Machine Learning Driven Healthcare Through Online Gym Under TheFramework Of Artificial Life

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ARTICLE INFO	ABSTRACT
	This work presents how the modern virtual amenities and ambience can be used to discover the convenience and effectiveness of online gym. The domain of the study is Artificial Life(AI)in which Human behavioral aspects are taken into the consideration in virtual environment under framework of Artificial Intelligence. The area of implementation of the same is Healthcare. The motivation behind the work is multitasking responsibilities of modern life where working professionals or students don't have much time space. In the proposed work, there is no more need of commuting to the gym through rushing out to the class, it is anywhere anytime exercise at one shot wherever & whenever the user of the system wants. In this era of multi-vertical responsibilities fitness is perhaps the strongest health criterion with appropriate work-out schedule. In the model formulation of the problem, novel software model is proposed in which the user can explore variety of workout programs and trainers with different approaches and specialties in the contrast to physical gym in which facility is trivial. The model is self-experienced inspired by Machine Learning that can throw new exercises and techniques with changing time to its user. In the solution process, this system can understand workout needs and desires through textual interaction with user and will be prescribed the appropriate calisthenics / remedial exercise plans. The proposed work is supplemented by illustrative case studies in Yoga and Aerobics. **Keywords:** Artificial Life, Calisthenics, fitness, Machine Learning, online-gym, workout.

I. INTRODUCTION

Regular exercise is something that can lift your spirits, strengthen your defenses against illness, and reduce your risk of heart disease, diabetes, high blood pressure, and chronic illnesses. Perhaps it looks too wonderful to be true. However, it's not. Exercise makes you feel better and live longer. A lot of people aim to be in shape. After all, being fit is the same as being healthy. A lower risk of chronic illness and a better ability to manage new health conditions are linked to enhanced general fitness, which promotes increased mobility and functionality over the long term course of a person's lifetime. Being active can also improve your daily functioning in the short run, from improved mood to better sleep, since our bodies are made of me and they work better.

The objective of the experiment, presented through the paper is to utilize machine learning and technology to provide cost-friendly gym and fitness services through their home equipment. Without spending extra pennies on the gym membership and personal trainers. One can use curated fitness series specially made for the targeted fitness goals. Workouts can be doneregarding the place the person is , so that the regularity be maintained without disrupting the present busy live of the users.

Approximately 67% of respondents to a recent Rakuten Insight study on gym/fitness membership in India inAugust 2020 did not have a membership. Merely 33% of the total respondents indicated that they belonged to a gym. However, to put things in perspective, 1.38 billion people live in India. It is true that not everyone lives in a city with workout centers, gyms, or health clubs. Even so, even if you take that 1.38 billion and cut it in half, the population is still greater than that of the US.

1.1 Literature Review:

Machine learning based classifiers are being utilized in healthcare application for last few years. In this section some of the works in prediction of the fitness market analysis have been discussed.

Global Statistics on Fitness, 2020–2030:

HEALTH AND FITNESS CLUB MARKET: In 2000, the health and fitness club business had a market value of US$8 billion. From 2021 to 2026, it is anticipated to increase at a CAGR of 721%, with the Asia Pacific region experiencing the fastest growth.
By 2024, the industry is projected to be valued at over $96.6 billion. HOME FITNESS EQUIPMENT MARKET: In 2021, the home fitness equipment market was valued at USD 13,74,123 million. From 2022 to 2027, a compound annual growth rate (CAGR) of 2.75% is anticipated, with the Asia Pacific area rising at the greatest rate.

HEALTH AND FITNESS APP industry: The fitness app industry was estimated to be worth USD 1.1 billion globally in 2021. It is projected that the fitness app market would grow to $1.3 billion by 2022. Between 2022 and 2030, this market is expected to grow at a CAGR of 17.6%. In Q2, there were 24.0% more daily active users (DAUs) of fitness applications than there were in Q1 of 2020. Between Q1 and Q2 of 2000, there was a 46% global rise in the downloads of health and fitness apps. This is mostly because to the expanding popularity of online fitness training, as well as elevated consciousness and mental health. By 2024, the global online e-Services fitness app market is projected to generate USD 5273.5 million in sales.
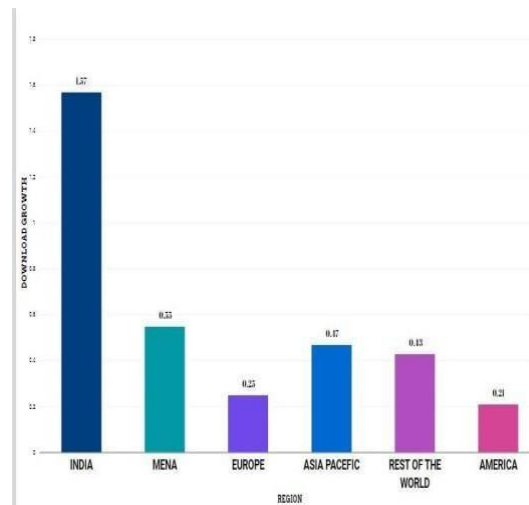

Figure 1: Region wise growth index.

Body mass index, or BMI, is a figure that is calculated using a person's height and weight. BMI is computed from weight (kg) and height (m) and is defined as weight divided by the square of height. It is given as km/m^2. It broadly categorizes individuals according to their height and the amount of tissue (bone, muscle, and fat). Underweight (less than 18.5 km/m2), normal weight (18.3-24.9), overweight (25-29.9), and obese (30 and beyond) are the four main BMI classifications for adults. For BMIs under 20 and over 25, all-cause mortality is high, andthe risk rises outside of the 20–25 range.

$$\text{BMI} = \frac{\text{mass}_{\text{kg}}}{\text{height}_{\text{m}}{}^2} = \frac{\text{mass}_{\text{lb}}}{\text{height}_{\text{in}}{}^2} \times 703$$

Global downloads of health and fitness apps increased by 46% between Q1 and Q2 of 2020. Which nation tops this ranking? India experienced the greatest download growth, up 157%. Imagine there are about 58 million new active users! India was placed under lockdown from March to May 2020, which resulted in a large number of people staying inside. This demonstrates the extent to which the pandemic has impacted

our lives. Indians are doing everything they can to maintain their health and fitness, from buying wearable to setting up at-home gyms and enrolling in online fitness courses.
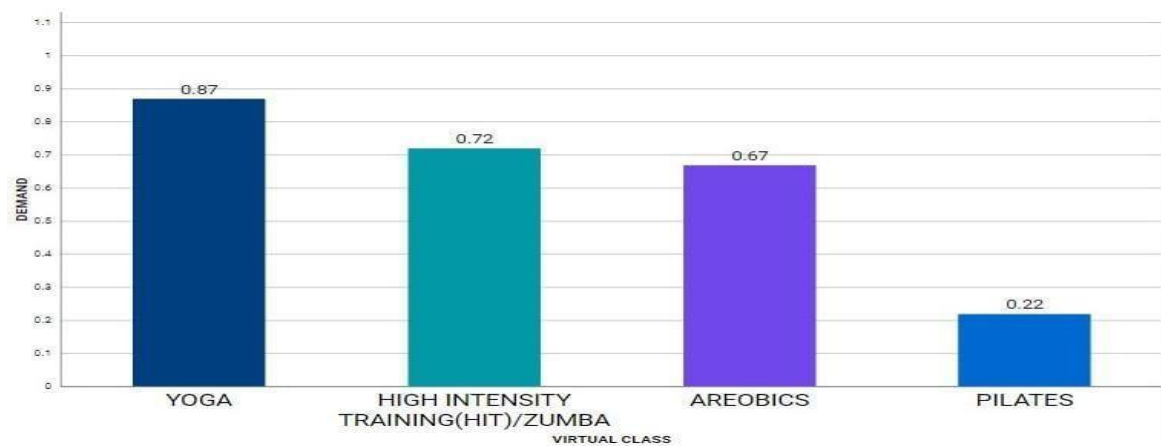

Figure 2: Virtual Class against demand.

Among Indian individuals ages 18 to 69, 4 out of 10 are sedentary! In contrast, 41.3% of adult Indians do not meet the WHO's recommended daily allowance of 150 minutes of moderate to intense physical activity. It is discovered that women are less active than men. 30.9% of males and 52.4% of women said they did not engage in enough PA. A number of factors, such as cultural norms, emotions, time constraints, and motivation, contribute to this low level of PA. Insufficient PA affects 51.7% of those living in cities, compared to 36.1% of people living in rural areas. Of homemakers, 48.8% acknowledge that they don't practice enough. Adults with insufficient PA have elevated blood pressure and obesity in one-third of them. The average daily time spent by villagers was 101.1 minutes, compared to 62.2 minutes by city dwellers. The study demonstrates how the attitudes, behaviors, and habits of the Indian populace have changed throughout time. Just 26% of Indians do yoga, 11% engage in aerobic exercise, and 10% use bodyweight exercise, according to the 2019 poll. The data from 2020 indicates that all activities have increased by over 60%. The rise in popularity of handy, on-demand virtual services has coincided with the growing demand for fitness. No matter how much a person enjoys exercising, there is a need for qualified experts to help them deal with the lack of resources and their hectic schedules. These specialists must be trained, coached, and advised.

II. METHODOLOGICAL ASPECTS

2.1 Objective:
The aim of a physical fitness project can vary based on its specific goals and objectives. However, the primary aim of most physical fitness projects is to improve and promote the overall health and well-being of individuals or communities through various forms of physical activity, exercise, and healthy lifestyle practices.

- Encouraging People to Exercise Regularly: The primary objective of many fitness programs is to motivate people to exercise regularly in order to improve their cardiovascular health, increase their muscle strength and endurance, and maintain a healthy body weight.

- Preventing Chronic Diseases: Engaging in regular physical activity lowers the risk of developing long-term conditions like obesity, diabetes, and heart disease. Fitness initiatives seek to inform participants of these advantages and assist them in forming wholesome habits that will ward off such ailments.

- Raising Awareness: Fitness initiatives frequently seek to increase public understanding of the value of physical activity and its advantages for stress relief, mental health, and general quality of life.

- Encouraging Active Lifestyles: Projects may focus on inspiring individuals to incorporate physical activity into their daily routines, whether through structured exercise programs, active commuting, recreational sports, or other forms of movement.

- Educating about Proper Exercise Techniques: Many people are unsure about the correct way to exercise, which can lead to injury. Fitness projects can educate participants about proper exercise techniques, safe training practices, and injury prevention.

- Enhancing Fitness Levels: Fitness projects may have specific goals to help participants improve their fitness levels over time, such as increasing endurance, strength, flexibility, or agility.

- Community Engagement: Some projects aim to foster a sense of community by organizing group activities like fitness classes, group hikes, or sports events, which can make physical activity more enjoyable and sustainable.

- Inclusivity and Accessibility: Physical activity initiatives should emphasize ensuring that individuals of all ages, abilities, and backgrounds may engage in it.
- Behavioral Change: Encouraging lasting behavioral change is often a central aim. Projects may provide tools, resources, and support to help participants adopt and maintain healthier lifestyles.
- Measuring Progress: Fitness projects may involve tracking participants' progress through fitness assessments, measurements, and health indicators to demonstrate improvements over time.
- Enhancing Mental Health: Studies have demonstrated that regular exercise improves mental health by lowering stress, anxiety, and depression. Initiatives may seek to highlight this relationship and encourage mental health.
- Empowerment and Confidence: Participants frequently feel more empowered and self-assured after reaching fitness objectives, and these feelings can carry over into other aspects of their lives. A physical fitness project's ultimate goal is to support and motivate people to take up better routines that improve their general physical and mental health. Each project's unique objectives and approaches may differ depending on its intended results, target audience, and available resources.

III. TECHNOLOGICAL ASPECTS

3.1 Use of Artificial Life:

Artificial Life is that branch of studies of Artificial Intelligence that mainly deals with making household practices easier. It covers aboard spectrum covering smart furniture to Smart room.

Health and Fitness Tracking: The primary purpose of many fitness web applications is to provide users with a platform to track their health and fitness progress. This could include features such as recording workouts, monitoring nutrition intake, tracking weight changes, and measuring other health metrics like heart rate and sleep patterns. The goal is to help users stay accountable and motivated to achieve their fitness goals.

Personalized Workouts and Training Plans: A fitness web application can offer personalized workout routines and training plans tailored to users' goals, fitness levels, and preferences. Users can access a variety of exercises and routines designed to help them improve strength, endurance, flexibility, and other fitness aspects.

Virtual Coaching and Guidance: Some fitness web applications incorporate virtual coaching features that provide users with real-time guidance during workouts. Virtual coaches can offer exercise demonstrations, correct form, suggest modifications, and keep users motivated throughout their sessions.

Injury Prevention and Rehabilitation: Certain fitness web applications focus on providing content and tools related to injury prevention and rehabilitation. These applications may offer guidance on proper form, posture correction, and exercises that can help users recover from injuries.

Data Analysis and Insights: Fitness web applications can collect and analyze user data to provide insights into progress and trends over time. Data-driven insights can help users make informed decisions about their fitness routines and make necessary adjustments for better results. Accessibility and Convenience: Web applications provide users with the convenience of accessing their fitness routines and tracking tools from anywhere with an internet connection.

This accessibility allows users to stay on track even when traveling or unable to visit gyms.

Research and Data Collection: In some cases, fitness web applications might be developed as part of research initiatives to collect data on user behaviors, health outcomes, and fitness trends. Ultimately, the purpose of a physical fitness project should align with the needs and desires of the target users. By addressing specific pain points, providing valuable features, and offering an intuitive user experience, a fitness web application can contribute to users' health and well-being while fostering engagement and motivation.
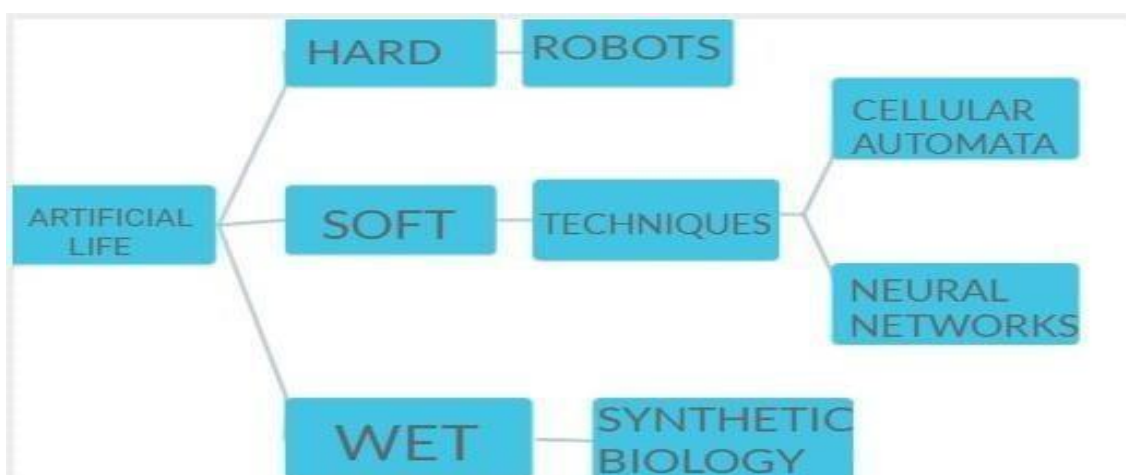
FIGURE 3: Types of Artificial Life.

3.2 Employing Machine learning:

Fundamentally, machine learning is the process of creating models and algorithms that let computers learn from data and make judgments or predictions without the need for programming. Learning and adapting skills produced significant advancements and had an impact.

Automation and Efficiency:
Machine learning algorithms are good at complex tasks that take a long time or are near impossible for humans to do manually. This efficiency is particularly evident in industries such as Manufacturing, transportation and customer service, where routine processes can be simplified and optimized.

Data-Driven Insight: Machine Learning Leverages large disasters to discovers patterns, trends, and correlations that may not be evident in traditional analysis. This has revolutionized industries like finance, healthcare, and business, where data from insights drives decision
making and strategy development.

Solving complex problems:
ML solves complex problems by processing large amounts of data and arriving at solutions that would be too difficult for humans alone. This ability has led to advances in areas such as climatemodeling, drug discovery, and genomics. Self-driven cars are becoming new normal, giving owners experience of effortless driving. Reducing accidents and making life a quite easier.

Continuous Improvement:
Machine learning models can continuously improve themselves by learning new data by providing continuous improvement and adaptation. This is useful in applications ranging from fraud dete ction to translation.

Impact on Human Lives:
Healthcare: Machine Learning Algorithms have been used to diagnose diabetic retinop by withan accuracy of 89.5% and work better than expert humans.
Natural Language Processing (NLP): Google's BERT model based on NLP and ML improvesthe accuracy of Internet search and language understanding.
Automated Cars: Machine learning is an essential part of cars, helping them see their surrounding and make decisions at the right time. Companies like Waymo and Tesla are at the frontrunner of this technology Language translation: Google Translate uses machine learning to translate more than 100 languages, facilitating cross-cultural communication.
The impact of machine learning on the development of science and human life is changing and continuing. As technology continues to advance, the boundaries of what is possible will expand and there will be many development and possibilities in the future.

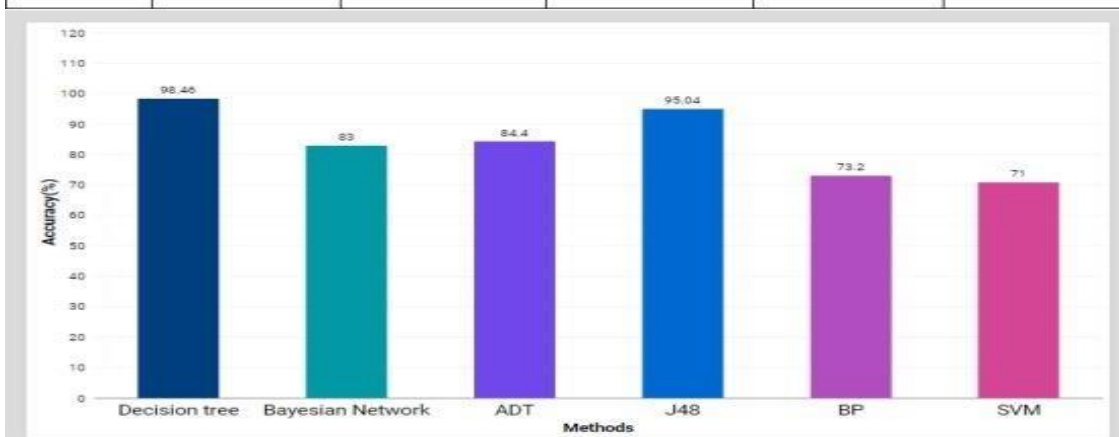| Methods	Accuracy(%)	Specificity(%)	Sensitivity(%)	Precision(%)	F-measure(%)
Decision tree	98.46	95.28	95.7		
Bayesian Network	83.0	87.8	67.5		65.5
ADT	84.4	99.0	7.0	93.78	
J48	95.04				
BP	73.2				
SVM	71.0				

FIGURE 4: Performance of various machine learning technique based on their accuracy.

IV. TECHNOLOGICAL ASPECT OF ONLINE GYM

The Benefits of Staying Fit:
Fitness is like giving special gifts to your body and mind. Not only does it look good; It's about being healthy and well. Let's understand why exercise is important and how you can make it part of your daily routine.

Why is exercise important?
Think of your body as a machine. Just like a machine needs proper care, your body needs exercise to perform at its best. When you are healthy, your heart, muscles and bones are strong. It makes you less sick and allows you to do more of the things you love.
Physical Fitness: Health benefits your body. When you move and play, you help keep your heart strong. This means your heart can pump more blood, which is essential for your body to function properly. Also, exercise helps keep your bones strong so you're less likely to be injured.
Energy Boost: Fitness can make you stronger. Have you noticed that you feel better after playing or running outside? This is because exercise helps your body release chemicals that make you feel happy and energetic.
Mind Power: Did you know that exercising is also good for your brain? When you exercise, your brain gets more oxygen and nutrients, which helps you think and focus better. It's like overcharging your brain!

Easy Ways to Keep Fit:
To keep in shape, you don't need expensive stuff or a gym membership. Here are a few easy methods to include fitness into your everyday routine.
Outdoor games: Playing outside is so much fun! You can run, jump and explore. Fresh air and sunshine make you happy and energetic. So gather your friends and enjoy outdoor activities together!
Walking: Walking is an easy and effective way to maintain health. You don't need any special equipment, you just have legs! It increases your heart rate and gives you energy. Regular walking can help you feel healthier and happier.
Exercise: Exercise is a fun way to stay fit and active. You can run, jump and play with your friends while exercising. Exercise strengthens muscles and keeps your body healthy. So choose the game you like and have a good time!
Stretching: Stretching is like giving your body a nice, gentle and lively hug. It helps your muscles to be flexible and not tense. Regular stretching can help your body relax and prepare for action. Exercises that employ your body weight are referred to as bodyweight exercises. There is no need for specialized equipment or tools. They support improved balance, muscle strength, and flexibility. These consist of activities like push-ups, squats, and planks that you may perform at home or anyplace else.

4.1 Calisthenics:
Calisthenics which is commonly known as physical exercise, calisthenics is a simple and effective way to stay fit and strong without the need for fancy equipment or heavy weights. It's like using your body as a gym to improve your health. Let's explore Calisthenics and its benefits in a simple way.

1. *Natural Movements:* Calisthenics is an exercise we do every day. Consider doing push-ups like pushing a door or squatting moves like sitting and standing. These exercises use the muscles your body needs to move.
2. *No need for flashy equipment:* Unlike going to a large gym with complex machines, calisthenics training makes it easy. You don't need a lot of equipment; just your body and the occasional pull-up or dip bar is enough.
3. *Get stronger*: Calisthenics helps you get stronger by using your body weight to work. Exercises like pull- ups work your back and arms, while squats build strength in your legs. As you progress, you can do different exercises to work more muscles.
4. *Increase flexibility*: Calisthenics can make you flexible. When you do exercises that move your joints with various movements, such as leg raises, you increase your flexibility and make your body faster.
5. *Easy to get started*: Calisthenics is for everyone, whether you're just getting started or already in shape. You can start with easier exercises and increase the difficulty as you get stronger. It means you're being really tough on yourself.
6. *Anytime, anywhere*: You can do calisthenics anytime, anywhere. The park, your backyard, or even your living room can be your office. No need to wait for gym time or a long commute.
7. *Cheap*: Calisthenics is cheap. No need to spend money on a gym membership or expensive equipment. This makes it accessible to many people.
8. *Functional Fitness*: It's not just about looking strong; It's about getting stronger every day. Calisthenics exercises work your entire body together, helping you perform tasks such as lifting or bending.
9. *Get better with time*: You can start with simple exercises in gymnastics and work your way up to more intense exercises. This progress can help you improve in your workouts and not fall behind.

10. *A healthy mind*: Exercise is not only good for your body, but also for your mind. Aerobics release chemicals in your brain that make you happy and reduce stress. So it's like a wish!

11. *Injury Prevention*: You can reduce your chances of injury by exercising with good form. Unlike heavy lifting, which can damage your muscles, physical activity is generally safer.

12. *Friends in the community*: There are a lot of people who love calisthenics here and there is a friendship among those who love it. You can share your progress, learn from others and be inspired.

13. *Suitable for all ages*: Whether you are young or old, there is something for everyone in calisthenics. You can adjust the exercises according to your fitness level and age.

14. *Save Time*: Calisthenics provides a great workout in our busy lives. With a single exercise, you can target more muscles and save time while staying in shape.

FIGURE 5: Stages of Calisthenics

4.2   Fitness Criterions:

The rise of online gyms has caused a tremendous revolution in the fitness industry in recent years. Individuals looking to enhance their physical well-being no longer have to limit themselves to traditional physical fitness clubs. Online gyms have emerged as a convenient, accessible, and highly effective way to achieve fitness goals from the comfort of one's home. In this presentation, we will explore the key advantages and features of online gyms, how they work, and why they are becoming an increasingly popular choice for fitness enthusiasts worldwide. Online gyms offer unparalleled convenience and accessibility. Users can access a wide range of workouts and fitness programs at any time and from anywhere with an internet connection. Whether you're a busy professional, a stay-at-home parent, or someone with limited access to traditional gyms, online fitness platforms provide the flexibility to fit workouts into your schedule.

Variety of exercises: Online fitness centers offer a vast collection of exercises tailored to individual preferences and fitness levels. There is something for everyone, ranging from strength training and high intensity interval training (HIIT) to yoga and pilates. Exercise selection is based on the objectives of the user, which may include flexibility, weight loss, muscle building, or general well-being.

Interactive Features:

Convenience and Accessibility: Online gyms often include interactive features that simulate the gym experience. Live classes, virtual personal trainers, and community forums allow users to connect with instructors fellow fitness enthusiasts. This sense of community and accountability can boost motivation and engagement.

Cost-Effective Solutions: Compared to traditional gym memberships and personal training sessions, online gyms typically offer cost-effective solutions. Many platforms provide free trials, affordable monthly subscriptions, and the option to cancel anytime. This affordability makes quality fitness accessible to a broader audience.

Tracking and Progress Monitoring: Online gym platforms often come equipped with tools for tracking and monitoring progress. Users can log their workouts, record measurements, and track improvements over time. This data-driven approach empowers individuals to stay motivated and make informed adjustments to their fitness routines.

In conclusion, the way we think about fitness and wellbeing has completely changed as a result of online gyms. They provide unmatched convenience, an extensive range of exercises, and customized fitness strategies, interactive elements, and affordable fixes. Online gyms will probably become more crucial in assisting people in reaching their fitness and health objectives as the fitness sector develops.

Whether you're a seasoned fitness enthusiast or just starting your journey, the world of online gyms

awaits, ready to support you on your journey to a healthier and happier you.

Work Out:

Overview of Exercise: Exercise is a vital part of living a healthy lifestyle. They include a broad variety of physical pursuits intended to enhance and preserve our level of fitness. Workouts are essential to reaching your health and fitness objectives, regardless of your level of experience as an athlete or where you are in your fitness path.

Types of Workouts: Workouts come in various forms, each targeting different aspects of fitness. Cardiovascular workouts, such as running and cycling, improve endurance and heart health. Strength training workouts, involving weights or resistance bands, build muscle and increase metabolism. Flexibility- focused workouts, like yoga and stretching, enhance mobility and reducethe risk of injuries.

Benefits of Frequent Exercise: There are several advantages to frequent exercise. First, by lowering the chance of chronic illnesses like obesity, diabetes, and heart disease, it enhances general physical health. Exercise also improves mental health by decreasing stress, increasing endorphin production, and improving cognitive performance. They also promote dedication and discipline, which are essential traits for success in any field.

Customizing Your Workout Routine: One size doesn't fit all when it comes to workouts. It's vitalto tailor your exercise routine to your individual goals and needs. This may involve a combination of aerobic, strength, and flexibility exercises. Consulting a fitness professional can help you create a personalized plan that aligns with your objectives.

Overcoming Challenges: Staying committed to a workout routine can be challenging. Common obstacles include lack of time, motivation, or access to a gym. However, there are solutions to these challenges. Home workouts, time management strategies, and finding a workout buddy canhelp you stay on track.

Nutrition and Recovery: Workouts should be complemented by proper nutrition and adequate rest. Consuming a balanced diet with the right nutrients fuels your workouts and supportsrecovery. Sleep and rest days are equally crucial, as they allow your body to repair and grow stronger.

FIGURE 6: Increase in demand of Fitness equipment and workout across the Globe.

In summary, starting a regular exercise routine is a great way to achieve and keep up a healthy and fit physique. You can reap the numerous psychological and physical advantages of exercising by picking the appropriate workouts, adjusting your regimen, and overcoming obstacles as you go. Recall that consistency is essential, and that working out changes one's way of living.

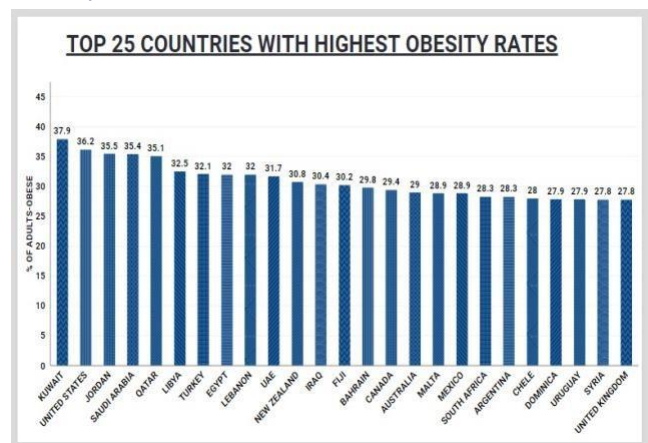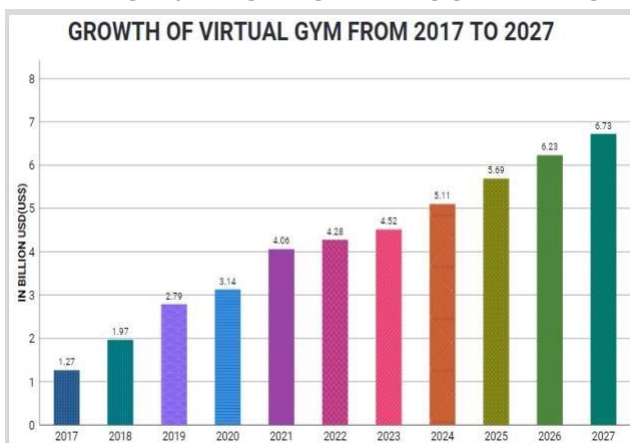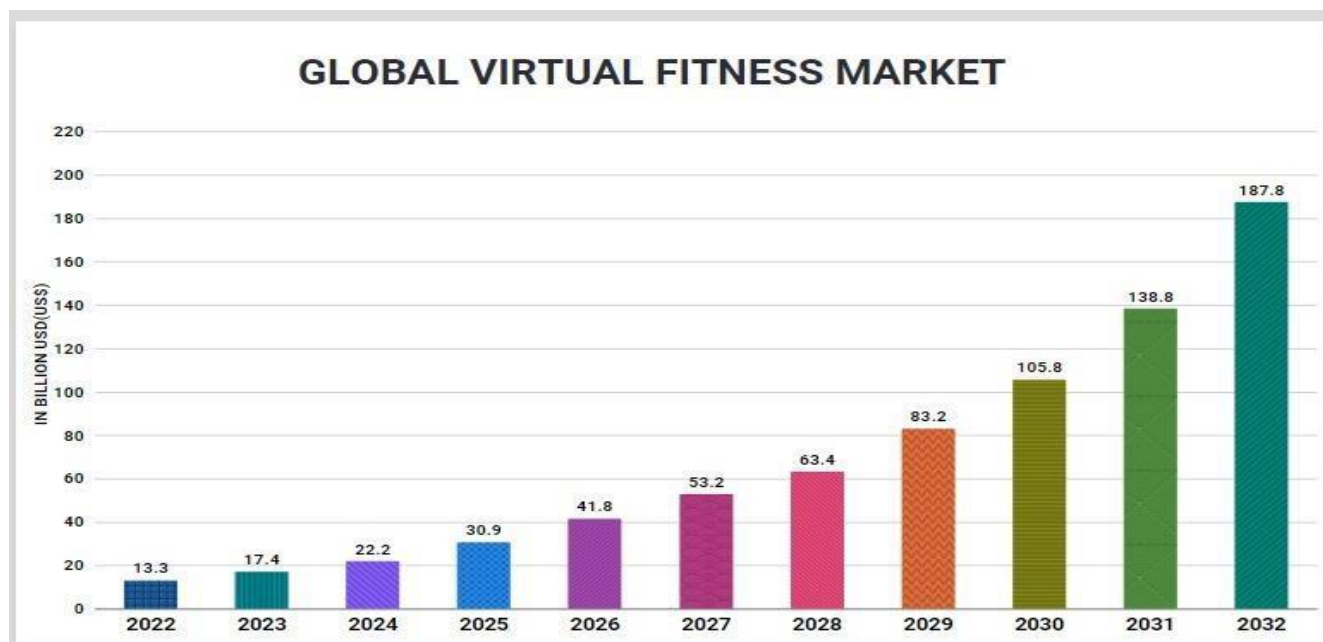### NEED OF VIRTUAL GYM IN OUR DAY TO DAY LIFE:

Figure 5: Growth of online Gyms across the years.   **Figure 6:** Rate Obesity across the globe.

Figure 7: Increase in demand of Virtual Gym across the Globe.

CONCLUSION:

Following the popular verse health is the wealth, the need for more emphasize on health and fitness need was like never before. Pandemic has escalated is further. The stress and complexities of the professional and corporate life with comparatively faster pace of life and living has makeit far more complicated. So much so that Gym equipment at common household is no more a sophistication, however, is a genuine need. Though, various ranges of gym equipment are affordable for common fitness practices but for common exercises without equipment, the major need is that of a trainer. The proposed Online or Virtual Gym not only addresses these issues andassist someone make fitness practices in a self-reliant way reducing the health risk, but also enhances perception and knowledge base about common fitness practices irrespective of school of thoughts viz. yoga, aerobics etc.

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Declaration of competing interest:

The authors declare that they have no known competing financial or personal interests that could have appeared to influence the work reported in this paper. All the authors declare that they have no competing interests.

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