Automated System for Career Advancements of the Faculties of Higher Education

Team Memebers:

1. **Tanya Gupta 2023UEE4648**
2. **Yashmit Gupta 2023UEE4661**
3. **Krish Garg 2023UCS1685**
4. **Suryansh Kumar Singh 2023UEC2596**
5. **Nihal Sharma 2024UCS1700**
6. **Sujal Chaudhary 2024UCA1953**

PS: SIH1613

Team: HexaCode

HexaCode

Problem Statement

Automated System for Career Advancements of the Faculties of Higher Education:

The traditional faculty self-appraisal process in universities is inefficient, paper-based, and lacks transparency, hindering comprehensive evaluation and recognition of faculty contributions. There is a need for a secure, user-friendly web-based platform that automates the tracking of faculty activities, providing real-time data for both faculty and administrators. This system should streamline data management, enhance evaluation accuracy, and support paperless administration, ultimately fostering continuous improvement in higher education.

Solution

FACULTY PERFORMANCE MANAGEMENT SYSTEM: We have designed an advanced web portal that integrates machine learning, data visualization, and secure cloud computing to optimize faculty performance tracking and appraisal. This system provides a seamless and efficient platform for faculty to manage and improve their professional activities.

The portal features:

1. **Faculty Dashboards** for tracking attendance, research submissions, and performance metrics.
2. **Student Review Interface** enabling real-time feedback collection.
3. **Admin Dashboards** with leaderboards, appraisal management, and performance monitoring.
4. **AI-Driven Performance Scoring** calculating comprehensive faculty scores using weighted metrics.

Data integrity and security are ensured through encrypted storage and secure user authentication, providing a reliable and tamper-proof environment for both faculty and administrators.

USP

Seamless Integration with Google Scholar : Automates research publication tracking, ensuring accurate and up-to-date records without manual effort.

AI-Driven Performance Insights: Provides personalized recommendations for faculty improvement through advanced machine learning, enhancing professional development.

Dynamic Leaderboards: Real-time ranking system that fosters a competitive environment, encouraging faculty to excel in their roles.

Real-Time Appraisal Forecasting: Predictive analytics offer clear insights into appraisal and promotion chances, motivating continuous faculty improvement.

Military-Grade Security: Unbreakable session management and powerful anti-DDoS protection ensure bulletproof security and uninterrupted access.

Student engagement interface: Dedicated review page for students to provide feedback, enhancing faculty evaluation.

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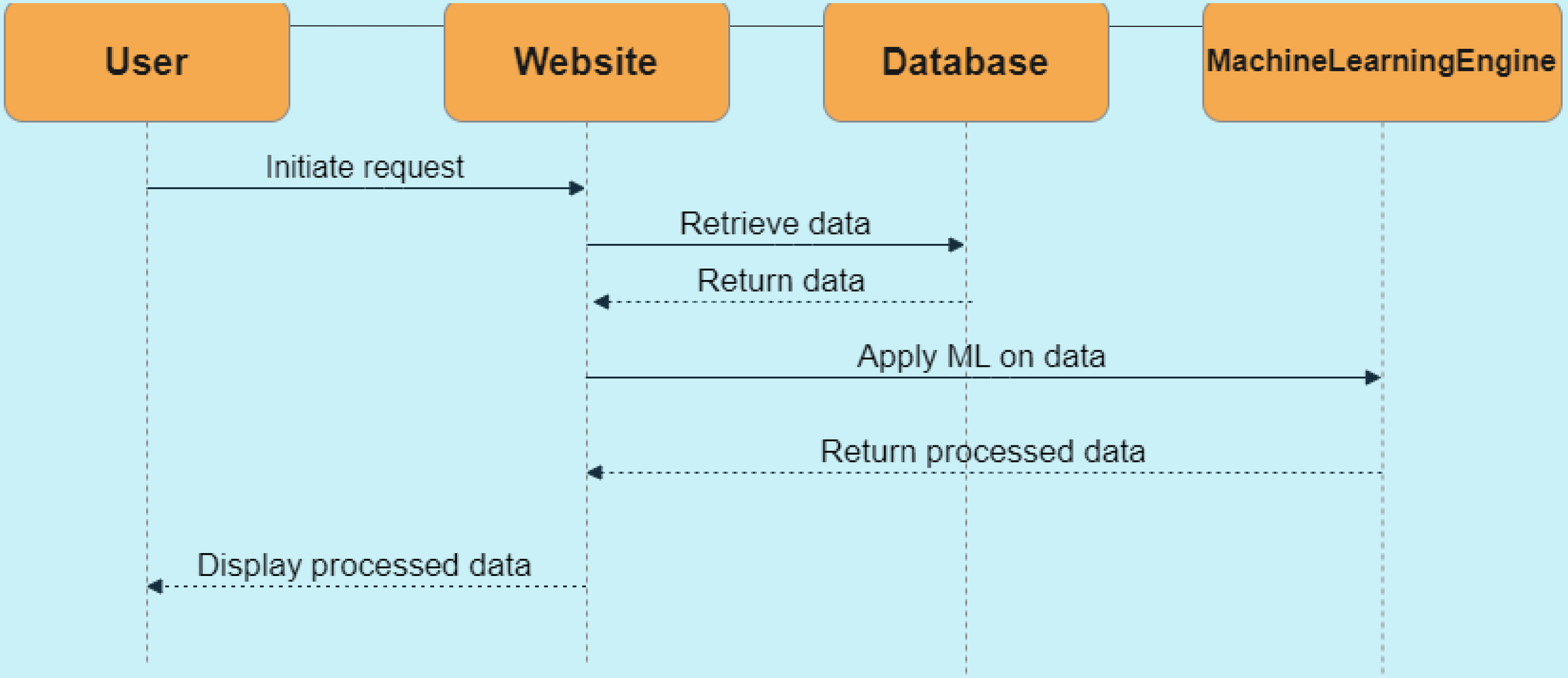
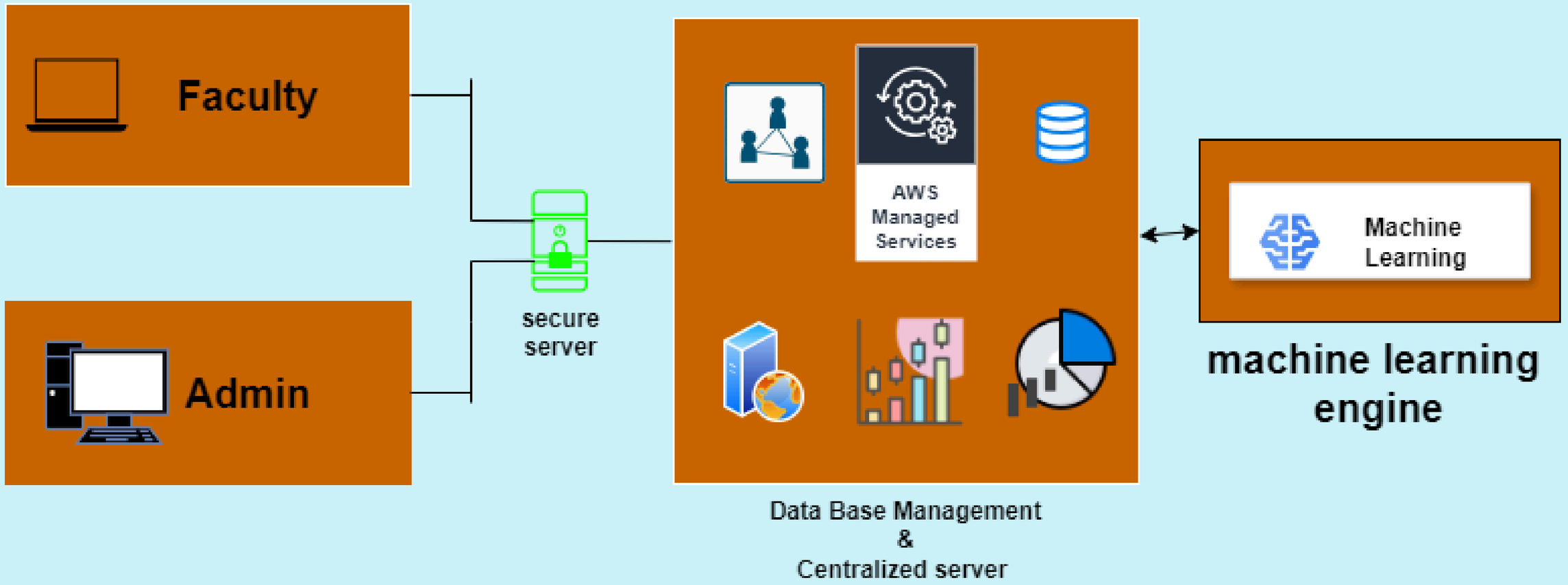
Flow Chart


User
Website
Database
MachineLearningEngine
Initiate request
Retrieve data
Return data
Apply ML on data
Return processed data
Display processed data

Infra Diagram



Tech Stack


node
JS
NEXT.JS
scikit
learn
shadcn
MySQL
PyTorch
Tailwind CSS
Sentry
DigitalOcean
JWT

Machine Learning

- ML Model Implementation
- Predictive Model: We have integrated a sophisticated ML model using Gradient Boosting Regressor to accurately evaluate and score faculty performance.
- Data Handling: The model is trained on a comprehensive dataset simulating real faculty activities and is ready to seamlessly adapt to actual institutional data.
- Regression-Based Scoring: Our Gradient Boosting Regressor predicts a performance score on a scale from 0 to 1, with 1 indicating top performance and 0 highlighting areas for improvement.

Machine Learning

- **Modeling Technique:**
- The **Gradient Boosting Regressor** aggregates the strengths of multiple weak learners, iteratively refining predictions to ensure high accuracy.
- Fine-tuned with cross-validation to ensure robustness and minimize overfitting, delivering a reliable and generalizable model.
- Future Enhancements: As we incorporate real-time data, further improvements will be made through hyperparameter tuning, advanced feature engineering, and exploring additional models to continuously enhance accuracy.

Machine Learning

Why Gradient Boosting?

- **Performance:** These models tend to perform better on complex datasets and can capture intricate patterns that simpler models might miss.
- **Flexibility:** They can be fine with different types of data well, making them versatile for the diverse inputs in a faculty evaluation system.

Why Not Choose Simpler Models?

While models like **Random Forest** or **Support Vector Regressor (SVR)** are strong contenders, Gradient Boosting Regressors typically outperform them in scenarios involving complex data and the need for precise predictions. Their ability to iteratively improve on errors and their robustness against overfitting make them a superior choice in many applications.

Data Management

- **Efficient Data Handling:** Our backend, powered by **Node.js**, ensures seamless and scalable data processing, even under heavy load.
- **Optimized Database: MySQL** is employed for robust and reliable data storage, designed to handle complex queries and large datasets efficiently.
- **Scalable Hosting:** Hosted on **DigitalOcean**, our infrastructure is built to scale, providing high availability and rapid data retrieval.
- **Streamlined Operations:** Our tech stack is engineered for efficiency, ensuring that every data transaction is optimized for speed and accuracy, reducing latency and enhancing user experience.

Business Model

Subscription-Based Revenue Model

- **Target Audience:** Our business model is centered around a subscription-based approach, catering to universities, colleges, and even small local schools. These institutions can efficiently track and manage their faculty's activities through our user-friendly platform
- **Affordable and Scalable:** Designed to be low-cost yet robust, our platform offers an accurate and reliable solution, making it accessible even to smaller educational institutions with limited budgets.
- **Wide Applicability:** Beyond educational institutions, our system can be adapted for use in various other organizations where faculty or employee performance tracking is needed, providing a broader market reach.

Business Model

- Efficiency & Empowerment: By powering institutions with an easy-to-use, data-driven platform, we enable them to optimize their workforce, making informed decisions on faculty development, promotions, and resource allocation.
- Profit Potential: With low operational costs and a scalable subscription model, our business can generate significant profits while delivering high value to our clients.
- Market Expansion: Starting with educational institutions, our model is designed to expand into other sectors, filling a gap where such infrastructure is currently lacking, ensuring long-term growth and sustainability.