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Neo Banking - The Fintech Revolution

Mr. D. Krishna^{*1}, *Ch.Sathvika*^{*2}, *L. Durga Sai Prakash*^{*3}, *V.Sathvik*^{*4}, *M. Dinesh Chowdary*^{*5}.

^{*1}Professor Of Department Of CSE, ACE Engineering College, Hyderabad, Telangana, India.

^{*2,3,4,5}Student, Department Of CSE, ACE Engineering College, Hyderabad, Telangana, India

ABSTRACT—

This project focuses on the development of a Neo Banking System that incorporates three essential features: Credit Card Fraud Detection Prediction, Loan Approval Prediction, and Customer Churn Prediction. These features are implemented as web applications using the Flask framework. The Credit Card Fraud Detection Prediction feature utilizes advanced machine learning algorithms to analyze customer transaction data in real-time. By leveraging historical patterns and anomaly detection techniques, the system can identify potentially fraudulent activities, providing timely alerts and mitigating financial risks.

The Loan Approval Prediction feature aims to streamline and enhance the loan application process. Through the application of predictive models, the system evaluates various factors, such as customer credit history, income, and financial stability. This allows for accurate assessments of loan applications, enabling the bank to make informed decisions efficiently. The Customer Churn Prediction feature focuses on customer retention and satisfaction. By analyzing customer behavior, engagement patterns, and demographic information, the system can predict the likelihood of customers churning. This enables proactive customer retention strategies to be implemented, such as personalized offers and improved customer service, thereby reducing customer attrition and increasing overall customer satisfaction.

All three features are implemented as web applications using the Flask framework, providing a user-friendly interface accessible via web browsers. The system offers efficient and accurate predictions, aiding financial institutions in making data-driven decisions, minimizing fraud risks, optimizing loan approval processes, and enhancing customer satisfaction and retention.

Keywords— Neo Banking; Machine learning; Churn prediction; Fraud detection; Loan approval; Random forest; Linear regression.

1. INTRODUCTION

The financial sector embraces digital services in all parts of its business operations as the globe moves into the digital era. Bank and financial organisation customers rely substantially on digital services. Banks benefit from ease, low costs, and everywhere transactions, while customers benefit from the importance of profitability and ease of operation. These services are frequently referred to as "E-banking" in the banking sector. Neo Banks, a big e-banking revolution, is currently under way.

Neo-Banks, commonly referred to as challenger banks, are digitally exclusive financial organisations that offer clients a complete banking experience through a mobile or web-based application. Neo-banks provide a digital overlay to traditional core banking products to improve them while reducing operating costs and improving the customer experience. Neo banks are online-only, entirely digital banking institutions. Simply put, they are not present physically. Transactions in traditional banks could take a lot of the clients' time and effort. Neo banks, which add an immersive, digital layer on top of conventional banking, guarantee a flawless online experience. Customers can independently create accounts and use their services without problem thanks to their tech-driven character. Neo-banks need an ideal design that incorporates cutting-edge tools like cloud computing, AI, and machine learning. These Neo-Banks are dependable in the business and here to stay thanks to the combination of these technologies and data security.

2. EXISTING SYSTEM

Internet banking, sometimes referred to as online banking, e-banking, or virtual banking, is a type of electronic payment system that allows customers of banks and other financial institutions to carry out a variety of financial transactions via the financial institution's website.

TRADITIONAL BANKING

Traditional banks are unable to incorporate new emerging technology at first due to the regulatory framework and overall financial system they use. Because of this, banks are unable to develop new goods or services that can solve customers' needs or problems at the same time as fintech firms. We can infer that this occurs because banks are more process-focused than fintech.

Using a bank is more affordable than using a traditional bank because neo banks don't impose monthly fees like traditional banks do. For instance, a consumer may be required to pay a fee if he requests that his bank offer him a chequebook or debit card. However, this is not the case with Neo Bank because they do not charge their customers any fees for maintaining money in an e-wallet. The primary distinction between neo banks and regular banks is that traditional banks currently own their own licence, whilst neo banks do not. For the provision of their services, they must rely on a legally permitted partner.

In a traditional bank, an approval procedure like loan sanctioning or other service request typically takes more time.

If we examine these two phrases—neo bank and digital bank—in terms of their activities, we find that they are very similar to one another in that they both provide their customers with online services. However, there is a small distinction between neo banks and digital banks: while digital banks are an online extension of existing banks, neo banks are altogether new and built on IT and artificial intelligence.

DRAWBACKS

Incredibly, \$21.84 billion USD was lost due to credit card theft worldwide in 2015. Merchants are impacted by credit card fraud losses because they are responsible for paying all associated expenses, such as card issuer fees and administrative costs. Some goods are priced higher or receive fewer discounts and incentives because retailers must cover the loss. As a result, it is essential to minimise the loss, and an efficient system for detecting fraud is crucial for decreasing or completely eradicating fraud incidents.

Data mining is a technique used to find patterns and relationships in data to enhance commercial decision-making. Its tools can provide answers to business queries that were previously too time-consuming to address.

Only Razor Pay offers a product package that enables businesses to accept, process, and distribute payments in India. All payment methods, including credit card, debit card, net banking, UPI, and well-known wallets like JioMoney, Mobi Kwik, Airtel Money, Free Charge, Ola Money, and Pay Zapp are accessible through it.

3. PROPOSED SYSTEM

Neo Bank is a wholly digitally controlled bank that uses machine learning and information technology to provide a cutting-edge infrastructure for the consumer that streamlines the banking process. Application Programming Interface (API), a computer-based programming language that aids in connecting one piece of software to another in order to perform services, is the foundation upon which Neo Bank is built. API enables banks to expose their systems, allowing other parties to offer banking services using their internal infrastructure.

Our work has contributed in the following ways:

1. CREDIT CARD FRAUD DETECTION SYSTEM

We offer a credit card fraud detection system that determines whether there is any fraudulent activity if the customer opens the website with regard to all other transactions and other services. It offers the fundamental techniques for identifying credit card system fraud.

We have updated various security elements and put them in this procedure to speed up the fraud detection process. Finally, it displays "0" for fraudulent transactions and "1" for legitimate transactions. As a result, we determine if the transaction process is secure or not by using machine learning methods.

2. CUSTOMER CHURN PREDICTION USING MACHINE LEARNING

In cases where no other software is available to provide this information, customer churn prediction can be studied. To analyse bank customer data and forecast customer attrition, we applied deep learning techniques, specifically artificial neural networks. The experiment was run on a dataset known as churn modelling, and the findings show that by utilising the ANN algorithm, we were able to achieve an accuracy of 87% for bank customer data. The suggested framework offered a reasonably priced method for keeping bank clients, which boosts client profits.

3. LOAN APPROVAL PREDICTION

The primary need in the current world is LOANS. Banks only receive a large portion of the overall earnings from this. It is advantageous for people to purchase any type of luxury, such as homes, vehicles, etc., as well as for students to manage their educational and living expenditures.

However, the decision as to whether the applicant's profile is pertinent for loan approval or not. Banks have a lot of responsibilities.

Through the website, users can apply for loans; when their information has been verified, further action can be performed.

If the client satisfies all the prerequisites, the loan application will be approved. If not, the loan application is turned down and the client's loan is revoked.



FIG.1 NEO BANKING SYSTEM

4. BLOCK DIAGRAM OF PROPOSED SYSTEM

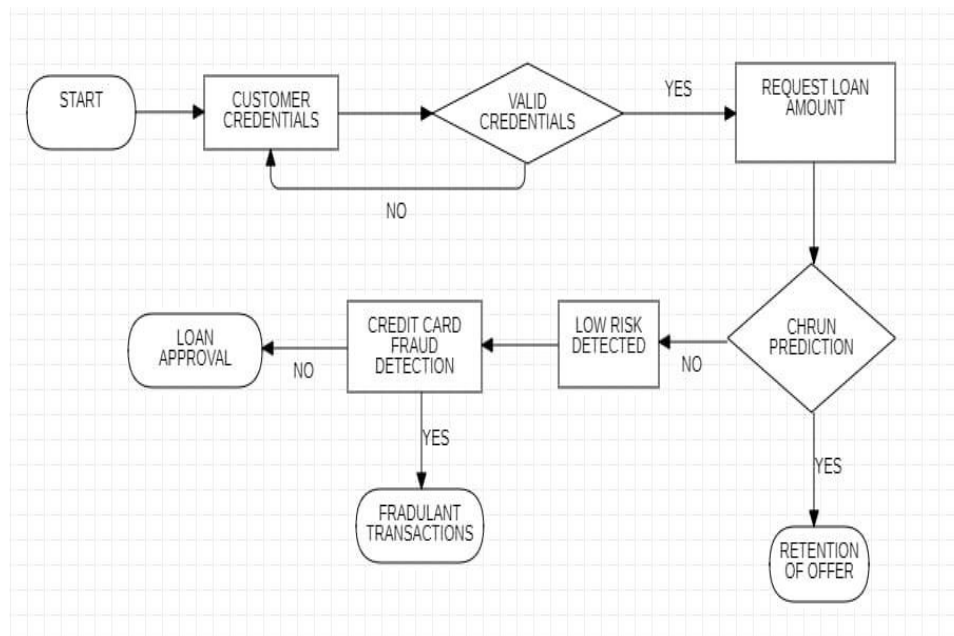


FIG 2 BLOCK DIAGRAM OF PROPOSED SYSTEM

5. OVERVIEW OF EMBEDDED SYSTEM

The integration of specialised hardware and software elements that are created to carry out particular functions within the financial infrastructure is referred to as an embedded system for a neo banking system. Neo banking, sometimes referred to as digital banking or online banking, describes financial institutions that run mostly or entirely online and offer customers digital services.

In a modern financial system, an embedded system typically consists of the following elements:

Hardware: A credit card fraud detection embedded system's hardware includes servers, data storage systems, network gadgets, and specialised hardware accelerators. The processing and analysis of substantial volumes of credit card transaction data is handled by these devices.

Depending on the particular needs and services the bank offers, the hardware of an embedded system in a neo banking system may change. In addition to security systems (such as firewalls) and specialised equipment like ATMs or card readers, it could also comprise servers, data storage devices, network hardware, and servers.

Processor : Pentium 3.0 GHz or higher.

1. RAM : 256 Mb or more.
2. Hard Drive : 10 GB or more.

Software: The software component is made up of a number of algorithms and modules that cooperate to find and stop credit card fraud. Typical software elements include:

- a. Data Acquisition:** This module gathers information on credit card transactions from a number of places, including online transaction logs, POS systems, and payment gateways.
- b. Data Preprocessing:** To remove noise, clean up the data, and prepare it for future study, the obtained data is pre-processed.
- c. Feature Extraction:** The pre-processed data is used to extract pertinent features such transaction amount, location, time, merchant ID, and client information.
- d. Machine Learning Models:** To create predictive models that can find patterns and abnormalities connected to fraudulent transactions, machine learning techniques are used. Both supervised learning (like decision trees, logistic regression, and support vector machines) and unsupervised learning (like clustering, anomaly detection) are frequently used approaches.
- e. Rule-Based Systems:** Rule-based systems detect questionable transactions using predetermined criteria and thresholds. These guidelines may be based on historical fraud tendencies, unusual behaviour, or transaction patterns.
- f. Real-Time Monitoring:** Incoming credit card transactions are continuously monitored in real-time by the system, which compares them to previous transactions and pre-established rules. An alert or notification is sent for additional examination whenever there is any questionable behaviour.

Client Side: HTML, Web Browser, Flash Player, MS Office, Windows XP/9x/ME. Web Server: HTML, MS Office , Windows XP/9x/ME.

Operating System: A platform for running the banking software and for managing the hardware resources is provided by an embedded operating system. Real-time operating systems (RTOS), Linux-based versions, and specialised operating systems created to meet particular needs are popular options for embedded operating systems.

1. Windows 9x/xp, Windows ME.

Security: An essential component of a modern financial system is security. To safeguard sensitive information and stop unauthorised access, embedded systems contain a variety of security mechanisms. This could involve physical security measures, intrusion detection systems, access controls, secure protocols (like SSL/TLS), biometric authentication, and encryption techniques.

To provide secure, dependable, and user-friendly banking services, an embedded system for a neo banking system incorporates numerous hardware and software components. In order to fulfil the expectations of the digital banking environment, it ensures seamless transaction processing, strong security measures, effective communication, and analytical capabilities.

6. FUNCTIONALITY

Web technology and machine learning models can be used to make this proposed system work. Banks can proactively monitor consumer behaviour, spot anomalies in real time, lower the likelihood of false positives, and stop fraud using machine learning. Decision-makers can develop more knowledgeable plans of action thanks to machine learning's capacity to simulate how a bank will respond to various economic scenarios.

Regardless of the volume of data, machine learning for FinTech gives thoroughly analysed insights for immediate decisions, saving both time and money. However, it also makes it easier to predict market patterns in the future with greater speed and accuracy.

Machine learning models including linear regression, decision-making algorithms, and random forest algorithms are required for credit card fraud detection systems.

Random Forest is a classifier that uses many decision trees on different subsets of the input dataset and averages the results to increase the dataset's predicted accuracy. Instead than depending on a single decision tree, the random forest uses forecasts from each tree and predicts the result based on the votes of the majority of predictions.

HyperText Markup Language, or HTML, is used to build websites and web applications. For easier comprehension, the expansion is broken down below:

HyperText: HyperText, also known as "text wrapped within a text," resembles a hyperlink in that it has an underlying text that, when clicked, directs the user to a different website.

Markup syntax: Although it's not required, a markup language aids in adding formatting and layout to text documents. It makes text material more dynamic and engaging.

The process of making web pages attractive is made easier with the use of CSS, often known as cascading style sheets. CSS was created to make it possible to separate document text from presentational components like font, layout, and colours. Typically, external.css files are used to store the style definitions.

7. PERFORMANCE EVALUATION

A neobanking system's performance evaluation for capabilities like credit card fraud detection, customer attrition prediction, and loan approval prediction entails evaluating the precision, dependability, and efficacy of these elements. Following are some crucial evaluation criteria and techniques for each component:

1. Loan Approval Prediction:

- **Accuracy Metrics:** The performance of the loan approval prediction model should be assessed using accuracy metrics including accuracy, precision, recall, F1-score, and AUC-ROC. These metrics shed light on how well the model can categorise loan applications as accepted or denied.

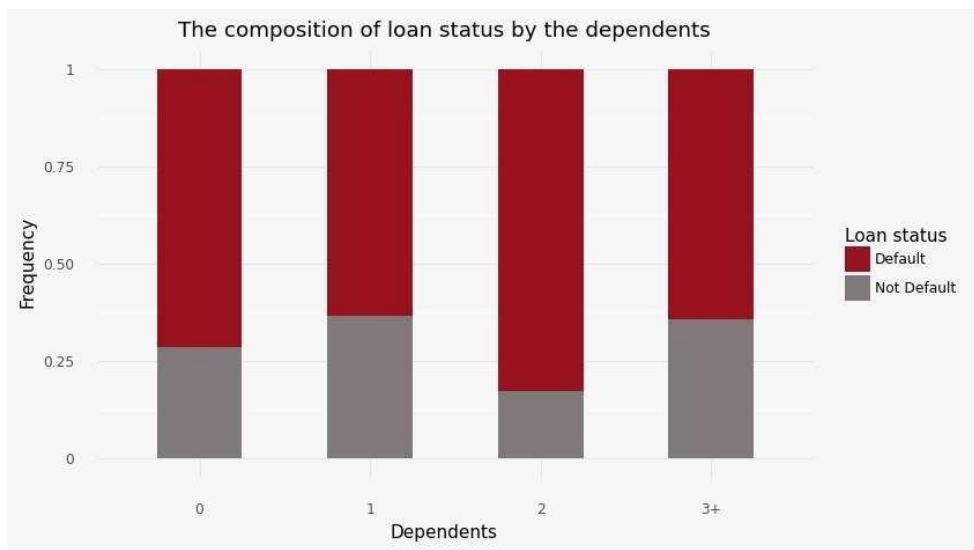


FIG.3 PERFORMANCE EVALUATION FOR LOAN APPROVAL

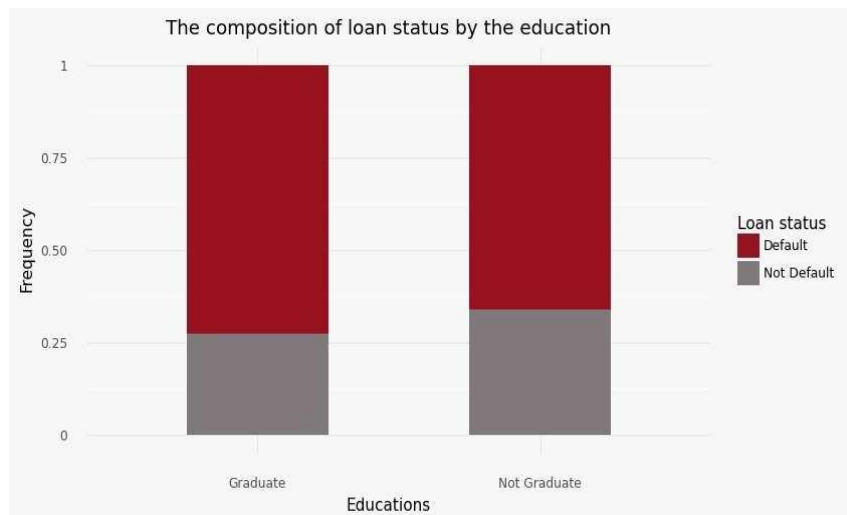


FIG.4 LOAN STATUS

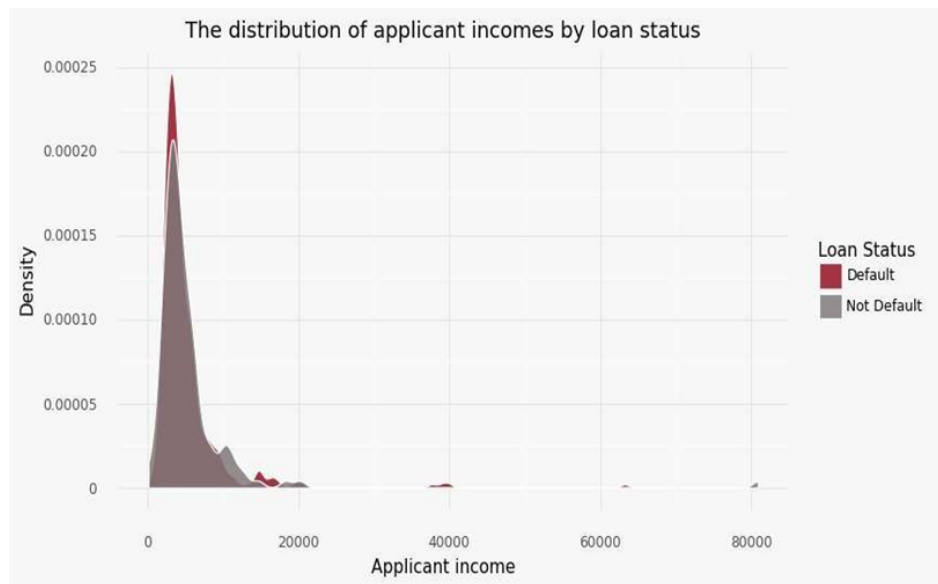


FIG.5 APPLICANT INCOME

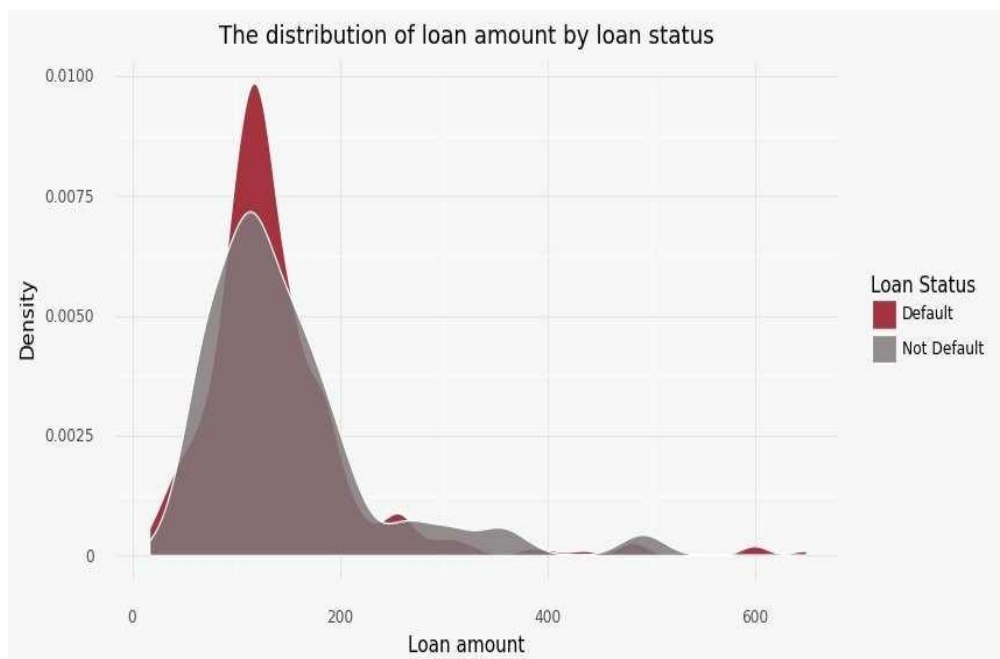


FIG.6 LOAN AMOUNT

2. Credit Card Fraud Detection:

- **Accuracy Metrics:** Calculate performance measures for the fraud detection model, including precision, recall, F1-score, and accuracy. When comparing expected and actual fraud cases, recall represents the percentage of correctly identified fraud cases out of all actual fraud cases. Precision is the percentage of correctly identified fraud cases out of all predicted fraud cases. The harmonic mean of recall and precision is known as the F1-score.

3. Customer Churn Prediction:

- **Accuracy Metrics:** Utilise parameters like accuracy, precision, recall, F1-score, and area under the precision-recall curve (AUC-PR) to assess churn prediction models in a manner similar to fraud detection. If the clients who have left are members of a minority class, accuracy may not be enough. Performance of the model is assessed more thoroughly using precision, recall, and F1-score.

- **Confusion Matrix:** To understand the distribution of true positives, true negatives, false positives, and false negatives, look at the confusion matrix. This aids in determining the model's advantages and disadvantages in churn prediction.

8. RESULTS



Credit Card Fraud Detection Rest API

Enter the 30 feature values in the below cell(in order):

Predict

FIG.7 CREDIT CARD FRAUD DETECTION



Credit Card Fraud Detection Results

Validating provided transaction...

According to our model, the provided transaction is not a
Fraud transaction.

FIG.8 CREDIT CARD FRAUD DETECTION RESULTS



Prediction

The loan approval is obtained using the machine learning model of **XGBoost**. It has the accuracy of around 83%. To obtain this model performance, we have acquired the training data from a public dataset library.

{{ prediction }}

[Back to Home](#)

FIG.9 LOAN PREDICTION

Your Marital Status
 Number of Dependents
 Your Property Area
 Applicant Income per Month (USD)
 Co-Applicant Income per Month (USD)

Loan and Credit Description

Your Loan Amount (USD)
 Your Loan Term (days)
 Your Credit History
 I agree all statements in [Terms of service](#)

FIG.10 DETAILS OF CUSTOMER FOR LOAN APPROVAL

Enter User Information in the Form Below

| | |
|---|---|
| Credit Score: | Number of Products Used: |
| <input type="text"/> | <input type="text" value="-- select --"/> |
| Country: | Has an Active Credit Card: |
| <input type="text" value="-- select --"/> | <input type="text" value="-- select --"/> |
| Gender: | Is an Active Bank Member: |
| <input type="text" value="-- select --"/> | <input type="text" value="-- select --"/> |
| Age: | Estimated Salary: |
| <input type="text"/> | <input type="text"/> |
| Years as Bank Customer: | |
| <input type="text"/> | <input type="button" value="Submit"/> |
| Account Balance: | |
| <input type="text"/> | |

FIG.11 CHURN PREDICTION

9. CONCLUSION

The banking industry's future lies with Neobank. Customers and traditional banks may now conduct business easily thanks to the platform's extensive range of offerings. People today demand that their work be completed in a matter of minutes rather than days, hence it is crucial to transform conventional banks into neo banks. Corruption decreases as a result of the working environment's transparency. Additional transaction costs such processing fees and other fees will be reduced as a result. In order to make business operations as simple as possible, Neobank is providing its customers with a variety of fresh user data and a user-friendly interface.

Overall, this Neo Banking System project aims to leverage cutting-edge technologies and predictive analytics to empower financial institutions with advanced tools for fraud detection, loan approval decision-making, and customer churn prediction, ultimately fostering a secure, efficient, and customer-centric banking experience.

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