

ADA 449 HW3 Report

In this assignment, I have trained a Neural Network in the Julia programming language using the Flux library. As the dataset, I have used the [pima-indians-diabetes-database](#). This dataset is from the National Institute of Diabetes and Digestive and Kidney Diseases. The objective of the dataset is to diagnostically predict whether a patient has diabetes, based on certain diagnostic measurements included in the dataset.¹

The data had missing values, imbalance in the target variable, and needed normalization. Columns “Glucose”, “BloodPressure”, “SkinThickness”, “Insulin”, “BMI” had 0 values in some rows indicating missing values because those values cannot be 0 in a person. Also, the target column had a total of 500 0s, and 268 1s, indicating imbalance. I have applied under sampling and used 268 rows from each.

I have created the Neural Network using binary cross entropy as the loss function, Adam as the optimizer, and both ReLu and sigmoid as the activation function (sigmoid in the output layer). I have applied dropout to prevent overfitting. Here are the 3 different neural networks I have created.

Setup 1:

Architecture: 256-128-64 neurons

Dropout Rate: 0.5

Learning Rate: 0.01

Setup 2:

Architecture: 128-64-32-16 neurons

Dropout Rate: 0.2

Learning Rate: 0.001

Setup 3:

Architecture: 512-256 neurons

Dropout Rate: 0.6

Learning Rate: 0.01

I got the best results using Setup 2. Here are the results I got using Setup 2 during the training:

```
Epoch 10: Loss = 0.44352347490510063, Train Accuracy = 0.7982486263736265, Test Accuracy = 0.7365056818181819
Epoch 20: Loss = 0.3937008693146444, Train Accuracy = 0.8250343406593407, Test Accuracy = 0.7365056818181819
Epoch 30: Loss = 0.3530708200904962, Train Accuracy = 0.8461538461538461, Test Accuracy = 0.7365056818181819
Epoch 40: Loss = 0.3165266661508253, Train Accuracy = 0.8705357142857143, Test Accuracy = 0.7599431818181819
Epoch 50: Loss = 0.285015830918463, Train Accuracy = 0.8707074175824177, Test Accuracy = 0.7286931818181819
Epoch 60: Loss = 0.3100190363124871, Train Accuracy = 0.8573145604395604, Test Accuracy = 0.7130681818181819
Epoch 70: Loss = 0.26644767912178996, Train Accuracy = 0.8928571428571429, Test Accuracy = 0.7443181818181819
Epoch 80: Loss = 0.2461597629929495, Train Accuracy = 0.8516483516483516, Test Accuracy = 0.7130681818181819
Epoch 90: Loss = 0.26904146287397934, Train Accuracy = 0.8841002747252747, Test Accuracy = 0.7521306818181819
Epoch 100: Loss = 0.2276809446740113, Train Accuracy = 0.9074519230769231, Test Accuracy = 0.7521306818181819
```

Training Loss and Test Accuracy curves:

