

# Project Summary

This project involved building a neural network model using an Artificial Neural Network (ANN) architecture for classification and regression tasks. The classification model aimed to predict customer churn. The model was implemented from scratch without relying on deep learning libraries, focusing on understanding the fundamental processes behind ANN training and prediction.

## Specific Actions and Technologies:

- Utilized Python libraries such as Pandas, NumPy, and Matplotlib for data manipulation, preprocessing, and visualization.

### Data Preprocessing:

- Converted categorical variables like gender and geography into numeric form for model compatibility.
- Normalized continuous features to standardize input values.
- Separated features and labels for classification tasks.

### ANN Model Implementation:

- Created a flexible ANN class to handle both classification tasks.
- Defined activation functions, including ReLU, sigmoid, and softmax, along with their derivatives for backpropagation.
- Implemented gradient descent for training, enabling adjustable learning rates and epoch counts.

### Classification Model for Customer Churn:

- Configured a network with two hidden layers to predict churn based on features like credit score, age, and number of products.
- Visualized the model's predictions alongside the actual data distribution to assess performance.

### Model Evaluation and Analysis:

- For classification, calculated accuracy on training data and visualized class predictions.
- Visualized loss function over epochs to assess model convergence.

This summary highlights the design and implementation of a custom ANN architecture tailored for classification, emphasizing the hands-on approach to neural network fundamentals and model evaluation.