

## Comprehensive literature review on Open pose AI model and Alzheimer Disease predictions

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**Abstract:** Recent advancements in the field of artificial intelligence made them shine in a variety of applications in different sectors. Their usage in activity recognition based on video analysis to analyze Alzheimer patient's characteristics improves the healthcare diagnosis. This review talks about the techniques used to analyze motion and activity using markers that are processed by a lightweight AI model that can do good research in the medical field. What motion capture methods are used, along with their structures and parameters, are used in this study to teach various AI models how to guess what the patients will do next. The activities are then put into different categories based on how people act and what they do every day. For example, sleep patterns, walking, talking, sitting, and using electronics are all looked at as daily activities to improve healthcare diagnostics. Furthermore, this research also provides the highlights in activity recognition and classifying their routines, which tends to give additional healthcare monitoring systems to the patient's caretakers without interference from medical experts. Additionally, this research gives clear notifications on different video or motion analysis models and their advantages when implemented in specific areas, such as medical activity analysis with high accuracy.

**Keywords:** Artificial Intelligence; Alzheimer; Activity Recognition; Open Pose AI; Healthcare.

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### Introduction

In a recent report from NLM (National Library Medicine), nearly 25 million people worldwide are going to be affected by a brain memory fade condition called Alzheimer. People affected with Alzheimer's disease can have difficulty doing their routine work, such as sleeping, walking, and talking, much more than activities handled in daily life. Over 80% of Alzheimer's patients are unpredictable, making treatment management challenging. The people affected with Alzheimer's face difficulty in problem-solving and decision-making in their daily routines. To analyze the activity of the patients with questionnaire feedback and some manual diagnosis processes, AI plays an important role in analyzing the patient character in different forms.[1]

The artificial intelligence model can look at a lot of different ways to show how a patient's personality changes, like MRI scans, MCI neuroimaging, and manual testing with a classifier. In this study, we use a video recording of an Alzheimer's patient's day-to-day activities and a lightweight open pose AI model to track their activity. The model uses biomarker activities like walking, talking, and using a phone as a global estimator to map their pose geometry to markers in their whole body so that we can look at their daily activities and store them as a measure of their activity. A lightweight visual transformer is used to find the different activity or missed activity processed by the patient after collecting the data to find which activity was missed by the user.

This study's main contribution is to look at some of the most important machine learning and activity recognition models. These models look at the user's activity and store it so they can guess what activity the patient is missing. types of AI models used in this same area of research to identify user activity with different parameters and medical datasets to train the models assisted for diagnosis of the patients.

The work begins with section 2 as related work and history of AI model in activity recognition, Section 3 defines key contribution of the existing works are explained with their uniqueness is detecting patient activity, Section 4 defines the experimental results about the accuracy achieved by healthcare AI model and section 5 defines the conclusion and future work of this research [2].

### Related work

In the recent era, machine learning artificial intelligence models have played a significant role in identifying patient conditions and their activity analysis in various forms. These models include manual questionnaire models, data interpretation models, and object and video-based activity analysis, all of which are used to predict the severity of Alzheimer's patients with varying accuracy ranges. This analysis focuses on those models and their key findings explained in Table 1.

Table 1. Compares of different AI model in Alzheimer prediction with the related work

Reference No	Model	Finding	Accuracy Range
[3]	Xception fused with Random Forest	Uses Barin MRI to find the stages of the patient	99.14
[4]	Biceph-Net	Diagnosis the information form Brain MRI	98.16
[5]	Deep CNN with LGPose	Human pose estimation model with visual transformer.	86.4
[6]	Support Vector Machine with secure hash algorithm	Identification of depression in patients leads to quality of life.	91
[7]	Ensemble Learning	3D classification method with MRI image	AUC-91.28
[8]	Deep CNN with Semantic regions	Human pose estimation model with body parts, biomarkers and objects.	3.39
[9]	Evolutionary Deep CNN with some optimization technique	Identification of Alzheimer from the image dataset in real time healthcare application.	Computational efficiency-0.018
[10]	GRU Networks	Real time annotation capturing from dance movements with human body parts key markers.	87
[11]	CNN fused with long-term short-term memory	Alzheimer patients' severity recognition from MRI scan images	99
[12]	Transfer learning model	Fused different types of datasets such as MRI with ECG combine to predict Alzheimer in patients with effective feature extraction model.	80
[13]	Graph based convolutional neural network	Multi label classification of activity changes in Alzheimer patients based on MRI image.	84.03
[14]	OpenPose and Graph neural network	Human pose estimation and ensure safe working environment.	F1 Score-0.8
[15]	Biosensors	Human model to analyses the human activity with their regular day to day activities	95

		with the use of wearable technologies	
[16]	Support Vector Machine with k-nearest neighbor	Fused different types of AI model to predict brain disorders early during activity changes.	93.71
[17]	CNN with Visual transformers	Prediction are done with the use of brain image data.	86
[18]	Multimode Machine learning model	Fused different types of datasets such as MRI with ECG combine to predict Alzheimer in patients with effective gradient boosting regressors.	42
Proposed Work	OpenPose and XGBoost	Lightweight Activity analyzer from real time video and activity prediction with the use of XGBoost to analyze the severity of Alzheimer patients with their activity	88

Accuracy Ranges of Different AI Models

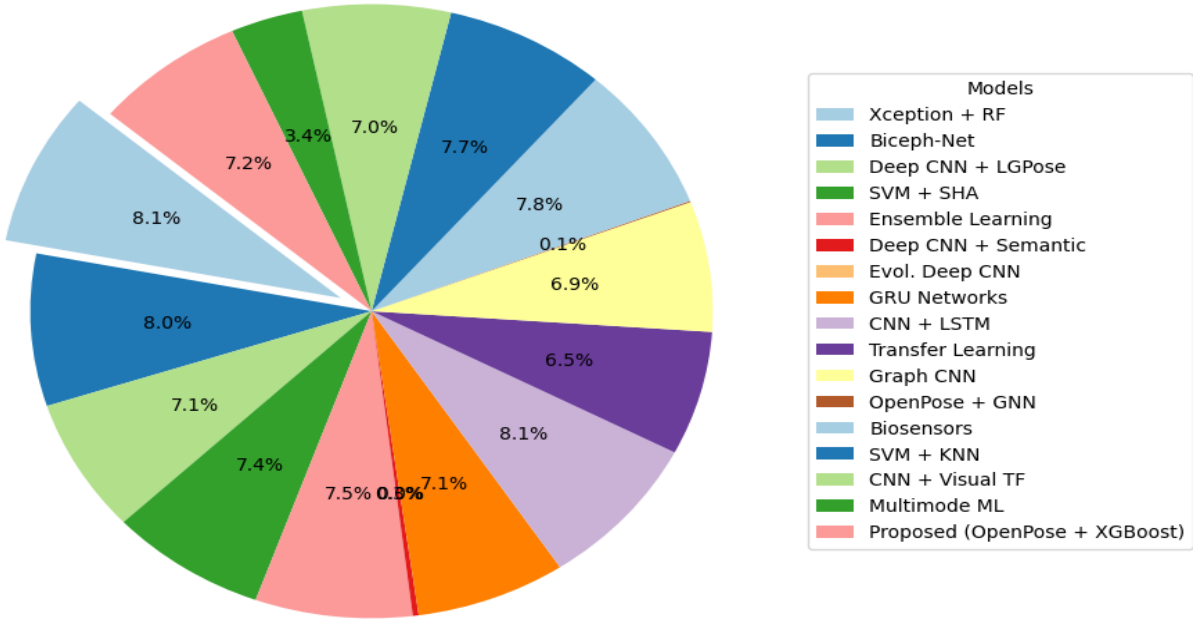


Figure 1. Alzheimer disease prediction Different AI models

**Key Contribution**

The key contribution of this research is to explore different artificial intelligence models in detecting Alzheimer's disease from the patients using different approaches, mostly based on brain images and some activity analysis. But effectively analyzing is not

possible with these two ways; for that, we are processing video-based motion analysis to identify Alzheimer patient activity and defining which activity they forgot to analyze the severity range of the disease with the help of an AI model. The activity categorization helps analyze the missed behavior of the patients, which leads to cognitive decline. The major activities used for categorization are walking, taking, sitting, sleeping, and using electronic gadgets. This patient activity recognition improved patient supervision, reducing the need for medical experts by processing regular care and attention to patient activity.[17]

### Method, Experiments and Results

#### a) Methods

This review explains a good way to identify the daily activities of Alzheimer's patients. It suggests using video analysis with different markers, as well as some activities without markers, to monitor changes in the patients' activities. The proposed model uses different feature extraction methods, such as posture changes, and missed daily activities such as sleep time and interaction with home people are noted. The updated activity is recorded using a simple OpenPose AI model to track key movements from the video. This information is then sent to the XGBoost classifier, which accurately identifies any missed activities and notifies the caregiver about any mixed activities for Alzheimer's patients are expressed in Figure 2.

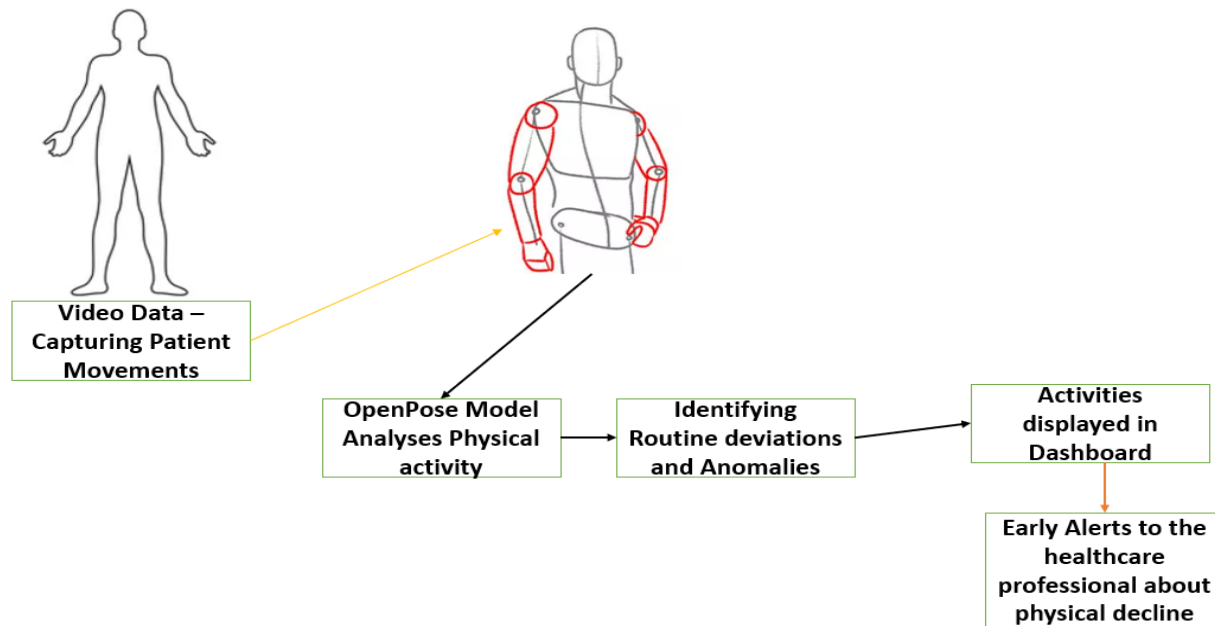


Figure 2. Proposed Method to analyze patient activity

#### b) Experiments and Results

The comprehensive review above indicates that MRI-based image analysis and biosensor-based data analysis require significant computational time and recommendations from medical experts to confirm the severe status of the patients. So that it doesn't take too much time to process the image dataset, we're building an activity recognition model using video recordings from a regular camera. Studies show that this combined deep learning model, which includes CNN and LSTM, is very accurate. Having high computational data resources is needed to execute the perfect outcome of the proposed model to overcome this issue: a lightweight OpenPose AI model to analyze the activity from different activity markers to identify the activity missed by the patients makes the proposed work effective in the real-world activity analysis of Alzheimer patients.

The specific work includes different day-to-day activities that the patients do, such as talking, walking, sleeping, talking on the phone, and working on a laptop. These activities are recorded on video and fed into the OpenPose AI model with 12,600 training samples that contain different biomarkers. Then, the whole activity is sent to the XGBoosting model to find the patients' missed activities with 5,400 testing samples that make sure the patients' different activity representation is correct. Moreover, by automating video-based activity analysis of patients, we provide detailed information on patient's behavior changes to caretakers with real-time monitoring and direct intervention on patients, reducing the workload of caregivers and medical experts by saving their time and attention. Ultimately, the proposed model will yield superior results compared to the standard image analysis

model, and it holds significant potential for addressing practical health applications involving Alzheimer patients are expressed in Figure 3.[17]

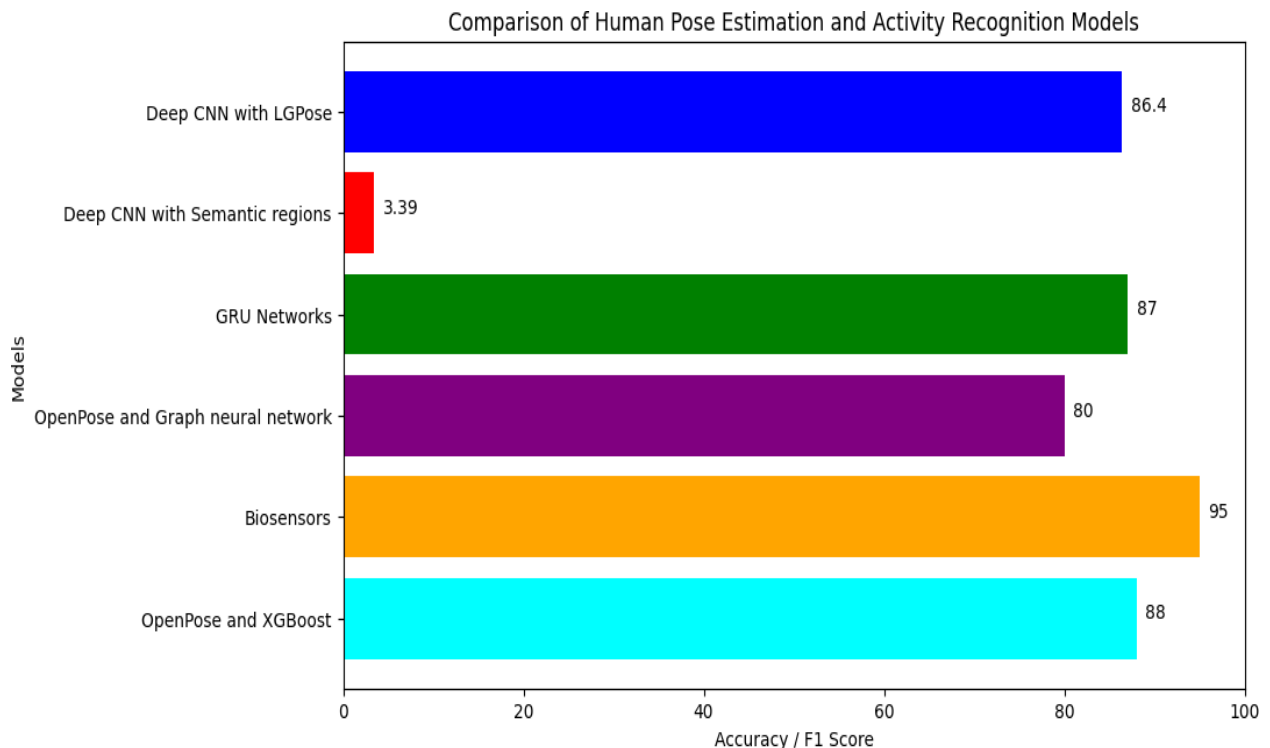


Figure 3. Video Based Activity Analysis AI model Accuracy range in prediction.

### Discussions

This study looks at a number of different artificial intelligence models used in video capture and machine learning. The proposed model is better than some traditional models because it adds markers to video activity to easily find routine and missed activities.[18]

### Conclusions

1. Problem statement Addressed/ Motivation
  - The motivation is to enhance the daily routine of Alzheimer's patients by using video-based activity analysis through a machine learning model.
  - The traditional model is based on image-based analysis, fully relying on medical experts' suggestions regarding the severity of Alzheimer's in patients.
  - The requirement for patients to visit medical experts regularly places a burden on caregivers, necessitating various medical interventions.
2. Method used
  - The suggested model uses the OpenPose AI model to track video activity and the XGBoosting model to look at daily routine data for missed activities. This makes it possible to accurately find the missed activities.
3. Key findings
  - The artificial intelligence-based model enables real-time monitoring of patients and notes their daily activity, which is a crucial feature in knowing the status of Alzheimer patients.
  - Automatic alerts are set by the AI model, which helps the caretakers and family members track the patient effectively by easing the burden of real-time monitoring of patients.
4. Limitations of the work and future work that should be carried
  - Challenges include environmental factors affecting video-based patient monitoring and some variation in patients' movements.

- Future research may focus on addressing environmental factors through analysis by refining the multi-model for enhancing patient safety.
- The integration of AI in healthcare monitoring will transform the need for medical experts in certain brain-oriented diseases and improve medical efficiency in rural areas, paving the way for future improvements.

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