

Smart Gym Management System: A Data-Driven Approach to Monitoring user Activity and Performance Metrics

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Abstract— The Fitness Management System is a web-based tool designed to make the daily operations of a fitness center smoother and more efficient. It equips gym owners and staff with everything they need to assist members, from handling registrations and tracking attendance to managing payments and making adjustments, all while reducing manual work and minimizing errors. **Centralized Dashboard:** Admin can monitor memberships, track payments, and oversee staff activities all from one user-friendly platform. **Role-Based Access:** This feature allows for tailored access for admin, trainers, and members, depending on their specific roles. **Member Management:** Users can easily register, check schedules, keep tabs on their workout history, and make payments online. **Trainer Module:** Trainers can design and assign workout plans while also tracking the progress of their members. **Reports & Analytics:** Admin can create financial reports and gain valuable insights into business performance through visual data.

Index Terms— Role-Based Access Control, Member & Trainer Management, Interactive Dashboard, Data Visualization.

I. INTRODUCTION

In our fast-paced world, technology is shaking up the fitness industry like never before. As more people focus on their health, the need for well-structured workout programs is on the rise. But let's be real running a gym isn't without its hurdles. From juggling a growing number of members to managing complicated schedules and dealing with outdated record-keeping, it can get pretty overwhelming. Traditional systems often fall short, leading to errors and inefficiencies, which is why a smart, digital solution is essential. Enter the Gym Management System, a game-changer designed to streamline and enhance gym operations. This system offers a centralized platform for gym owners, trainers, and members, automating daily tasks, reducing manual errors, and boosting communication within the gym.

Core Features: **Membership Management** -Keeps track of member records, subscription details, and renewal reminders. **Attendance Tracking**- Automatically logs check-ins and session participation. **Billing & Payments:** Makes fee collection and billing management a breeze. **Role-Based Access**- admin manage memberships and payments, trainers oversee workout plans, and members can keep tabs on their fitness journey.

Security & Future Scalability: This system prioritizes data privacy with secure authentication and encrypted storage, ensuring user information is protected. It's accessible from various devices and can be expanded with features like virtual workout sessions and AI-driven fitness recommendations. By optimizing operations and embracing automation, the Gym Management System boosts efficiency, enhances financial tracking, and creates a smooth experience for gym owners, trainers, and members alike. With the help of modern technology, managing a gym becomes more organized, productive, and stress-free.

II. LITERATURE SURVEY

The authors Zhiguo Li ,at al.[1] have explained the In recent years, there was developing interest inside the use of health trackers and smart phone applications for selling physical interest. Many of those packages use accelerometers to estimate the extent of hobby that customers have interaction in and offer visual reports of a user's step counts. When furnished, maximum guidelines are restrained to famous popular fitness advice. In our examine, we expand an technique for supplying statistics-pushed and personalized guidelines for intraday interest planning. We generate an hour-by using-hour hobby plan that is based totally on the user's probability of adhering to the plan. The person's chance of adherence to the plan is customized, based totally on his/her beyond pastime patterns and present day activity goal. The use of this technique, we are able to tailor notifications.

Yongjian Qiu at al.[2], have discussed the bodily fitness tracking is an critical device for sickness prevention and early evaluation and remedy. This feature absolutely considers the closing power of sensor nodes, distance between clusters and node spacing, and so on. And especially introduces the machine of making use of PSO to choose the maximum excellent cluster head mixture and the technique of PSO cluster routing set of rules. based on the conventional particle swarm set of guidelines, this paper proposes a monitoring set of regulations primarily based on -manner chaotic seek by means of using introducing chaotic are trying to find method and opposite studying technique.

Shivappa M Metgar at al. [3] have explained the contemporary existence, characterized by sedentary behaviour and nutritional imbalances, have led to an alarming upward thrust in modern day-related illnesses, posing significant fitness challenges globally. Addressing those troubles requires innovative and comprehensive health control solutions. Fitness Hub is a platform designed to fight these demanding situations by way of leveraging technologies. It integrates seamlessly with APIs like Spoonacular and Edamam to offer a holistic health management experience. The health Hub platform is meticulously dependent into four important sections: the food plan Library, meals Library, workout section, and ailment Prediction tool. The food plan Library gives users in- intensity insights into numerous diet sorts, such as keto, vegetarian, and gluten-unfastened alternatives, in conjunction with powerful calorie control techniques. The food Library enhances this by way of supplying a rich repository brand new nutritious recipes and customized food plan plans, tailored to man or woman dietary possibilities and dietary needs.

Yuanxin Liu at al.[4] have explained the In modern-day society, people's tempo of existence is speedy, and the strain is good sized, leading to an increasing number of outstanding problems which includes obesity and sub-fitness. Traditional fitness techniques can't meet human being's wishes to a sure extent. Consequently, this work pursuits to use generation to alternate human being's existence and compensate for traditional fitness strategies' shortcomings. first off, this work overviews neurorobotics, offering neural perception and manipulate capabilities for aerobics shrewd fitness system. This painting proposes an aerobics sensible health system based on neurorobotics technology and huge statistics analysis and develops a recommendation system for the satisfactory health exercise.

Shivappa M Metgar at al.[5] have defined the health manipulate system that objectives to empower customers to decorate their traditional properly-being thru powerful food plan manipulate, exercise monitoring, and ailment prediction. This painting includes four principal sections which are weight-reduction plan Library, meals Library, exercising, and disorder Prediction. The weight reduction plan Library gives customers with information on various food plan sorts and calorie intake. The meals Library offers food recipes and personalized weight loss plan plans based totally on users' calorie wishes. The exercising section suggests suitable exercises to burn the desired quantity of energy. Ultimately, the disease Prediction section assists users in figuring out potential health problems based totally on selected signs and symptoms and offers applicable remedy recommendations.

Zejiang Huang, at al.[6] have discussed the inside the way of bodily fitness training, it's miles an essential problem of scientic physical health education to alter and manage the physical load intensity in actual-time, correctly and correctly steady with the physiological load inside the human body on the way to make it steady with the predetermined intention of the training plan. with the resource of deciding on such factors as vertical

leap, rapid leg raising, sitting beforehand, height, chest circumference, percentage of body constitution, YOYO intermittent patience running and so on, the use of RFID generation to mark distinctive athletes, and after using the particle swarm optimization approach of BP network to set up the evaluation version of the athletes' bodily condition.

Afzaal Hussain et al.[7] have explained the device mastering-based totally sports activities pastime popularity has captured a number of hobby in latest years. Automated pastime recognition not handiest reduces fee and time however could be very helpful in analyzing fitness-touchy data acquired the usage of clever wearable generation. Gymnasium interest popularity with the aid of incorporating smart wearable technology comes in the scope of this subject matter. This paper presents a device for classifying fitness center activities the usage of feature engineering strategies implemented to time collection data. The amassed time collection information consists of an athlete's body motion using an inner 3-axis accelerometer build into the zephyr bio-harness 3 device. The information were gathered by way of implementing a six-week health habitual seeking to target six muscle businesses, preceded through sooner or later of rest and recuperation every week.

The growing hobby in health and fitness has sparked the advent of various virtual platforms designed to streamline gymnasium operations and improve person reports. Modern health club control systems like mind frame and gym grasp offer basic functionalities together with membership control, scheduling, and billing. but, lots of those options can be quite high-priced or lack the customization that small to mid-sized fitness facilities, especially in India, really need.

On top of that, health tracking apps like my fitness buddy, Strava, and Nike training club generally tend to cognizance more on character workouts in place of complete fitness center control. These apps fall brief in terms of managing running shoes, planning workout routines, or preserving tabs on business performance from an administrative angle.

III. PROPOSED WORK

To cope with those problems, our fitness center management system (GMS) provides an automated, comfy, and efficient solution that enhances club monitoring, payment processing, worker scheduling, and standard operational management.

Our solution will feature role-based totally access for 3 exclusive consumer sorts: directors, running shoes and members. Every group will have specific functionalities tailored to their desires, which include member registration, instructor scheduling, personalized exercise plans, and development monitoring. Running shoes may have the capability to assign exercising routines and display performance, even as individuals can without problems take a look at their progress thru a user-friendly dashboard.

To keep the entirety relaxed and defend user data, we'll put in force JWT-based person authentication and HTTPS encryption. Key overall performance metrics and health statistics will be visualized with Chart.js, allowing fitness center owners and running shoes to advantage precious insights through easy and interactive dashboards.

This proposed work aims to deliver a reliable and smart Gym Management System that boosts user engagement, enhances operational efficiency, and easily supports future growth. It is also required to clean and put together the records earlier than partaking in any data-related activity. As a result, we hire a pre-processing stage technique. In this system, we've proposed a model for an early prediction of most cancers thru using inexperienced devices getting to know strategies. The set of tasks that can be executed in our proposed work is analyzed, designed, completed, and experimented with the use of system mastering algorithms.

Advantages of the proposed system:

The Muscle Flex gym management machine offers several blessings that substantially enhance the manner health centers perform. With the aid of leveraging present day web technology and automation, the device enhances user experience, operational performance, and records-pushed decision-making. Key advantages include:

Centralized Member management: All member facts including profiles, fitness plans, and progress is controlled from a single, clean-to-use platform.

Trainer Efficiency: Running shoes can effortlessly assign and replace workout plans, reveal purchaser overall performance, and control their schedules.

Personalized user experience: Participants receive tailor-made fitness plans and might song their progress via interactive dashboards, growing motivation and duty.

Data Security and Privacy: The system uses secure authentication (JWT) and encrypted communication (HTTPS) to protect sensitive user data.

Real-Time Analytics and Insights: Built-in analytics using Chart.js provide visual insights into gym performance, enabling data-driven decisions for trainers and gym owners.

Cross-Platform Compatibility: Designed to work smoothly across desktops, tablets, and mobile devices, ensuring accessibility for all users.

User-Friendly Interface: The frontend, built with React.js and styled with Tailwind CSS, ensures a clean and intuitive interface for all types of users.

IV. SYSTEM ARCHITECTURE

Many health centers and gyms nevertheless rely upon guide record-preserving methods which includes paper logs, spreadsheets, and bodily registers to manipulate memberships, payments, and worker schedules. Every other fundamental task is data protection, as guide statistics are susceptible to loss, theft, or unauthorized get right of entry to. Without a structured virtual answer, gyms face difficulties in scaling operations, coping with a developing number of individuals, and preserving seamless verbal exchange with clients and staff.

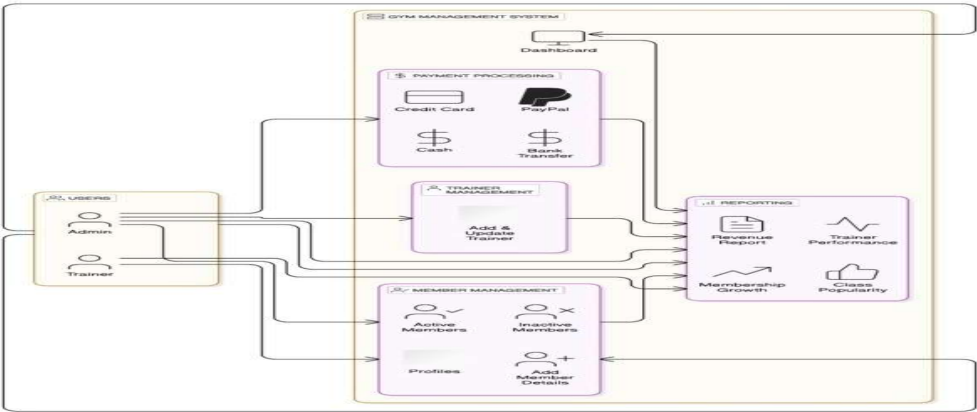


Fig 1: System Architecture

V. RESULTS AND DISCUSSION

These traditional approaches are prone to errors, inefficiencies, and security risks, leading to data loss, mismanagement of subscriptions, and inaccurate payroll calculations. Additionally, gym owners often struggle with tracking membership renewals, attendance, and trainer schedules, which can result in missed payments, overbooked sessions, or underutilized resources.

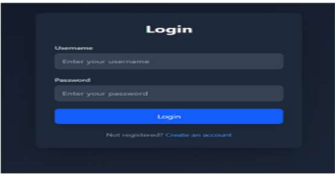


Fig 2: Responsive Login Page

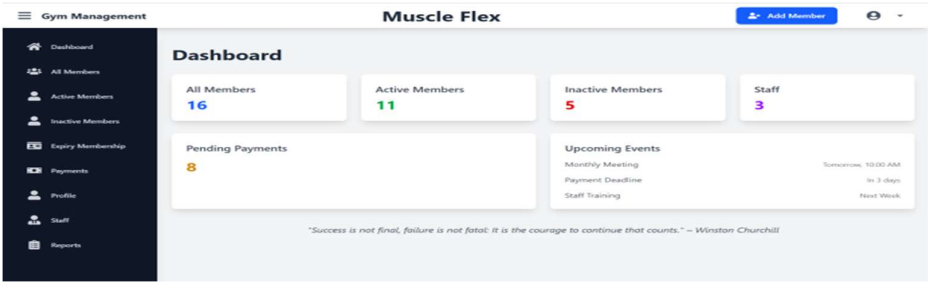


Fig 3: Dashboard

NAME	EMAIL	PHONE	START DATE	EXPIRY DATE	ACTIONS
trk321	trk321123@gmail.com	63832892980	28/02/2025	26/06/2025	Update Delete
ram	ram@gmail.com	222243556	03/09/2024	20/02/2025	Update Delete
pranav	pranav@gmail.com	8348947	01/03/2025	30/04/2025	Update Delete
jai	jai@gmail.com	08767390918	06/11/2024	16/01/2025	Update Delete
karan	karan@gmail.com	3443323444	14/08/2024	22/01/2025	Update Delete
ram	ram@gmail.com	08767390918	14/08/2024	01/12/2024	Update Delete

Fig 4: Data Status of all the members

Fig 5: Adding new members

Fig 6: Staff and Admin

VI. CONCLUSIONS

In our fast-paced world, the Gym Management System has become a must-have digital tool that makes life easier for fitness centers. While many gyms are still stuck using outdated manual methods which can lead to inefficiencies, errors, and added stress for administrative staff this system really steps up to improve operations and boost productivity. It comes packed with useful features like user authentication, membership tracking, payment processing, and trainer assignments. Everything is stored in a centralized database, so gym administrators, trainers, and members can all access the latest information. The user-friendly dashboard makes it easy to keep an eye on key performance indicators, helping gym owners make smart, data-driven decisions. Future upgrades like AI-driven workout recommendations, IoT-based fitness tracking, and a seamless mobile app experience could really boost user satisfaction and operational efficiency.

FUTURE WORK

In future, the Muscle Flex health club management machine may be extended with several superior capabilities to improve user enjoy and operational efficiency. Deliberate enhancements consist of the improvement of mobile applications for Android and IOS, allowing individuals and trainers to access the machine from anywhere. Integration with health trackers and clever gym gadget will enable computerized statistics syncing, giving customers real-time insights into their exercise overall performance. AI-powered workout and meal plan recommendations can be brought to provide personalized health suggestions based on person development. For fitness center chains, centralized department control with distinct performance reports will provide more manipulate and scalability.

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