



Cloud Computing /Deep Learning Customer Churn Prediction for SaaS Platforms

Gogada Spandana, Kokula Gopichand, Kusam Charitha Reddy, Gummadi Keerthana,

Madi NithishKumar, N. Shivalingam, Dr.Prasad Dharnasi

UG Student, Department of Computer Science and Engineering, Holy Mary Institute of Technology & Science,
Telangana, India

UG Student, Department of Computer Science and Engineering, Holy Mary Institute of Technology & Science,
Telangana, India

UG Student, Department of Computer Science and Engineering, Holy Mary Institute of Technology & Science,
Telangana, India

UG Student, Department of Computer Science and Engineering, Holy Mary Institute of Technology & Science,
Telangana, India

UG Student, Department of Computer Science and Engineering, Holy Mary Institute of Technology & Science,
Telangana, India

Associate Professor, Department of Computer Science and Engineering, Holy Mary Institute of Technology & Science,
Telangana, India

Professor, Department of Computer Science and Engineering, Holy Mary Institute of Technology & Science,
Telangana, India

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ABSTRACT: Churn prediction is a critical business strategy for Software-as-a-Service (SaaS) platforms, as customer retention is more cost-effective than new customer acquisition. This project leverages the power of deep learning and cloud computing to develop a robust and scalable customer churn prediction system for SaaS businesses. Churn prediction is a critical business strategy for Software-as-a-Service (SaaS) platforms, as customer retention is more cost-effective than new customer acquisition. This project leverages the power of deep learning and cloud computing to develop a robust and scalable customer churn prediction system for SaaS businesses.

In today's competitive Software-as-a-Service (SaaS) market, keeping customers is more important than gaining new ones. When users stop using a service, it leads to customer churn, which directly affects a company's revenue. This project, "**Customer Churn Prediction for SaaS Platforms using Cloud Computing and Deep Learning**," aims to build a smart system that can predict which customers are likely to leave by studying their behaviour and usage data. The system uses **Cloud Computing** for storing and processing large amounts of data efficiently, and **Deep Learning models** such as Artificial Neural Networks (ANN) and Long Short-Term Memory (LSTM) to find hidden patterns and make accurate predictions. By combining these technologies, the project provides a powerful and scalable solution that helps SaaS companies understand their customers better, take preventive actions, and reduce churn effectively.

The main goal of the "**Customer Churn Prediction for SaaS Platforms using Cloud Computing and Deep Learning**" project is to develop an intelligent, scalable, and cloud-based predictive system that can accurately identify customers who are likely to discontinue using a SaaS product.

By leveraging **deep learning models** and **cloud computing technologies**, the system aims to analyse customer usage patterns, engagement behaviour, and transaction data to forecast churn probability. The ultimate objective is to enable SaaS providers to **proactively implement retention strategies**, reduce customer loss, and improve overall business performance through data-driven decision-making.



KEYWORDS: Customer Churn, SaaS Platforms, Cloud Computing, Deep Learning, Artificial Neural Networks, LSTM, Predictive Analytics, Customer Retention.

I. INTRODUCTION

In today's highly competitive digital market, Over-The-Top (OTT) and Software-as-a-Service (SaaS) platforms face significant challenges in retaining customers. With increasing service options available, customers can easily switch to competitors, making customer churn a critical concern for service providers. Understanding customer behaviour and predicting potential churn in advance has become essential for improving customer satisfaction and ensuring long-term business sustainability.

Traditional churn analysis methods rely on manual evaluation and static reporting techniques, which are often reactive and inefficient. These approaches identify churn only after customers discontinue their services, leading to delayed retention strategies and increased revenue loss. The lack of intelligent prediction mechanisms and real-time analysis limits the effectiveness of such systems, especially when handling large volumes of customer data generated by modern OTT and SaaS platforms.

To address these challenges, this project proposes a Machine Learning-based customer churn prediction system that enables proactive decision-making. By analysing historical customer data such as usage patterns, billing information, and support interactions, the system predicts the likelihood of churn before it occurs. The proposed solution integrates data preprocessing, predictive modelling, and a web-based interface to provide accurate churn predictions, helping organizations implement timely retention strategies and improve overall service performance.

II. LITERATURE REVIEW

Recent studies have increasingly focused on advanced deep learning techniques for customer churn prediction in SaaS platforms. P. Gupta (2023) proposed a hybrid CNN-LSTM model to analyse user activity patterns and predict churn with higher accuracy and fewer false predictions. While the model showed strong performance, the study did not evaluate cost-effectiveness or real-world deployment feasibility in SaaS cloud environments.

Building on sequential modelling approaches, G. Patel (2022) applied Long Short-Term Memory (LSTM) networks to time-series SaaS usage data, capturing behavioural patterns such as login frequency and feature adoption. This approach improved churn prediction accuracy; however, it involved high computational costs and lacked cloud integration for real-time implementation.

In 2021, P. Sharma introduced a Deep Neural Network (DNN) model for churn prediction in subscription-based applications. The model effectively captured complex customer behaviour and outperformed traditional machine learning techniques. Despite these improvements, the system lacked cloud-based scalability and showed reduced performance when handling large-scale datasets.

Earlier research by S. Banerjee (2020) focused on machine-learning-based churn prediction using behavioural and subscription data from SaaS platforms. Although effective, the approach relied on traditional machine learning methods and did not incorporate advanced deep learning models for improved accuracy.

In the same year, D. Reddy (2020) proposed a cloud-enabled churn prediction framework using AWS services to support scalable data processing and near real-time predictions. However, the system employed only basic Artificial Neural Networks and did not explore advanced deep learning architectures such as LSTM or GRU.

III. PROBLEM STATEMENT

In the highly competitive OTT and SaaS industry, customer churn has become a major challenge affecting revenue growth and long-term sustainability. Although large volumes of user data such as subscription history, usage behaviour, and payment patterns are available, many organizations still rely on traditional analytical methods that fail to accurately predict customer churn in advance. Existing systems often lack the ability to analyse complex user behaviour patterns and do not provide timely insights for proactive customer retention. Hence, there is a need for an intelligent, data-driven churn prediction system that leverages machine learning and deep learning techniques to identify potential churners effectively and support strategic decision-making.



IV. RESEARCH METHODOLOGY

1. Research Design

This study adopts a **quantitative, descriptive, and analytical research design** to predict customer churn in OTT and SaaS platforms. The research is non-experimental and is based on historical customer data analysis. Advanced machine learning and deep learning models are employed to identify churn patterns from customer behavior data. The study focuses on building a predictive system that can classify customers as churn or non-churn based on multiple behavioral and subscription-related attributes.

OTT and SaaS platforms provide subscription-based digital services where customer retention plays a critical role. Understanding customer behavior through data analytics enables organizations to reduce churn and improve service quality.

2. Data Sources

The dataset used in this research is obtained from publicly available and widely used datasets related to customer churn, including:

- Telco Customer Churn Dataset (Kaggle / IBM Sample Data)
- OTT/SaaS subscription usage records
- Customer billing and payment history
- Service usage and interaction logs

The data represents real-world customer behaviour and is suitable for predictive modelling and performance evaluation.

3. Sample Selection

A purposive sampling technique is used to select relevant customer records from the dataset based on the following criteria:

- Active subscription history
- Availability of churn labels
- Complete usage and billing information
- Customers from diverse service plans

The selected dataset ensures a balanced representation of churned and retained customers, enabling accurate model training and validation.

4. Data Collection Parameters

The following parameters are considered for churn prediction:

Category	Parameters
Demographic Data	Customer ID, tenure,
Usage Metrics	Total usage hours, service usage
Billing Metrics	Monthly charges, payment failures
Support Metrics	Number of support calls
Target Variable	Churn (Yes/No)

These parameters help capture both behavioural and financial aspects influencing customer churn

5. Data Preprocessing

Before model development, the collected data undergoes preprocessing to improve data quality and model performance:



- Removal of duplicate records
- Handling missing and inconsistent values
- Encoding categorical variables
- Feature scaling and normalization
- Splitting data into training and testing sets

This step ensures reliable input data for machine learning and deep learning models.

6. Engagement Rate Calculation

Machine learning and deep learning techniques such as Logistic Regression, Random Forest, Artificial Neural Networks (ANN), and LSTM models are used for churn prediction. The models are trained using historical data and evaluated using performance metrics such as accuracy, precision, recall, and F1-score.

The system is implemented using Python with frameworks such as Flask for backend services and Streamlit for frontend visualization, enabling real-time churn prediction.

V. CONCLUSION

The study demonstrates that advanced machine learning and deep learning models significantly improve the accuracy of customer churn prediction in OTT and SaaS platforms. Behavioural metrics such as usage frequency, support interactions, and payment failures play a crucial role in identifying churn-prone customers. By leveraging predictive analytics, organizations can proactively address customer dissatisfaction and implement effective retention strategies. The proposed system provides a scalable and efficient solution for churn analysis, enabling businesses to reduce customer loss and enhance customer lifetime value. The integration of cloud-based deployment further supports real-time prediction and accessibility.

REFERENCES

1. Lakshmi, A. J., Dasari, R., Chilukuri, M., Tirumani, Y., Praveena, H. D., & Kumar, A. P. (2023, May). Design and implementation of a smart electric fence built on solar with an automatic irrigation system. In *2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC)* (pp. 1553–1558). IEEE.
2. Sugumar, R. (2025). Explainable AI-driven secure multi-modal analytics for financial fraud detection and cyber-enabled pharmaceutical network analysis. *International Journal of Advanced Research in Computer Science & Technology (IJARCST)*, 8(6), 13239–13249.
3. Ananth, S., Radha, D. K., Prema, D. S., & Nirajan, K. (2019). Fake news detection using convolution neural network in deep learning. *International Journal of Innovative Research in Computer and Communication Engineering*, 7(1), 49–63.
4. Poornima, G., & Anand, L. (2025). Medical image fusion model using CT and MRI images based on dual scale weighted fusion based residual attention network with encoder–decoder architecture. *Biomedical Signal Processing and Control*, 108, 107932.
5. Saravanan, M., & Sivakumaran, T. S. (2016). Three phase dual input direct matrix converter for integration of two AC sources from wind turbines. *Circuits and Systems*, 7, 3807–3817.
6. Prasanna, D., & Manishvarma, R. (2025, February). Skin cancer detection using image classification in deep learning. In *2025 3rd International Conference on Integrated Circuits and Communication Systems (ICICACS)* (pp. 1–8). IEEE.
7. Vani, S., Malathi, P., Ramya, V. J., Sriman, B., Saravanan, M., & Srivel, R. (2024). An efficient black widow optimization-based faster R-CNN for classification of COVID-19 from CT images. *Multimedia Systems*, 30(2), 108.
8. Inbavalli, M., & Arasu, T. (2015). Efficient analysis of frequent item set association rule mining methods. *International Journal of Scientific & Engineering Research*, 6(4).
9. Sammy, F., Chettier, T., Boyina, V., Shingne, H., Saluja, K., Mali, M., ... & Shobana, A. (2025). Deep learning-driven visual analytics framework for next-generation environmental monitoring. *Journal of Applied Science and Technology Trends*, 114–122.
10. Kiran, A., Rubini, P., & Kumar, S. S. (2025). Comprehensive review of privacy, utility and fairness offered by synthetic data. *IEEE Access*.
11. David, A. (2020). Air pollution control monitoring & delivery rate escalated by efficient use of Markov process in MANET networks: To measure quality of service parameters. *Test Engineering & Management*.



12. Sakthivel, T. S., Ragupathy, P., & Chinnadurai, N. (2025). Solar system integrated smart grid utilizing hybrid coot-genetic algorithm optimized ANN controller. *Iranian Journal of Science and Technology, Transactions of Electrical Engineering*, 1–24.
13. Madheswaran, M., Dhanalakshmi, R., Ramasubramanian, G., Aghalya, S., Raju, S., & Thirumaraiselvan, P. (2024, April). Advancements in immunization management for personalized vaccine scheduling with IoT and machine learning. In *2024 10th International Conference on Communication and Signal Processing (ICCSP)* (pp. 1566–1570). IEEE.
14. Kumar, A. S., Saravanan, M., Joshna, N., & Seshadri, G. (2019). Contingency analysis of fault and minimization of power system outage using fuzzy controller. *International Journal of Innovative Technology and Exploring Engineering*, 9(1), 4111–4115.
15. Poornachandar, T., Latha, A., Nisha, K., Revathi, K., & Sathishkumar, V. E. (2025, September). Cloud-based extreme learning machines for mining waste detoxification efficiency. In *2025 4th International Conference on Innovative Mechanisms for Industry Applications (ICIMIA)* (pp. 1348–1353). IEEE.
16. Aashiq Banu, S., Sucharita, M. S., Soundarya, Y. L., Nithya, L., Dhivya, R., & Rengarajan, A. (2020). Robust image encryption in transform domain using duo chaotic maps—A secure communication. In *Evolutionary Computing and Mobile Sustainable Networks: Proceedings of ICECMSN 2020* (pp. 271–281). Springer.
17. Dharnasi, P. (2025). A multi-domain AI framework for enterprise agility integrating retail analytics with SAP modernization and secure financial intelligence. *International Journal of Humanities and Information Technology*, 7(4), 61–66.
18. Karthikeyan, K., & Umasankar, P. (2025). A novel buck-boost modified series forward (BBMSF) converter for enhanced efficiency in hybrid renewable energy systems. *Ain Shams Engineering Journal*, 16(10), 103557.
19. Yashwanth, K., Adithya, N., Sivaraman, R., Janakiraman, S., & Rengarajan, A. (2021, July). Design and development of pipelined computational unit for high-speed processors. In *2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT)* (pp. 1–5). IEEE.
20. Prasanna, D., Ahamed, N. A., Abinesh, S., Karthikeyan, G., & Inbatamilan, R. (2024, November). Cloud-based automatically human document authentication processes for secured system. In *2024 International Conference on Integrated Intelligence and Communication Systems (ICIICS)* (pp. 1–7). IEEE.
21. Ananth, S., Radha, D. K., Prema, D. S., & Nirajan, K. (2019). Fake news detection using convolution neural network in deep learning. *International Journal of Innovative Research in Computer and Communication Engineering*, 7(1), 49–63.
22. Saravanan, M., Kumar, A. S., Devasaran, R., Seshadri, G., & Sivaganesan, S. (2019). Performance analysis of very sparse matrix converter using indirect space vector modulation. *International Journal of Innovative Technology and Exploring Engineering*, 9(1), 4756–4762.
23. Karthikeyan, K., Umasankar, P., Parathraju, P., Prabha, M., & Pulivarthy, P. Integration and analysis of solar vertical axis wind hybrid energy system using modified zeta converter.