

FinEasy – A Personal Finance App

Ajinkya Joshi¹, Rutuja Mane¹, Kimaya Salvekar¹, Prof. P. B. Ekatpure²

¹ Student, Department of Computer Engineering, SCOE, Pune, Maharashtra, India

² Assistant Professor, Department of Computer Engineering, SCOE, Pune, Maharashtra, India

ABSTRACT

Finance management is an important and unavoidable activity that most people dread. In today's fast-paced world, managing finances has become more complex than ever before. Finance management not only involves handling investments but also includes managing multiple accounts and tracking expenses. Each of these activities involves accessing information from different sources, and so collecting and consolidating information is not easy. However, technology has made it possible to streamline financial management, and personal finance mobile applications have become increasingly popular. Currently, there are some stand-alone personal finance applications that address different issues of financial management. There are individual software packages available for portfolio management, budgeting, and investment tracking. But each of these applications is limited to only a specific aspect of personal finance. Also, these applications being stand alone in nature, their usage is limited to the specific system on which they have been installed. In our project, we are addressing the above issues by creating a customizable and secure application for Personal Finance Management. This application can be used as a one for all for maintaining a user's personal finances, including income, investments, and expenses. Users can tailor the application based on their financial requirements to effectively handle and manage financial accounts. This application eradicates the need for multiple software applications and decreases the complexity involved in managing money. Our personal finance mobile application aims to simplify finance management by providing users with a centralized platform that integrates different aspects of finance management. The application aims in including features such as income and expense tracking, debt tracking, and financial goal setting, investment suggestions, stock volatility prediction. The educational content of the application can improve financial literacy and encourage responsible financial behavior. The application's user interface is designed to be user-friendly and intuitive, making it easy for users to navigate and access the information they need. Overall, our personal finance mobile application can provide a convenient and efficient solution for people who want to manage their finances effectively. It can help users track their expenses, manage their budgets, track their debt, provide suggestions based on their investment interests and achieve their financial goals. The application is secure and customizable, making it an ideal solution for people with varying financial needs.

Keyword: - Machine learning, deep learning, time series analysis and systematic literature review

1. INTRODUCTION:

In India, the financial world involves many responsibilities and, more often than not, just one person is able to take on the responsibility of one function on their own. A personal finance app, at its core, is an application that helps individuals manage their finances. These applications are designed to provide users with a general view of their financial health, including their income, expenses, debts, and investments. They are becoming increasingly popular as more people seek to take control of their finances and make well-informed decisions about their money. There are some applications available for personal finance that provide different features like portfolio management, budgeting, investment, debt tracking, etc. But these applications are limited only to a specific aspect of personal finance.

However, our Personal Finance application can be used as a one stop shop for maintaining a record of user's personal finances. By consolidating all of your financial information in one place, you can quickly get an overview of your financial situation and identify areas where you can make improvements. You can also track your progress over time and make adjustments as needed to stay on track towards your goals. Some key features in our applications are investment suggestions tailored to user's investment interests and providing personalized risk assessments by estimating the volatility of assets. Monitor your investments and take necessary actions based on changing financial situations.

Overall, a personal finance application can be useful for anyone who wants to take control of their finances. By providing users with an easy-to-use platform for managing their money, these apps can help users make smarter financial decisions, save money, and achieve their financial goals. It can also be used for the purpose of improving financial literacy among the users

2. RELATED WORK:

Declan French, Donal McKillop, Elaine Stewart [1] describes "Personal finance apps and low-income households". In this paper, Author investigated the efficacy of personal finance smartphone apps to improve the financial capability of those on a low income. They developed four smartphone apps (a loan interest comparison app, an expenditure comparison app, a cash calendar app, and a debt management app). These apps were provided to members of Derry Credit Union, the largest credit union in Northern Ireland (NI). Credit union members in NI tend to be on relatively lower incomes than the general population and live in more socioeconomically disadvantaged areas. A Randomized Control Trial (RCT) was used to assess the efficacy of the apps in improving financially capable behaviors. Improvements were found in several measures designed to gauge financial knowledge, understanding and basic skills and attitudes and motivations. These improvements translated into an improvement in a small number of the measures gauging financially capable behaviors. Those provided with smartphone apps demonstrated increased self-confidence in financial decision making and financial literacy and improved their ability to delay self-gratification and their sense of being able to effect change. Furthermore, financially capable behavior changes manifested in better keeping track of finances and managing unexpected bills. The effectiveness of these apps was evaluated using an RCT with working-age members (16–65 years) of Derry Credit Union, the largest Credit Union in NI. Derry Credit Union was not involved in the initial development of the apps. The trial began July/August 2017, recruiting 500 participants who were then randomized to receive the mobile apps (260 in the treatment group) or not (240 in the control group). A follow-up survey exploring participants' financial circumstances, employment, income, attitudes to risk, and household demographics was conducted in February/March 2018.

Dmytro S. Antoniuk¹, Tetiana A. Vakaliuk^{1,2,3}, Vladyslav V. Didkivskiy¹, Oleksandr Yu. Vizghalov¹, Oksana V. Oliinyk¹ and Valentyn M. Yanchuk¹ [2] describes "Using a business simulator with elements of machine learning to develop personal finance management skills" in which they described The need for personal finance competency development was analyzed in the research internationally. The challenge is relevant for both developed and developing countries. Influence of the financial literacy on the well-being of people worldwide and the need to recognize it as the fundamental right and universal need was discussed by Lusardi. Using business simulations in education is a shared practice now. Simulations are being used in practical training, such as flight or combat simulations as well as in economic, managerial, and financial areas. Researchers study the pedagogical significance of this type of technology enhanced educational method. The analysis of the analogues revealed that most part of the simulation software is appropriate for a specific area of the finance in the countries with developed financial markets. Based on the conclusions above this work represents the experiment in developing more generalized simulator for the countries with less developed market of financial instruments. Since this simulator was designed to develop personal finance management skills, an attempt was made to apply machine-learning elements to make this business simulator work even better. This requires the creation of a system that could determine for the user an effective strategy of action in the simulator because the amount of real data of simulation participants is extremely small for analysis and identification of hidden dependencies using cluster analysis. This task is suitable for those that are solved by the latest approach in machine learning, namely reinforcement training. Currently, economic processes are a new topic for research into the possibilities of applying the full potential of machine learning. Scientists from around the world are just making the first attempts to reproduce such processes programmatically to use artificial intelligence to find solutions and answer various economic questions of humanity.

Yogita Deshmukh, [3] describes “Stock Market Prediction Using Machine Learning”. Stock Market prediction and analysis is the act of trying to determine the future value of a company stock or other financial instrument traded on an exchange. Stock market is the important part of economy of the country and plays a vital role in the growth of the industry and commerce of the country that eventually affects the economy of the country. Both investors and industry are involved in stock market and wants to know whether some stock will rise or fall over certain period of time. The stock market is the primary source for any company to raise funds for business expansions. It is based on the concept of demand and supply. The methodology presented may be adapted to other enterprises and their stocks. Theoretically, the discussion on the predictions of stock prices is still controversial and unproductive. However, from the empirical standpoint, this research proved to be very productive, with some methods for financial market prediction being developed and demonstrated. Predicting the direction into which stock prices change is very important for the development of effective strategies to operate in the stock market. The result of the questionnaire applied to qualified respondents revealed that 80% of the respondents believe that the models and methods they use are satisfactory, but they do not use computer techniques to operate in the stock market.

Gang Huang, Xiaohua Zhou and Qingyang Song [4] describes “Deep Reinforcement Learning for Portfolio Management” The application of AI in the financial field is basically the application of machine learning (Bartram et al. 2020). According to the attributes of the modeling algorithm, machine learning can be divided into supervised learning, unsupervised learning and reinforcement learning. Supervised Learning requires additional human effort to set the training labels or objective functions, and the Intelligence of the model is directly related to the accuracy of the training labels or objective Functions, thus supervised learning is not a fully intelligent machine learning model in a strict sense. Unsupervised learning mainly includes cluster analysis and self-supervised learning. At present, Human intervention and good algorithms are still needed to improve the effectiveness of cluster Analysis in the financial field. Self-supervised learning is an intelligent algorithmic model that has emerged in recent years, Heaton et al. (2017) proposed an asset allocation model with no short Selling mechanism, but self-supervised learning is not a mature algorithmic model. Therefore, unsupervised learning is not a fully intelligent machine learning model too. The modeling idea of Reinforcement learning is much more different. It generates data through the interaction between Agent and the environment, and the agent uses these generated data to learn the optimal strategy. Here is an explanation of the short mechanism. Taking the futures market as an example, the assets in the market can be shorted, and the transaction is margin trading. Either long position or short position, the money in the margin is occupied by the position, and this part of occupied Money cannot be used for trading. That means, this occupied margin is actually the collateral asset, while the rest part of margin that is not occupied by the position can treated as a risk-free asset, which is cash in this article. Shorting in the stock market is similar, but instead of trading on margin, if you want to short stocks you have to take assets as collateral.

Shristi Shakya Khanal & P.W.C. Prasadl & Abeer Alsadoonl & Angelika Maagl [5] describes “A systematic review: machine learning based Recommendation systems for e-learning”. The constantly growing offering of online learning materials to students is making it more difficult to locate specific information from data pools. Personalization systems attempt to reduce this complexity through adaptive e-learning and recommendation systems. The latter are, generally, based on machine learning techniques and algorithms and there has been progress. However, challenges remain in the form of data-scarcity, cold-start, scalability, time consumption and accuracy. Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), Deep Belief Networks (DBN) and others. These systems are now widely employed in different industries, mainly for object and speech recognition and natural language processing (NLP) but also for advertising and recommender systems (You et al. 2019). In such cases, the aim is to approximate an item or information to a user (Goodfellow Et al. 2016). A recent work on RS by You et al. (2019) combined RNN with a Novel Temporal Neural Network (HierTCN) to permit hierarchical analysis of user preferences and match results to recent information to capture the historical impact on recent User decisions. Since the development of RS, recommender systems are generally used in e learning platforms to implement adaptive learning environments and to solve the issue of information overload for users. This review is based on 101 papers related to RS in e-learning published in the last few years. The main contribution of this paper is that it provides a taxonomy of RS systems along with ML algorithms, evaluation metrics applied along insights on challenges and issues that are yet to be addressed by future research. This study has shown CF as popular recommendation technique used in E learning with most of the studies aiming to improve the quality of recommendations. Among the four techniques, hybrid techniques have a competitive edge, yet their popularity is low. ML algorithms could not be classified in this paper due to multiple Algorithms used in single systems. Clustering was a common ML technique with future research pointing to SVN and neural networks to enhance results. Although RS in e-Learning are based on learners, evaluation of the system was more focused on measuring the accuracy of the algorithms through Mean, Precision, Recall and F-measure rather than evaluating the impact on satisfaction and preference level of users.

Kunal Pahwa, Neha Agarwal [6] describes “Stock Market Analysis using Supervised Machine Learning”. Stock market or Share market is one of the most complicated and sophisticated way to do business. Small ownerships, brokerage corporations, banking sector, all depend on this very body to make revenue and divide risks; a very complicated model. However, this paper proposed to use machine learning algorithm to predict the future stock price for exchange by using open-source libraries and pre-existing algorithms to help make this unpredictable format of business a little more predictable. The outcome was completely based on numbers and assumes a lot of axioms that may or may not follow in the real world so as the time of prediction.

3. ALGORITHMS:

Machine learning algorithms can be useful in personal finance apps to provide users with personalized recommendations and insights based on their financial data. Here are a few examples of machine learning algorithms that can be used in personal finance apps:

Clustering: Clustering is a machine learning algorithm that can group similar data points together. In personal finance, clustering can be used to group expenses into categories such as housing, transportation, and entertainment. This can help users get a better understanding of their spending habits and identify areas where they can cut back.

Regression: Regression is a machine learning algorithm that can help predict future outcomes based on past data. In personal finance, regression can be used to predict future expenses, income, or investment returns. This can help users plan their finances more effectively. **Neural Networks:** Neural networks are a type of machine learning algorithm that can simulate the human brain. In personal finance, neural networks can be used to analyze large amounts of financial data and identify patterns or anomalies. This can help users detect fraudulent activity or other irregularities in their financial accounts.

Random Forests: Random forests are a machine learning algorithm that can combine multiple decision trees to improve accuracy. In personal finance, random forests can be used to predict future trends in the stock market or other investment vehicles.

Deep Learning: Deep learning algorithms can be used to analyze large amounts of financial data and identify patterns or trends that may not be immediately apparent. This could be useful for predicting market trends, identifying investment opportunities, and detecting fraudulent transactions.

Reinforcement learning: Reinforcement learning algorithms can be used to optimize financial decisions, such as debt repayment plans or investment strategies. By training an algorithm to make decisions based on feedback from the environment, the app could help users optimize their financial decisions over time.

Time Series Analysis: Time series analysis can be used to analyze trends in financial data, such as stock market prices, interest rates, and inflation rates, to help users make informed investment decisions. The GARCH (Generalized Autoregressive Conditional Heteroskedasticity) model can be used to model and forecast the volatility of financial assets, such as stocks. This is a time-series model that captures the dynamic and nonlinear nature of volatility, which is an important factor in risk management and asset allocation. The model is a two-step process. In the first step, an ARMA (Autoregressive Moving Average) model is used to model the mean or average of the asset returns. The residuals from the ARMA model are then used in the second step to model the variance or volatility of the asset returns using a GARCH process. The GARCH process models the conditional variance of the asset returns as a function of the past variances and past errors. Specifically, the GARCH process assumes that the variance of the current period is a weighted average of the past variances and the squared errors or residuals from the ARMA model. The weights are determined by the parameters of the GARCH model, which are estimated from historical data. The GARCH model can be used to forecast the future volatility of financial assets, which is an important input in risk management and portfolio optimization. By estimating the volatility of assets, investors can make informed decisions about how to allocate their investments and how to manage their risk exposure. In a personal finance app, the GARCH model can be used to provide users with personalized risk assessments and investment recommendations based on their financial goals and risk tolerance. The GARCH model can also be used to provide users with real-time updates on the volatility of their investments, helping them to make informed decisions about when to buy, sell, or hold their assets.

Web scraping: Web scraping algorithms can be used to collect financial news and updates from various sources, such as news websites, social media platforms, and blogs, and provide them to users in a centralized location. This can help provide financial literacy by giving users access to a wide range of information about financial markets, trends, and events. Rule-based web scraping can be used but for this purpose. This involves writing rules that specify how to extract data from specific websites or web pages. For example, a rule may specify to extract the title, author, date, and content of financial news articles from a specific news website. Once the financial news and updates are collected using web scraping algorithms, they can be processed and analyzed to extract insights and trends. This information can then be presented to users in a user-friendly format, such as a dashboard or mobile app, to help them make informed financial decisions. However, it is important to note that web scraping may have legal and ethical implications, and it is important to follow ethical guidelines and obtain necessary permissions before collecting and using data from websites. Overall, web scraping algorithms can be a useful tool for providing financial literacy through news and updates. These algorithms can automatically extract and analyze relevant financial information, providing users with the latest news and updates on financial markets and trends. However, it is important to ensure that the data sources and algorithms used are accurate and reliable to avoid making incorrect investment decisions.

4. CONCLUSIONS

Using FinEasy user can keep track of various personal finance related activities such as budgeting, investments and debt. Moreover, the user can also keep track of the stock markets and strategize investments based on the volatility analysis, user can also receive news and articles specifically tailored to their own interests. Hence by leveraging machine learning algorithms and other advanced technologies, the app could provide personalized financial guidance and help users make more informed financial decisions. In this Survey, we studied different research papers and different algorithms for our system. We found out that GARCH model is best suited for dealing with Time Series Data for predicting stock volatility.

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