Taxonomist - Hackoona Matata Hackathon Report

Introduction

Team Taxonomist is proud to present our project developed for the Hackoona Matata Hackathon. Our goal is to create a future where every rupee in the national budget is allocated efficiently to maximize impact. By leveraging advanced analytics and machine learning, we aim to improve economic planning and policy evaluation.

The Challenge

Our project tackles two key challenges:

Predicting India's Economic Growth

GDP forecasting is essential for national planning, as it reflects economic health. We experimented with various machine learning models:

- Random Forest
- Gradient Boosting
- Elastic Net

Elastic Net delivered the highest accuracy, even when trained on synthetic data. Our model predicted a GDP value close to India's 2023 figure of 3.57 trillion USD, proving its reliability.

Optimizing Budget Allocation

Currently, around ₹100,000 crores are spent on political advertising, while essential sectors like R&D and agriculture remain underfunded. To address this imbalance, we developed a budget allocation model using linear regression:

- Assigns optimal weights to different sectors.
- Captures hidden patterns effectively using 60 attributes, preventing overfitting.
- Initially distributes funds across three major sectors, with plans for more detailed allocations in the future.

Security Enhancements

To ensure data integrity, we are developing a security analysis tool to detect and prevent data poisoning attempts:

- Inputs are copied to the server before processing.
- Real-time cross-checking detects discrepancies.
- Any tampering triggers a warning and logs the event.

While this is an initial framework, we plan to integrate a full authentication and monitoring system.

Tech Stack

Front-End

- **React.js**: Component-based UI development for a modular user experience.
- **Next.js**: Server-side rendering for performance optimization.
- **Tailwind CSS**: Utility-first styling for rapid development and responsiveness.
- **Deployment**: Built using npm run build and managed with PM2 and Nginx.

Back-End

- **Python**: Machine learning implementation using Scikit-Learn and Pandas.
- **Flask**: RESTful API development for frontend-backend communication.
- **Deployment**: Flask-based backend hosted and managed for stability.

Database

- **Supabase**: PostgreSQL-powered storage for economic data and budget allocations.
- **Authentication & Role-Based Access Control**: Secure data access for different user roles.

Machine Learning

- **TensorFlow**: Deep learning models for improved economic predictions.
- **Scikit-Learn**: Algorithms like Elastic Net and Linear Regression for GDP forecasting and budget optimization.

API Layer

- **Flask-based APIs**: Facilitates seamless communication between the frontend and ML models.
- **Efficient Data Handling**: Fetches GDP predictions, budget allocations, and policy insights.

Deployment

- **Frontend**: Deployed using **PM2** and **Nginx** for scalability and performance.
- **Backend**: Hosted with **Flask**, ensuring seamless API communication.

Methodology

1. **Data Collection & Preprocessing**: Gather historical economic data, clean and normalize it.
2. **Model Development**: Train and select the best model for GDP forecasting and budget allocation.
3. **Simulation & Integration**: Enable seamless data flow between models.
4. **Backend & API Development**: Use Python and Flask for data processing and API communication.
5. **Frontend Implementation**: Develop a responsive UI with React.js and Next.js.
6. **Security Enhancements**: Implement authentication and real-time data integrity checks.
7. **Testing & Optimization**: Deploy and refine the application for real-time analytics.

Future Vision

Beyond GDP prediction and budget allocation, we are working on a **policy analyzer** that evaluates proposed policies using historical, demographic, and economic data. This tool will help policymakers make informed, data-driven decisions for sustainable economic growth.

Conclusion

Our project demonstrates the power of machine learning in economic forecasting and budget optimization. By reallocating resources from politically motivated expenditures to essential sectors, we aim to contribute to India's economic progress. We look forward to refining our models further and making a meaningful impact.