Donation Prediction Using Random Forest Regressor For NGO

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Abstract— The NGO website serves as a platform to engage individuals in supporting the NGO through donations and volunteer opportunities. It should have clarity and visual appeal, it has to educate and raise awareness about our organization. The donation process should offer one-time or recurring contributions, be seamless, accepting various online payment methods. Users can contribute not only monetarily but also by donating books and toys. Additionally, should encourage users to provide hands-on help by volunteering at events, focusing on aiding underprivileged children in need. It should be informative and user-friendly for NGO employers.

Index Terms- NGO, Charity, Donation, Volunteer

I. INTRODUCTION

Non-governmental organizations (NGOs) play a crucial role in addressing the needs of underprivileged communities, particularly children. In this paper, we investigate the effectiveness of digital platforms in engaging individuals to support such initiatives.

Our research focuses on how NGOs can effectively communicate their mission and provide seamless donation and volunteer opportunities. We also explore the motivations behind philanthropic behavior to offer practical insights for enhancing engagement strategies. Through our study, we aim to provide actionable recommendations for NGOs to maximize their impact in aiding underprivileged children, contributing to the discourse on social responsibility and collective action.

II. LITERATURE SURVEY

1) Mridula Goel, Aryan Agarwal, Namit Chandwani, and Tanmay Dixit [1] proposed a web application framework to connect NGOs and volunteers. The framework provides features such as user registration and login, NGO and volunteer profiles, project management, and communication tools. The authors argue that their framework can help NGOs to recruit volunteers more efficiently and effectively, and can also help volunteers to find projects that match their skills and interests.

2) Robyn Goff and Wouter Bam [2] identified key tools that can aid in the management of donations across NGOs. The author reviews a variety of tools, including donation management software, online crowdfunding platforms, and blockchain-based donation tracking systems. The author also discusses the different factors that NGOs should consider when choosing a donation management tool, such as the size of the organization, the types of donations it receives, and its budget.

3) Saurabha Joglekar and Savita Sangam [3] proposed a donor analytics and data platform for Indian NGOs. The platform would collect and analyze data from a variety of sources, including donor surveys, donation records, and social media data. This data would then be used to generate insights into donor behavior and preferences. The authors argue that their platform would help Indian NGOs to better understand their donors and improve their fundraising efforts

4) Oleksandr Berezko and Pavlo Zhezhnych [4] outlined a pertinent issue regarding the challenges faced by Non-Governmental Organizations (NGOs) in managing knowledge due to resource constraints. It suggests leveraging social software and the NGO's website as a means to facilitate Knowledge Management, especially through the implementation of Social Knowledge Environments (SKEs).

5) S. A. Shreya, M. A. Rahman, and M. R. Hossain [5] focused on the implementation of an Electronic Data Processing and Management System for Non-Governmental Organizations (NGOs) in Bangladesh, with a specific focus on two local NGOs, Nari Uddug Kendra and Friends In Village Development Bangladesh (FVDB), located in

Dhaka. The paper outlines the importance of transitioning from traditional manual record-keeping systems to automated database management systems.

6) Yashwanth Kumar G N and Supreetha M [6] proposed a blockchain-based donation and organ tracking system to enhance transparency and accountability in donation processes. By utilizing the SHA algorithm and blockchain technology, the system ensures secure and traceable donations, providing donors with confidence in their contributions. This approach promises increased transparency, accountability, and trust among stakeholders. However, implementation challenges include technical complexities, scalability issues, regulatory hurdles, energy consumption, and the need for user education and adoption.

7) Utsav Das, Arvind Narayanan, Aman Gupta, Onkar Singh Bagga, and Shalu Chopra [7] proposed a recommender system for NGOs to identify individuals passionate about their cause through Twitter analysis. This system evaluates digital footprints based on three metrics: Influence, Engagement, and Relevance. It utilizes the TwitterRank algorithm to measure influence, engagement via likes and retweets, and topic modeling using LDA for relevance assessment. This structured approach aids in selecting advocates efficiently and is adaptable across different NGOs, leveraging user-generated content for candidate evaluation.

8) Truong Xuan Tung and Trung Dung Ngo [8] This paper introduces a socially aware navigation framework for mobile service robots in dynamic human environments, utilizing deep reinforcement learning. Unlike traditional model-based approaches, this framework enables robots to autonomously learn optimal navigation strategies through trial-and-error interactions with their surroundings, ensuring human safety and comfort. The proposed approach offers greater adaptability and flexibility, addressing the limitations of existing methods.

9) Lidya Wati Evelina, Mariko Rizkiansyah, Muslikhin, Indra Prawira, and Rahmat Edi Irawan [9] This paper evaluates campaigns by Walhi and the Ministry of Environment and Forestry on Instagram. Employing virtual ethnography, it analyzes responses to these campaigns, aiming to gauge their effectiveness in raising awareness and shaping public perceptions of forest fires and environmental conservation.

10) Mohamad Fareez Bin Jasmi, and Sathiapriya Ramiah [10] discusses Malaysia's ongoing efforts to combat poverty, highlighting a comprehensive approach involving economic policies, social programs, and education initiatives. Despite remarkable progress, a residual 0.4 percent of the population still faces poverty, necessitating continued support. The establishment of The Need to Feed the Need (NFN), an NGO targeting urban poverty in Kuala Lumpur, is examined. However, NFN struggles with limited outreach and community awareness. Primary research indicates a lack of understanding among communities about urban poverty issues and ways to assist NFN. To address these challenges, integrating mobile applications and IoT technologies is proposed to enhance NFN's outreach, attract volunteers, and optimize resource allocation.

11) Ruchi Sharma, Parv Dave, and Jay Chaudhary [11] underscore the significance of Optical Character Recognition (OCR) technology in extracting text from digital images, facilitating efficient information retrieval. Practical applications include digitizing printed documents, recognizing vehicle number plates, and aiding in various sectors like traffic monitoring and business document processing. The paper proposes an OCR-based application to connect organizations, volunteers, and NGOs for volunteering work, addressing the current gap in coordination. It also discusses advancements in OCR technology, particularly in Machine Learning and deep learning techniques, enhancing accuracy. The model's potential extends to expediting patient admission processes in healthcare through Aadhar card scans, showcasing its versatility and scalability.

12) Baojie Zhang, Pengfei He, Zhongxun Wang, Congguang Liu, and Zhuoran Cai [12] Direction of Arrival (DOA) estimation methods are essential for processing array signals in large array systems. Traditional algorithms like MUSIC and ESPRIT have limitations in accuracy and computational complexity. In contrast, sparse signal representation frameworks offer improved performance. This paper proposes a linear DOA estimation method based on NGO-SVM,

combining the NGO algorithm with Support Vector Machines (SVM) to optimize classification hyperplanes and enhance estimation accuracy across different signal-to-noise ratio conditions.

III. PROBLEM STATEMENT

Many NGOs struggle to connect with donors and helpers. Why? They often lack funds and publicity. They need money and awareness for their great work. Our project wants to help with these problems. We're making a special website for an NGO. This will boost their profile and draw more supporters. This way, the NGO can meet its goals better. The website will be a tactical site to link the NGO's helpful work and people keen to chip in. This builds a lasting, stronger support base for the NGO.

IV. METHODOLOGY

Design and Prototyping
This phase involves translating the prioritized features and user personas into tangible design elements. Designers create wireframes, which are skeletal outlines of the website layout, and prototypes, which are interactive representations of how the website will function. Design considerations include user interface (UI) design, colour schemes, typography, imagery, and overall visual appeal. The goal is to create a design that not only reflects the NGO's brand identity but also guides users intuitively through the website, leading them towards donation and volunteer opportunities.

Development and Testing
With the design approved, developers begin building the website using appropriate technologies and frameworks. This phase involves coding the front-end (client-side) and back-end (server-side) components of the website, integrating functionalities such as donation forms, volunteer sign-up forms, user authentication, and content management systems (CMS). Throughout the development process, rigorous testing is conducted to identify and address any bugs, errors, or compatibility issues. Testing includes functionality testing, usability testing, performance testing, and security testing. Once the website passes all tests successfully, it is ready for deployment.

Integration of Donation and Volunteer Management Systems

This step involves integrating third-party tools and systems for donation and volunteer management seamlessly into the website. Donation management systems enable users to make secure online donations using various payment methods, such as credit/debit cards, PayPal, or bank transfers. Volunteer management systems allow users to sign up for volunteer opportunities, view event schedules, and communicate with NGO organizers. Integration ensures that donation and volunteer data are captured and managed efficiently, providing NGOs with valuable insights into donor behavior and volunteer engagement. Additionally, it enhances the user experience by offering convenient and accessible ways to contribute to the NGO's cause.

V. PROPOSED SYSTEM

Overview
A charity web application, often referred to as a charitable or philanthropic web app, is a digital platform designed to support and facilitate the activities of charitable organizations, nonprofits, and individuals engaged in philanthropy. It serves as an online hub for connecting donors, volunteers, and charitable causes.
The primary purpose of a charity web app is to streamline and enhance the operations of charitable organizations while providing supporters with user-friendly tools to contribute to causes they care about

Proposed System
Imagine a three-part structure for managing a Non-Governmental Organization (NGO) system. Picture this as a big cake with three layers. The top layer is the "presentation layer". Here, things like user interfaces are shown and interactions are handled through something akin to HTML. The middle part of the cake, which we'll call the "application layer", puts business thinking into play using a language such as Django. The base of our cake is the "data layer". This layer, concerned with keeping and finding data, uses a system like MariaDB.

The interconnected layers are facilitated by two APIs, with one managing requests from the presentation to the application layer and the other handling requests

from the application to the data layer. This three-tier architecture offers notable advantages over the existing two-tier model. It excels in scalability, allowing independent scaling of each tier to support a high volume of users or transactions. Enhanced security is achieved by isolating the data layer from the presentation and application layers, making unauthorized access more challenging for potential attackers. Moreover, the system gains flexibility as the three tiers can be implemented using diverse technologies, enabling the NGO to choose the most suitable solutions for their specific requirements. 2

Delving into the detailed components, the web server serves web pages, while the load balancer optimizes traffic distribution across multiple web servers, bolstering performance and scalability. The API Gateway acts as a central point for the presentation and application layers to access the data layer, offering additional security features such as authentication and authorization. The application server, hosting the application layer, provides essential features like thread management, load balancing, and caching. Meanwhile, the database server, hosting the data layer, handles data storage, retrieval, and querying.

This comprehensive architecture introduces several advantages, including enhanced scalability, security, and flexibility. The incorporation of a load balancer and API Gateway further contributes to improved system performance and increased protection against potential security threats. Overall, the proposed three-tier architecture represents a robust and adaptable solution for the NGO management system
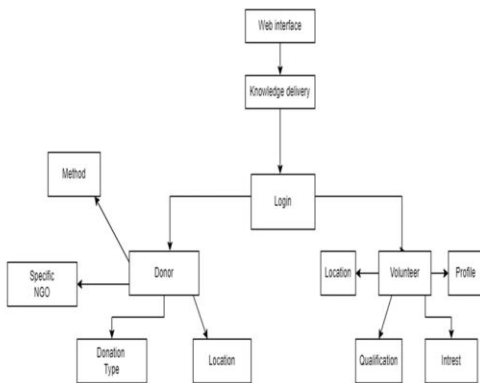

Fig.1: Proposed System Flowchart

Use Case

The use case diagram illustrates the various actors and their interactions with the charity website, encapsulating a range of functionalities to engage users effectively. Four main players exist: the User, Admin, Donor, and Volunteer. Users start by setting up an account. This is a big step because it lets them get involved. They can give money, volunteer, or join events. Logging in is easy and works with many activities. When they log in, they get to use all the features.

'Get approval' is a key function for Admins. They use it to check and approve new user accounts. This keeps the website secure. Donors get to choose a cause they care about. The system shares a full list of causes and gives lots of information. With the 'Make donation' function, a donor can give money. They set the amount and how they want to pay.

Volunteer engagement is a key aspect, facilitated through the "Volunteer" use case. Volunteers can express their interest, specifying the type of work and their availability. For transparency and accountability, donors can generate receipts for their contributions, serving practical purposes such as tax documentation. Volunteers further contribute by creating events and defining event details in the "Create event" use case.

Donors interested in attending events can utilize the "Select the event" use case, presenting a list of upcoming events with relevant details. The "Apply" use case allows donors to express their intent to attend an event, providing necessary contact and other information. Post-event, donors can offer valuable feedback through the "Fill survey form" use case, enabling organizers to enhance future events based on attendee experiences. Overall, the use case diagram effectively outlines the website's robust features, emphasizing user engagement and organizational transparency
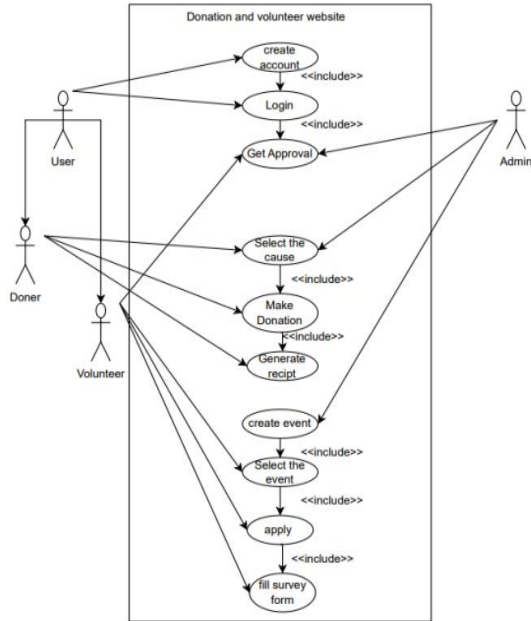
Fig.2: Use Case Diagram

Algorithms

The choice of algorithm for revenue forecasting significantly impacts the functionality and effectiveness of the NGO website and admin portal. In this scenario, employing the Random Forest Regressor algorithm for revenue prediction offers several advantages. Firstly, its high accuracy, as evidenced by the low Mean Absolute Error and Mean Squared Error values, ensures that the revenue forecasts provided on the website and admin portal are reliable and trustworthy. This accuracy instills confidence in donors, volunteers, and administrators, fostering transparency and credibility in the NGO's operations.

Furthermore, the Random Forest Regressor's superior predictive capability, indicated by the high R^2 score of 92.0%, enables the website and admin portal to offer precise revenue projections. This information is invaluable for strategic decision-making, allowing administrators to allocate resources effectively, plan fundraising campaigns, and set realistic targets for financial growth. Additionally, the integration of revenue forecasting into the admin portal enhances its functionality, providing administrators with real-time insights into the NGO's financial health and performance.

Moreover, the use of the Random Forest Regressor algorithm contributes to the overall user experience on the NGO website and admin portal. Accurate revenue forecasts instill confidence in donors and volunteers, encouraging continued support and engagement with the organization. Furthermore, by leveraging advanced machine learning techniques, the website and admin portal demonstrate a commitment to innovation and efficiency, positioning the NGO as a forward-thinking and technologically adept organization within the nonprofit sector.

Overall, the choice of the Random Forest Regressor algorithm for revenue forecasting enhances the functionality, credibility, and user experience of the NGO website and admin portal. Its accuracy and predictive power empower administrators to make informed decisions, while its integration fosters transparency and engagement among stakeholders. As a result, the NGO can effectively fulfill its mission and drive a positive impact in the communities it serves.

RESULT

The Home Page of the NGO website contains information about the NGO and a navigation bar that has different functionalities like login to the admin panel and donor's panel. Before login you need to sign up through your e-mail, after logging in as a Donor you can help the NGO by donating funds or by helping with useful and necessary stuff, you can also register to volunteer after being approved by the admin you can participate in events

The Home Page of the NGO Admin Portal contains information about NGOs a chat displaying future revenue and a navigation bar with different functionalities like Approving Volunteers, Payment Receipt, and Logout. A revenue forecast is an educated prediction or estimation for the upcoming month about how much money the NGO is likely to bring in. Random Forest algorithm is used for revenue forecast. Result analysis

The NGO website and admin portal serve as essential platforms for facilitating organizational operations and stakeholder engagement. The website offers comprehensive information about the NGO's mission and activities, enabling transparent communication

with donors and volunteers. Through the portal, administrators can efficiently manage volunteer approvals, track revenue forecasts, and oversee financial transactions. The integration of revenue forecasting within the portal aids in strategic planning, empowering the NGO to allocate resources effectively and advance its mission with greater foresight.
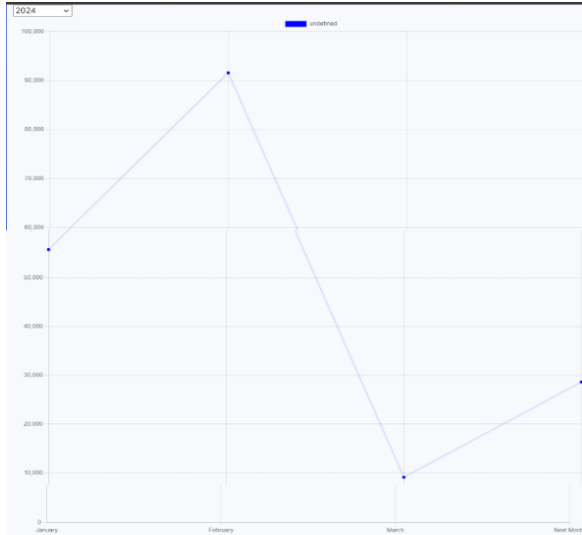

Fig.3: Forecasting Graph

Performance Matrix

The integration of revenue forecasting within the portal significantly enhances the NGO's strategic planning capabilities, enabling more effective resource allocation and a clearer trajectory for mission advancement. The performance matrix of the forecasting model showcases its robustness and reliability in providing valuable insights.

Collectively, these performance metrics highlight the model's invaluable contribution to strategic planning within the NGO, empowering stakeholders with actionable insights and fostering sustainable growth and impact. The R² score of algorithm is:0.92

TABLE I.   Performance Matrix Table

Matrix	Linear Regression	Random Forest Regressor	Voting Regressor	SARIMAX
Mean Absolute Error	15425.91	5559.37	10223.53	34617.45
Mean Squared Error	393304232.90	68856032.96	174239533.20	1955380328.50
Root Mean Squared Error	19831.90	8297.95	13199.98	44219.68
R² Score	36.0%	92.0%	80.0%	38.0%

CONCLUSION

Our charity website is a one-stop shop for individuals who want to get involved and support our organization. Whether you want to donate money, books, or toys, or volunteer your time, you can do it all on our website. We make it easy to donate and get involved, and we provide clear and concise information about our organization and our mission.

We believe that everyone has the power to make a difference, and we are committed to providing our supporters with the tools they need to do just that. When you support our charity, you are helping to make a real difference in the lives of those in need.

ACKNOWLEDGMENT

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