# Kaizen: A Fitness Application for Activity Tracking and Diet Management using Mobile Sensors

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**Abstract.** This paper presents Kaizen, a sensor-driven mobile application developed to track and encourage physical activity through goal-setting, gamification, and personalized diet recommendations, tailored specifically to the Indian dietary context. Kaizen uses accelerometers, GPS, and gyroscopes to monitor user movements in real-time, offering an alternative to traditional fitness tracking methods that often lack cultural dietary considerations or personalized motivation systems. With a ranking system and interactive challenges, Kaizen aims to enhance user engagement and promote continuous improvement in health and fitness. Early user testing indicates high responsiveness and motivational efficacy, suggesting broad potential for adoption and further development.

**Keywords.** Physical activity tracking, Indian diet, Gamification, Mobile sensors, Continuous improvement

## 1 INTRODUCTION

The proliferation of fitness applications has transformed health tracking; however, many lack personalization and cultural relevance, particularly regarding dietary needs. Traditional fitness trackers often focus solely on activity metrics without integrating motivational features or dietary elements specific to local cuisines. Kaizen, a mobile fitness application, addresses these gaps by combining advanced activity tracking, goal-based challenges, and a culturally relevant diet tracking feature. This study examines Kaizen's design, which leverages mobile sensors to capture real-time data, thus enhancing the accuracy and engagement in fitness monitoring for users, particularly in India.

## 2 LITERATURE SURVEY

Existing studies demonstrate the effectiveness of fitness applications and gamification in promoting healthy habits. For instance, Smith et al. (2021) explored the impact of gamification on exercise consistency, revealing a significant increase in user motivation. However, applications like Fitbit and MyFitnessPal lack customization for regional diets or interactive, social features that sustain long-term engagement (Kumar et al., 2023). Kaizen combines these elements to address the unique needs of users in India, bridging a gap in existing research by providing a holistic, culturally sensitive approach to fitness tracking.

## 3 RESEARCH METHODOLOGY

The development of Kaizen followed an agile methodology. Kaizen was developed using Android Studio, with Jetpack Compose for UI and Firebase for real-time data processing. Key aspects of the methodology include sensor calibration, activity tracking algorithm development, and the integration of a diet plan module based on Indian cuisine. The research methodology ensures the system's scalability and adaptability across various fitness levels and user preferences.

### 3.1 System Architecture

Kaizen’s architecture comprises three core modules: Activity Tracking, Diet Planning, and Gamification and Social Features.

- Activity Tracking Module: Utilizes accelerometers, GPS, and gyroscopes to monitor steps, calories, distance, and other movement metrics. These data points feed into personalized goal recommendations.
- Diet Planning Module: Provides dietary suggestions based on Indian cuisine, recommending local foods to meet daily nutritional requirements.
- Gamification and Social Features Module: Includes leagues, achievements, and challenges to enhance motivation through a structured ranking system.

# 4 THEORY AND CALCULATION

The Kaizen app applies sensor fusion techniques to integrate data from GPS, accelerometers, and gyroscopes to calculate user activity, such as distance travelled and steps taken. The theory behind the gamification element is based on behavioural psychology, where users are more likely to maintain engagement when provided with achievable goals and rewards.

## 4.1 Mathematical Expressions and Symbols

Equations for calculating calorie consumption based on steps, weight, and activity intensity will be implemented as follows:

$$Calories = MET \times Weight \times Time$$

Where MET (Metabolic Equivalent of Task) values are assigned based on the activity type (walking, running, etc.).

# 5 IMPLEMENTATION

The development process of Kaizen includes the following steps:

## 5.1 Activity Tracking

Real-time data collection from GPS, accelerometers, and gyroscopes records user movement and provides feedback through the app's interface. Users can view their daily and weekly statistics, including total steps, calories burned, and distance traveled.

## 5.2 Diet Tracking

The diet planning feature allows users to log their meals based on common Indian foods. Recommendations are made using an internal database of regional foods to match users' dietary preferences and nutritional goals.

## 5.3 Gamification

Kaizen's gamification features allow users to compete in challenges, achieve ranks based on streaks, and participate in social challenges with friends or other app users. Points and badges are awarded for achieving goals, promoting consistency and motivation.

# 6 RESULTS AND DISCUSSION

Kaizen underwent beta testing with a small group of users. Feedback highlighted the effectiveness of goal setting and the user-friendly diet tracking feature, particularly for its regional relevance. Responsiveness testing showed a delay of less than 150ms in activity tracking, providing real-time feedback without latency issues. Users reported increased motivation, validating Kaizen's approach to promoting continuous fitness improvement.

# 7 CONCLUSION

The Kaizen project demonstrates the viability of an integrated, culturally relevant fitness application focused on continuous improvement. Combining physical activity tracking with an Indian diet plan and gamification elements, Kaizen encourages sustainable health habits through an engaging, user-friendly platform. Future developments could include expansion of diet customization, enhanced social features, and integration with external health devices to further support users' health journeys.

# 8 DECLARATIONS

## 8.1 Study Limitations

The study was limited by a small user sample size, and further testing is needed to validate the app's performance across diverse user groups.

## 8.2 Acknowledgements

We would like to thank the volunteers who tested the application during the development process.

## 8.3 Funding source

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## 8.4 Competing Interests

The authors declare no competing interests.

# REFERENCES

1. Kumar, T. V. (2018). Project Risk Management System Development Based on Industry 4.0 Technology and its Practical Implications.
2. Tambi, V. K., & Singh, N. (2015). Potential Evaluation of REST Web Service Descriptions for Graph-Based Service Discovery with a Hypermedia Focus.
3. Kumar, T. V. (2024). A Comparison of SQL and NO-SQL Database Management Systems for Unstructured Data.
4. Kumar, T. V. (2024). A Comprehensive Empirical Study Determining Practitioners' Views on Docker Development Difficulties: Stack Overflow Analysis.
5. Kumar, T. V. (2024). Developments and Uses of Generative Artificial Intelligence and Present Experimental Data on the Impact on Productivity Applying Artificial Intelligence that is Generative.
6. Kumar, T. V. (2024). A New Framework and Performance Assessment Method for Distributed Deep Neural NetworkBased Middleware for Cyberattack Detection in the Smart IoT Ecosystem.
7. Sharma, S., & Dutta, N. (2016). Analysing Anomaly Process Detection using Classification Methods and Negative Selection Algorithms.
8. Sharma, S., & Dutta, N. (2024). Examining ChatGPT's and Other Models' Potential to Improve the Security Environment using Generative AI for Cybersecurity.
9. Sakshi, S. (2023). Development of a Project Risk Management System based on Industry 4.0 Technology and its Practical Implications.
10. Arora, P., & Bhardwaj, S. Mitigating the Security Issues and Challenges in the Internet of Things (IOT) Framework for Enhanced Security.
11. Sakshi, S. (2024). A Large-Scale Empirical Study Identifying Practitioners' Perspectives on Challenges in Docker Development: Analysis using Stack Overflow.
12. Sakshi, S. (2023). Advancements and Applications of Generative Artificial Intelligence and show the Experimental Evidence on the Productivity Effects using Generative Artificial Intelligence.
13. Sakshi, S. (2023). Assessment of Web Services based on SOAP and REST Principles using Different Metrics for Mobile Environment and Multimedia Conference.
14. Sakshi, S. (2022). Design and Implementation of a Pattern-based J2EE Application Development Environment.

15. Sharma, S., & Dutta, N. (2018). Development of New Smart City Applications using Blockchain Technology and Cybersecurity Utilisation. Development, 7(11).
16. Sharma, S., & Dutta, N. (2017). Development of Attractive Protection through Cyberattack Moderation and Traffic Impact Analysis for Connected Automated Vehicles. Development, 4(2).
17. Sharma, S., & Dutta, N. (2015). Evaluation of REST Web Service Descriptions for Graph-based Service Discovery with a Hypermedia Focus. Evaluation, 2(5).
18. Sharma, S., & Dutta, N. (2024). Examining ChatGPT's and Other Models' Potential to Improve the Security Environment using Generative AI for Cybersecurity.
19. Sharma, S., & Dutta, N. (2015). Cybersecurity Vulnerability Management using Novel Artificial Intelligence and Machine Learning Techniques. Sakshi, S. (2023). Development of a Project Risk Management System based on Industry 4.0 Technology and its Practical Implications.
20. Sharma, S., & Dutta, N. (2017). Classification and Feature Extraction in Artificial Intelligence-based Threat Detection using Analysing Methods.
21. Sharma, S., & Dutta, N. (2016). Analysing Anomaly Process Detection using Classification Methods and Negative Selection Algorithms.
22. Sharma, S., & Dutta, N. (2015). Distributed DNN-based Middleware for Cyberattack Detection in the Smart IOT Ecosystem: A Novel Framework and Performance Evaluation Technique.
23. Bhat, S. (2015). Technology for Chemical Industry Mixing and Processing. Technology, 2(2).
24. Bhat, S. (2024). Building Thermal Comforts with Various HVAC Systems and Optimum Conditions.
25. Bhat, S. (2020). Enhancing Data Centre Energy Efficiency with Modelling and Optimisation of End-To-End Cooling.
26. Bhat, S. (2016). Improving Data Centre Energy Efficiency with End-To-End Cooling Modelling and Optimisation.
27. Bhat, S. (2015). Deep Reinforcement Learning for Energy-Saving Thermal Comfort Management in Intelligent Structures.
28. Bhat, S. (2015). Design and Function of a Gas Turbine Range Extender for Hybrid Vehicles.
29. Bhat, S. (2023). Discovering the Attractiveness of Hydrogen-Fuelled Gas Turbines in Future Energy Systems.
30. Bhat, S. (2019). Data Centre Cooling Technology's Effect on Turbo-Mode Efficiency.
31. Bhat, S. (2018). The Impact of Data Centre Cooling Technology on Turbo-Mode Efficiency.
32. Archana, B., & Sreedaran, S. (2023). Synthesis, characterization, DNA binding and cleavage studies, in-vitro antimicrobial, cytotoxicity assay of new manganese (III) complexes of N-functionalized macrocyclic cyclam based Schiff base ligands. Polyhedron, 231, 116269.
33. Archana, B., & Sreedaran, S. (2022). New cyclam based Zn (II) complexes: effect of flexibility and para substitution on DNA binding, in vitro cytotoxic studies and antimicrobial activities. Journal of Chemical Sciences, 134(4), 102.
34. Archana, B., & Sreedaran, S. (2021). POTENTIALLY ACTIVE TRANSITION METAL COMPLEXES SYNTHESIZED AS SELECTIVE DNA BINDING AND ANTIMICROBIAL AGENTS. European Journal of Molecular and Clinical Medicine, 8(1), 1962-1971.
35. Rasappan, A. S., Palanisamy, R., Thangamuthu, V., Dharmalingam, V. P., Natarajan, M., Archana, B., ... & Kim, J. (2024). Battery-type WS2 decorated WO3 nanorods for high-performance supercapacitors. Materials Letters, 357, 135640.
36. Arora, P., & Bhardwaj, S. (2017). Investigation and Evaluation of Strategic Approaches Critically before Approving Cloud Computing Service Frameworks.
37. Arora, P., & Bhardwaj, S. (2017). Enhancing Security using Knowledge Discovery and Data Mining Methods in Cloud Computing.
38. Arora, P., & Bhardwaj, S. (2017). Combining Internet of Things and Wireless Sensor Networks: A Security-based and Hierarchical Approach.
39. Arora, P., & Bhardwaj, S. (2019). Safe and Dependable Intrusion Detection Method Designs Created with Artificial Intelligence Techniques. machine learning, 8(7).
40. Arora, P., & Bhardwaj, S. (2017). A Very Safe and Effective Way to Protect Privacy in Cloud Data Storage Configurations.

41. Arora, P., & Bhardwaj, S. (2019). The Suitability of Different Cybersecurity Services to Stop Smart Home Attacks.
42. Arora, P., & Bhardwaj, S. (2020). Research on Cybersecurity Issues and Solutions for Intelligent Transportation Systems.
43. Arora, P., & Bhardwaj, S. (2021). Methods for Threat and Risk Assessment and Mitigation to Improve Security in the Automotive Sector. Methods, 8(2).
44. Onyema, E. M., Gude, V., Bhatt, A., Aggarwal, A., Kumar, S., Benson-Emenike, M. E., & Nwobodo, L. O. (2023). Smart Job Scheduling Model for Cloud Computing Network Application. *SN Computer Science*, *5*(1), 39.
45. Hasnain, M., Gude, V., Edeh, M. O., Masood, F., Khan, W. U., Imad, M., & Fidelia, N. O. (2024). Cloud-Enhanced Machine Learning for Handwritten Character Recognition in Dementia Patients. In *Driving Transformative Technology Trends With Cloud Computing* (pp. 328-341). IGI Global.
46. Kumar, M. A., Onyema, E. M., Sundaravadivazhagan, B., Gupta, M., Shankar, A., Gude, V., & Yamsani, N. (2024). Detection and mitigation of few control plane attacks in software defined network environments using deep learning algorithm. *Concurrency and Computation: Practice and Experience*, *36*(26), e8256.
47. Gude, V., Lavanya, D., Hameeda, S., Rao, G. S., & Nidhya, M. S. (2023, December). Activation of Sleep and Active Node in Wireless Sensor Networks using Fuzzy Logic Routing Table. In *2023 3rd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA)* (pp. 1358-1360). IEEE.
48. Gorantla, V. A. K., Sriramulugari, S. K., Gorantla, B., Yuvaraj, N., & Singh, K. (2024, March). Optimizing performance of cloud computing management algorithm for high-traffic networks. In *2024 2nd International Conference on Disruptive Technologies (ICDT)* (pp. 482-487). IEEE.
49. Sriramulugari, S. K., & Gorantla, V. A. K. (2023). Deep learning based convolutional geometric group network for alzheimer disease prediction. *International Journal of Biotech Trends and Technology*, *13*(3).
50. Sriramulugari, S. K., & Gorantla, V. A. K. Cyber Security using Cryptographic Algorithms.
51. Gorantla, V. A. K., Sriramulugari, S. K., Mewada, A. H., Jiwani, N., & Kiruthiga, T. (2023, December). The slicing based spreading analysis for melanoma prediction using reinforcement learning model. In *2023 IEEE Technology & Engineering Management Conference-Asia Pacific (TEMSCON-ASPAC)* (pp. 1-7). IEEE.
52. Sriramulugari, S. K., Gorantla, V. A. K., Mewada, A. H., Gupta, K., & Kiruthiga, T. (2023, December). The opinion based analysis for stressed adults using sentimental mining model. In *2023 IEEE Technology & Engineering Management Conference-Asia Pacific (TEMSCON-ASPAC)* (pp. 1-6). IEEE.
53. Gorantla, V. A. K., Sriramulugari, S. K., Mewada, A. H., Gupta, K., & Kiruthiga, T. (2023, December). The smart computation of multi-organ spreading analysis of COVID-19 using fuzzy based logical controller. In *2023 IEEE Technology & Engineering Management Conference-Asia Pacific (TEMSCON-ASPAC)* (pp. 1-7). IEEE.
54. Gude, Venkataramaiah (2023). Machine Learning for Characterization and Analysis of Microstructure and Spectral Data of Materials. *International Journal of Intelligent Systems and Applications in Engineering* 12 (21):820 - 826.
55. Prabhu Kavin, B., Karki, S., Hemalatha, S., Singh, D., Vijayalakshmi, R., Thangamani, M., ... & Adigo, A. G. (2022). Machine Learning-Based Secure Data Acquisition for Fake Accounts Detection in Future Mobile Communication Networks. *Wireless Communications and Mobile Computing*, *2022*(1), 6356152.
56. Kalaiselvi, B., & Thangamani, M. (2020). An efficient Pearson correlation based improved random forest classification for protein structure prediction techniques. *Measurement*, *162*, 107885.
57. Thangamani, M., Satheesh, S., Lingisetty, R., Rajendran, S., & Shivahare, B. D. (2025). Mathematical Model for Swarm Optimization in Multimodal Biomedical Images. In *Swarm Optimization for Biomedical Applications* (pp. 86-107). CRC Press.
58. Chithrakumar, T., Mathivanan, S. K., Thangamani, M., Balusamy, B., Gite, S., & Deshpande, N. (2024, August). Revolutionizing Agriculture through Cyber Physical Systems: The Role of Robotics in Smart Farming. In *2024 International Conference on Electrical Electronics and Computing Technologies (ICEECT)* (Vol. 1, pp. 1-6). IEEE.
59. Tiwari, V., Ananthakumaran, S., Shree, M. R., Thangamani, M., Pushpavalli, M., & Patil, S. B. (2024). RETRACTED ARTICLE: Data analysis algorithm for internet of things based on federated learning with optical technology. *Optical and Quantum Electronics*, *56*(4), 572.
60. Sakthivel, M., SivaSubramanian, S., Prasad, G. N. R., & Thangamani, M. (2023). Automated detection of cardiac arrest in human beings using auto encoders. Measurement: Sensors, 27, 100792.

61. CHITHRAKUMAR, T., THANGAMANI, M., KSHIRSAGAR, R. P., & JAGANNADHAM, D. (2023). MICROCLIMATE PREDICTION USING INTERNET OF THINGS (IOT) BASED ENSEMBLE MODEL. *Journal of Environmental Protection and Ecology*, *24*(2), 622-631.
62. Vasista, T. G. K. (2017). Towards innovative methods of construction cost management and control. *Civ Eng Urban Plan: Int J*, *4*, 15-24.
63. Hsu, H. Y., Hwang, M. H., & Chiu, Y. S. P. (2021). Development of a strategic framework for sustainable supply chain management. *AIMS Environmental Science*, (6).
64. Venkateswarlu, M., & Vasista, T. G. (2023). Extraction, Transformation and Loading Process in the Cloud computing scenario. *International Journal of Engineering Applied Sciences and Technology*, *8*, 232-236.
65. Sagar, M., & Vanmathi, C. (2022, August). Network Cluster Reliability with Enhanced Security and Privacy of IoT Data for Anomaly Detection Using a Deep Learning Model. In *2022 Third International Conference on Intelligent Computing Instrumentation and Control Technologies (ICICICT)* (pp. 1670-1677). IEEE.
66. Sagar, M., & Vanmathi, C. (2024). A Comprehensive Review on Deep Learning Techniques on Cyber Attacks on Cyber Physical Systems. *SN Computer Science*, *5*(7), 891.
67. Sagar, M., & Vanmathi, C. (2024). Hybrid intelligent technique for intrusion detection in cyber physical systems with improved feature set. *Journal of Intelligent & Fuzzy Systems*, (Preprint), 1-17.
68. Vanmathi, C., Mangayarkarasi, R., Prabhavathy, P., Hemalatha, S., & Sagar, M. (2023). A Study of Human Interaction Emotional Intelligence in Healthcare Applications. In *Multidisciplinary Applications of Deep Learning-Based Artificial Emotional Intelligence* (pp. 151-165). IGI Global.
69. Kumar, N. A., & Kumar, J. (2009). *A Study on Measurement and Classification of TwitterAccounts*.
70. Senthilkumar, S., Haidari, M., Devi, G., Britto, A. S. F., Gorthi, R., & Sivaramkrishnan, M. (2022, October). Wireless bidirectional power transfer for E-vehicle charging system. In *2022 International Conference on Edge Computing and Applications (ICECAA)* (pp. 705-710). IEEE.
71. Firos, A., Prakash, N., Gorthi, R., Soni, M., Kumar, S., & Balaraju, V. (2023, February). Fault detection in power transmission lines using AI model. In *2023 IEEE International Conference on Integrated Circuits and Communication Systems (ICICACS)* (pp. 1-6). IEEE.
72. Gorthi, R. S., Babu, K. G., & Prasad, D. S. S. (2014). Simulink model for cost-effective analysis of hybrid system. *International Journal of Modern Engineering Research (IJMER)*, *4*(2).
73. Rao, P. R., & Sucharita, D. V. (2019). A framework to automate cloud based service attacks detection and prevention. *International Journal of Advanced Computer Science and Applications*, *10*(2), 241-250.
74. Rao, P. R., Sridhar, S. V., & RamaKrishna, V. (2013). An Optimistic Approach for Query Construction and Execution in Cloud Computing Environment. *International Journal of Advanced Research in Computer Science and Software Engineering*, *3*(5).
75. Rao, P. R., & Sucharita, V. (2020). A secure cloud service deployment framework for DevOps. *Indonesian Journal of Electrical Engineering and Computer Science*, *21*(2), 874-885.
76. Selvan, M. A., & Amali, S. M. J. (2024). RAINFALL DETECTION USING DEEP LEARNING TECHNIQUE.