Integrating Artificial Intelligence with Yoga
A Systematic Literature Review for ZenKraft

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ABSTRACT

As experienced in 2020, the COVID-19 pandemic led to the isolation of the population. These restricted physical activities such as sports events and social activities resulted in a disturbed state of mind and deteriorating physical wealth for society. To recover from this situation, it became necessary to maintain our health. Performing yoga consistently is one of the best solutions to maintaining a balance between physical and mental health. The year 2022 witnessed the rise of Artificial Intelligence, many people recognized the potential of AI and how it can be used within various fields to improve product development and quality. Leveraging the benefits of AI has now become a crucial step in creating high-level applications. We studied various papers to understand the methodologies used and challenges faced in the field of yoga about AI. We aimed to identify the gaps in existing techniques and provide solutions to bridge these gaps. Since people were quarantined during the pandemic it was difficult for them to perform yoga accurately without the risk of self-injury resulting in hesitance to perform yoga at home. Using AI to recommend proper yogasanas, detect their pose in real-time, and provide feedback is one way in which AI can be used to motivate individuals to practice yoga at home.

Introduction

The increasing popularity of yoga has catalyzed immense progress in academic studies directed toward the exact execution of postures. This research field is expanding in significance with the fast-increasing population engaging in yoga. Yoga practice has attracted considerable attention due to its potential to tackle important real-life issues, including stress relief, immune system stimulation, and overall physical well-being. Although individual studies are available, there is a limited and scattered analysis of yoga. Researchers are hindered from determining trends, patterns, problems, and research areas because of the scattered nature of available data. In this survey, we analyzed 18 representative research articles to contrast the current knowledge, methods, and methodologies used, and significant findings in the field of Yoga. We intend to provide a systematic review and suggest future research directions for researchers venturing into this field.

Our Motivation

In the year 2020, the COVID-19 pandemic revolutionized everyday life for individuals and imposed limitations on group activity, including group wellness activities like exercise and yoga. This overnight change prompted individuals to seek individual health habits at home, and therefore yoga became a popular way of keeping the body healthy and enhancing immunity.

The term "Survival of the fittest" is derived from Darwinian evolutionary theory, which describes the law of natural selection but with a focus on the health and strength of the individual. Post-gym and yoga studio closures, individuals began practicing at home, including yoga. With social distancing becoming the order of the day, technology became the necessary tool to bridge the gap that followed. Group yoga sessions were substituted with online yoga classes and individual routines. This change led to creative ways of customizing yoga practices, enabling individuals to enhance their immunity and overall health.

Literature Review

Recent advances in human pose estimation and its application to yoga have produced a broad array of techniques that cross-computer vision and health and wellness interventions. For instance, a hybrid method applying MediaPipe-based 2D keypoint extraction and humanoid-based 3D pose estimation has achieved robust real-time performance in adverse conditions[1], and CNN-LSTM architectures coupled with OpenCV and MediaPipe provide over 99% accuracy for yoga pose classification and pose correction[2]. Integration with MoveNet enables dynamic pose detection in real-

time[3], and traditional machine learning techniques employing tf-pose estimation with classifiers such as Random Forest and SVM have been observed to provide high precision for pose detection[4][9]. MediaPipe and OpenCV-based real-time implementations provide immediate audio-visual feedback for a number of asanas[5] and transfer learning with pre-trained CNNs improves classification accuracy over a variety of postures[6]. Specialized systems for sequences such as Surya Namaskar apply holistic keypoint detection and CNN-LSTM models for advanced posture correction in intelligent healthcare applications[7], while lightweight techniques employing PoseNet and KNN provide rapid corrective feedback for home practice[8]. Deep learning architectures that combine CNNs with LSTMs enable continuous yoga monitoring with near-ideal accuracy and real-time text/speech feedback for self-training[10][11][17]. IoT-based monitoring systems integrate wearable sensor data and personalized advice further to enhance practice safety and efficacy[12]. Moreover, AI-based systems that specialize in real-time posture detection and pose correction provide automatic, detailed feedback to improve user performance[13]. Wider clinical and qualitative meta-analyses highlight the outstanding mental and physical advantages of yoga—stress decrease, flexibility, and overall well-being improvement—with meta-analytic quantification of the effect size for depression relief at a moderate level, especially where yoga interventions are targeted at relaxation and longer practice sessions[14][16][18]. Lastly, scalable data management solutions with MongoDB, Python, and Express.js imply the need for scalability in applying these integrated systems to real-world applications[15]. Together, these articles not only enhance the technical precision of pose recognition systems but also prove the therapeutic effects of yoga and form a sound groundwork for expanded research and implementation in health monitoring and interactive self-training systems.

Our Ideas for improvement

The research mentioned above has motivated key ideas for our research study. We want to develop a personalized yoga assistant in combination with real-time detection mechanisms to give correct feedback on performed yoga exercises. A recommendation unit will give customized yoga classes according to the user's health condition and individual needs. A real-time detection module, using OpenCV and MediaPipe, will detect the pose and give correcting feedback for enhancement. People can easily manage their health at any moment using this app at their homes.

Conclusion

The systematic review identifies the transformative potential of the incorporation of Artificial Intelligence (AI) in yoga practice. In reviewing 18 studies, the review

demonstrates the effectiveness of AI-enabled technologies, such as Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTM) networks, OpenPose, MediaPipe, and MoveNet, in identifying, classifying, and correcting yoga poses in real time. These cutting-edge technologies have been able to achieve high accuracy rates, between 78.78% and 99.53% in pose detection and correction, which is especially crucial for home practice, particularly in the absence of a physical instructor. The review highlights major advancements in the development of AI-augmented yoga systems using hybrid CNN-LSTM architectures, transfer learning methods, and pose estimation models like tf-pose. These systems offer real-time feedback, personalized instruction, and customized recommendations, thus eradicating issues like improper posture adoption and injury risks. The use of AI not only facilitates increased efficacy and accessibility of yoga practice but also facilitates overall physical and mental well-being at a global scale. Future research needs to tackle larger datasets, model optimization for mobile platforms, and adoption of advanced feedback mechanisms to further improve accuracy and usability. Breaking the constraints of current methods, AI-augmented yoga systems have the potential to revolutionize personalized fitness and wellness practices, making yoga safer, more accessible, and responsive to diverse user needs.

Acknowledgement

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