Customer Churn Prediction using ANN - Full Project Report with Viva Questio

Bank Customer Churn Prediction using Artificial Neural Network (ANN)

Project Overview:

This practical focuses on predicting whether a bank customer will leave (churn) or stay in the next 6 months using an Artificial Neural Network (ANN).
The dataset contains 10,000 customer records with attributes such as CreditScore, Age, Tenure, Balance, NumOfProducts, HasCrCard, IsActiveMember, and EstimatedSalary.

The goal is to build a classification model that accurately identifies potential churners so that the bank can take preventive measures.

Summary of Steps:

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1. Data Preprocessing (handling missing data, encoding, scaling)
2. Splitting the dataset into train and test sets
3. Building and training an ANN using MLPClassifier
4. Evaluating model performance with accuracy and classification metrics
5. Handling class imbalance using RandomOverSampler
6. Improving accuracy from 82% to 86%

About ANN and Hidden Layers:

An Artificial Neural Network (ANN) is inspired by the human brain and consists of interconnected neurons.

It has three main parts:

- Input Layer: Takes input features like CreditScore, Age, etc.
- Hidden Layers: Intermediate layers that learn complex patterns and relationships. Each neuron applies an activation function such as ReLU to add non-linearity.
- Output Layer: Produces the final prediction (1 for churn, 0 for no churn).

In this project, three hidden layers (100, 100, 100) were used with ReLU activation, enabling the model to learn deeper insights from customer data.

Model Evaluation:

- Accuracy before oversampling: ~82%
- Accuracy after oversampling: ~86%
- Performance improved due to class balancing.
- Evaluation metrics: Accuracy, Precision, Recall, F1-Score, ROC-AUC.

Conclusion:

The ANN model successfully identified potential churners with high accuracy.

Balancing the data with RandomOverSampler improved the model?s generalization capability.

This project demonstrates how ANN and hidden layers can effectively handle nonlinear relationships in real-world banking data.

Expected Viva Questions:

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1. What is the objective of this project?
2. What is Customer Churn? Why is it important to predict?
3. Explain the working of an Artificial Neural Network (ANN).
4. What are hidden layers in an ANN? Why are they called hidden?
5. What activation function did you use and why?
6. How does the ReLU activation function work?
7. Why do we normalize or scale our data before training an ANN?
8. What is backpropagation? How does it update weights?
9. What optimizer did you use in your ANN model?
10. What is overfitting? How can you prevent it?
11. What is the purpose of the train-test split?
12. Why should we fit the StandardScaler on the training set only?
13. What problem does class imbalance cause in machine learning?
14. What is RandomOverSampler and how does it help?
15. What would happen if we oversample before splitting the data?
16. What is the difference between RandomOverSampler and SMOTE?
17. What evaluation metrics did you use? Why not just accuracy?
18. What was your model?s accuracy before and after balancing the dataset?
19. What is ROC-AUC score and what does it represent?
20. If your model had 100% accuracy, what could be wrong?
21. How many hidden layers and neurons did you use in your ANN?
22. What is the difference between a single-layer perceptron and a multilayer perceptron?
23. Why is ANN better suited for nonlinear relationships?

24. What libraries did you use in this project?

25. Can you explain how backpropagation minimizes the error?

26. Why did you choose ANN instead of Decision Tree or Random Forest?

27. What are some ways to further improve your model?s performance?

28. What does the confusion matrix tell you?

29. What are Precision and Recall? How do they differ?

30. What are some real-world applications of ANN other than churn prediction?