50
##  virginica :50
##
##
##
```

```r
# Train and test split
set.seed(254)
data_rows <- floor(0.80 * nrow(iris))
train_indices <- sample(c(1:nrow(iris)), data_rows)
train_data <- iris[train_indices, ]
test_data <- iris[-train_indices,]

# List of hidden layer configurations to test
hidden_layers_list <- list(c(3), c(4), c(5), c(50, 10), c(20, 5), c(15, 10, 5))

# Function to evaluate model accuracy and plot the model
evaluate_model <- function(hidden_layers) {
  model <- neuralnet(Species ~ Sepal.Length + Sepal.Width + Petal.Length + Petal.Width, data = train_da

  # Predict categories for the test dataset
  pred <- predict(model, test_data)
  labels <- c("setosa", "versicolor", "virginica")

  # Transform predictions to label names
  prediction_label <- data.frame(max.col(pred)) %>%
    mutate(pred = labels[max.col.pred.]) %>%
    select(pred) %>%
    unlist()

  # Evaluate the model
  check <- as.numeric(test_data$Species) == max.col(pred)
  accuracy <- (sum(check) / nrow(test_data)) * 100
  return(list(model = model, accuracy = accuracy))
}

# Test and evaluate each hidden layer configuration
results <- data.frame(Hidden_Layers = character(), Accuracy = numeric())
models <- list()

for (hidden_layers in hidden_layers_list) {
  result <- evaluate_model(hidden_layers)
  accuracy <- result$accuracy
  model <- result$model
  results <- rbind(results, data.frame(Hidden_Layers = paste(hidden_layers, collapse = "-"), Accuracy =
  models[[paste(hidden_layers, collapse = "-")]] <- model
}

# Display the results
print(results)
```

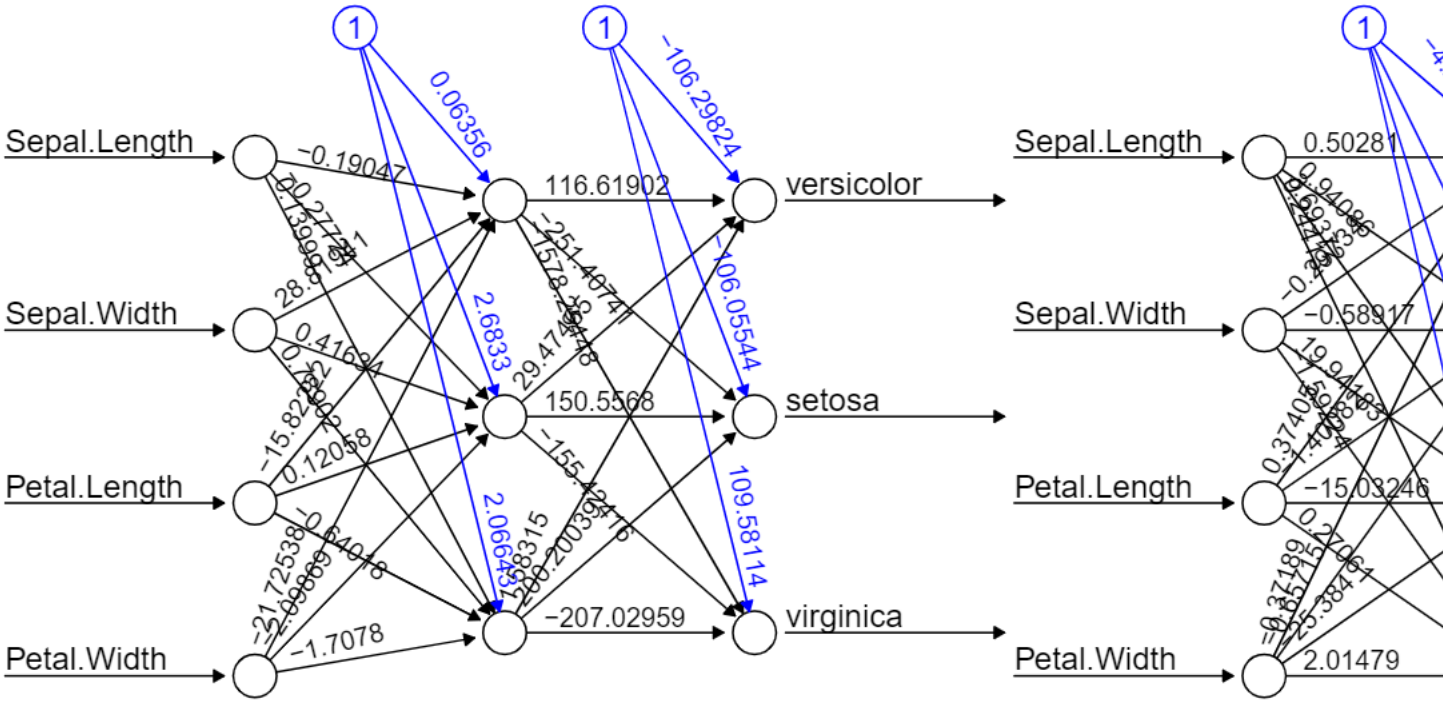
```
##   Hidden_Layers  Accuracy
## 1             3  96.66667
## 2             4 100.00000
## 3             5 100.00000
## 4         50-10 100.00000
## 5          20-5 100.00000
## 6       15-10-5 100.00000
```

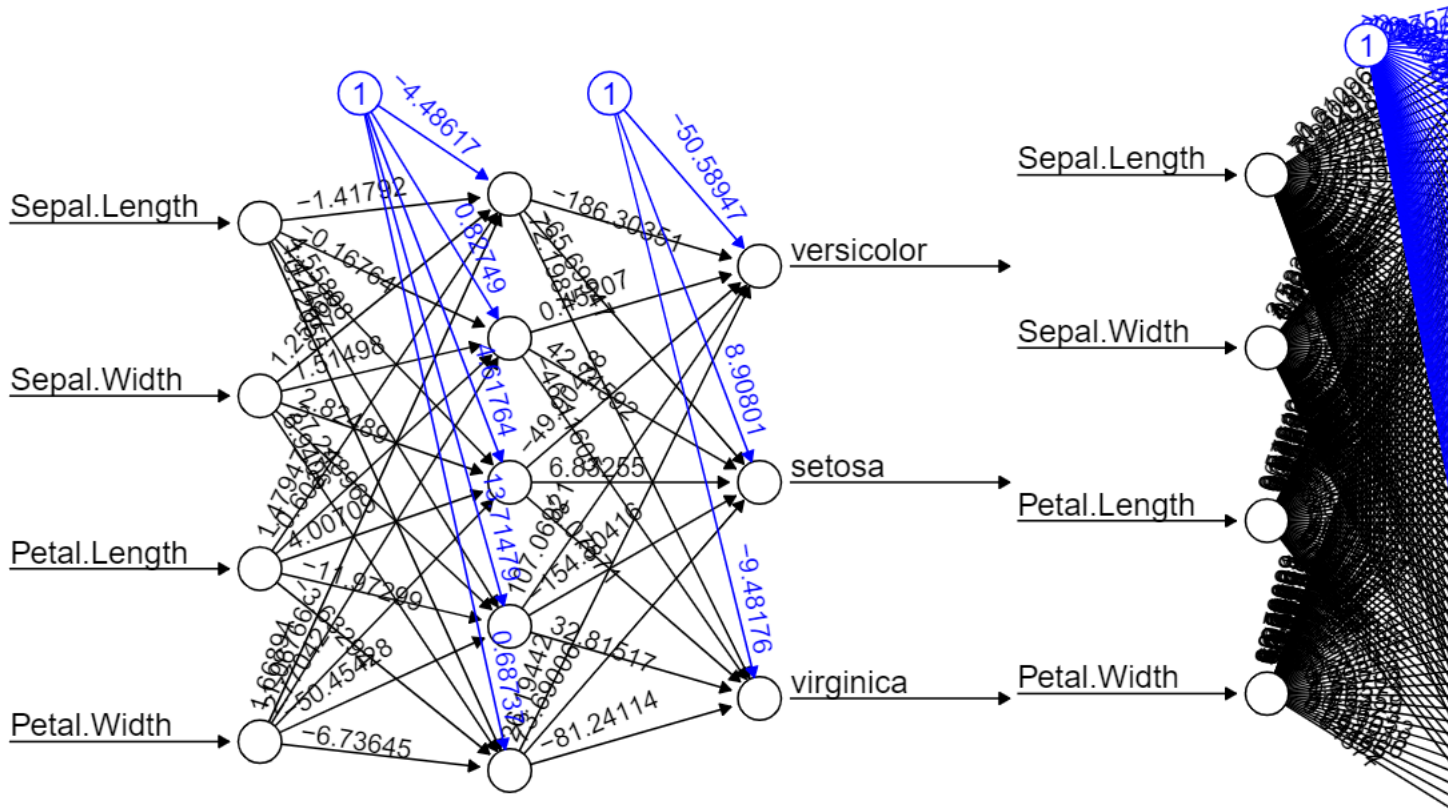
## hidden layer accuracy

```
results <- data.frame(
  Hidden_Layers = c("3", "4", "5", "50-10", "20-5", "15-10-5"),
  Accuracy = c(96.66667, 100.00000, 100.00000, 100.00000, 100.00000, 100.00000)
)
kable(results, format = "markdown")
```

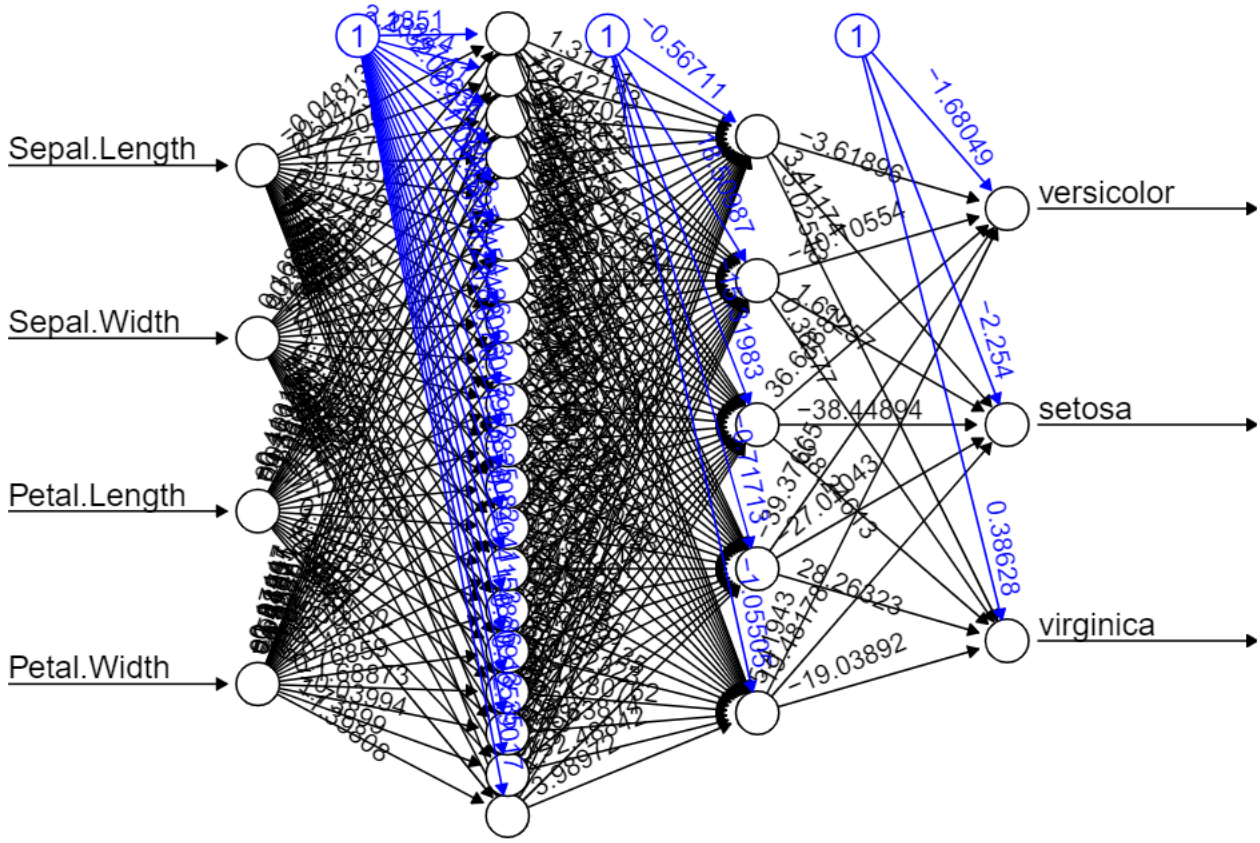
| Hidden_Layers | Accuracy |
|---|---|
| 3 | 96.66667 |
| 4 | 100.00000 |
| 5 | 100.00000 |
| 50-10 | 100.00000 |
| 20-5 | 100.00000 |
| 15-10-5 | 100.00000 |

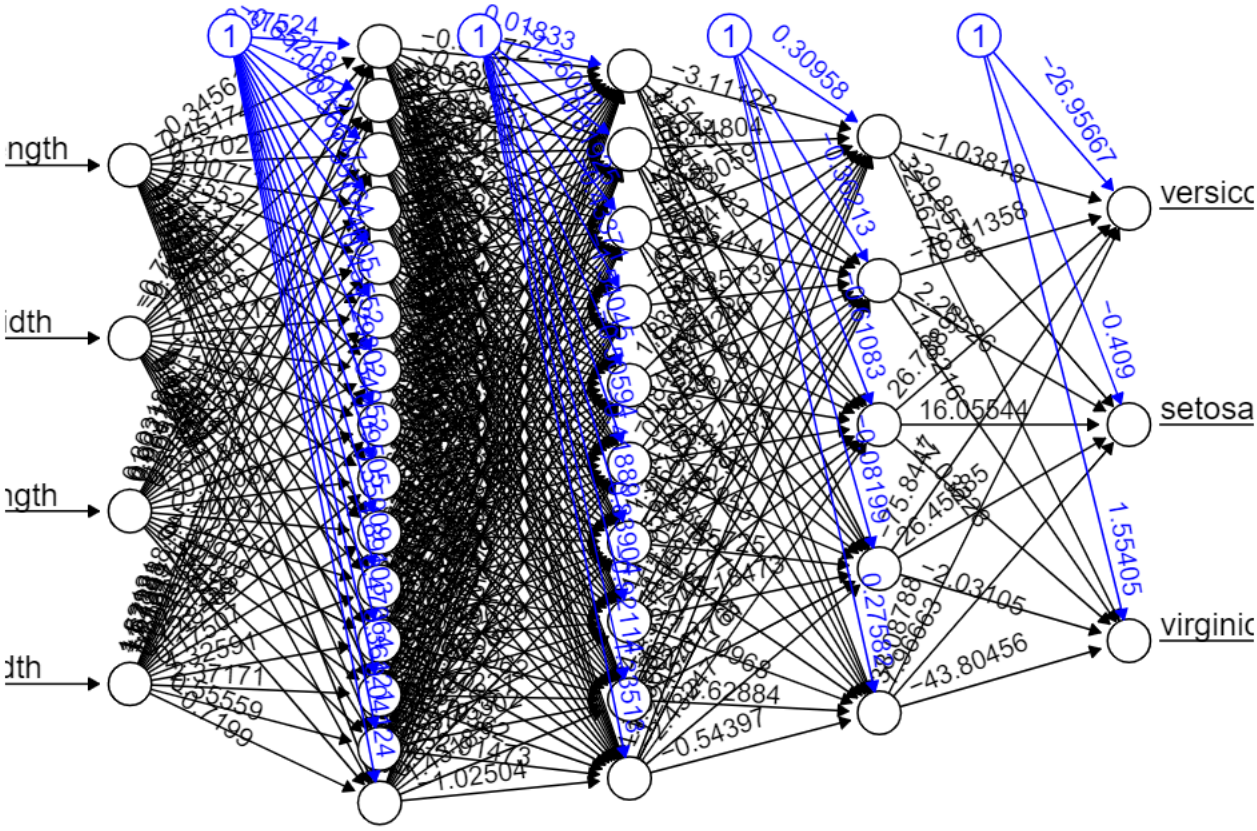
```
for (hidden_layers in hidden_layers_list) {
  hidden_layers_str <- paste(hidden_layers, collapse = "-")
  model <- models[[hidden_layers_str]]
  plot(model, rep = 'best', main = paste("Model with Hidden Layers:", hidden_layers_str))
}
```






Error: 1.003152 Steps: 1962

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idth
ngth
dth
versicc
setosa
virginic