Human Fall Detection with IBM Power AI Insights

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INTRODUCTION

Everyone gets to that certain point where aging takes its toll on their body. With time, people get older and their bodies get weaker and more fragile. Due to this the elderly are more susceptible to falling and can severely injure themselves in the process. To tackle this problem and help those in need we are developing a tool where people can get to their relatives or emergency services when they fall. This can help prevent serious consequences of their injuries. The proposed tool is based on a deep learning (DL) model, it continuously observes the environment through a video camera and detects when a human falls.

The aim of this project is to create a system that takes video camera footage and tries to detect if a person has fallen. After a DL model is created, the goal is to connect the model to a real-time web app. The idea of the app is to receive notifications that a person has fallen. The model detects the falling action and through the app alerts a relative or guardian taking care of the person that has fallen.

By having this implementation in houses, nursing homes or even hospitals we can save the elderly from more serious consequences or even save their lives.

METHOD

Our model is developed using a tool created by IBM called Power AI Insights®. This tool has implemented algorithms to help the user create ML models. We were provided with a collection of videos featuring people falling in many different scenarios3. These videos were edited for the training of our model. This includes, cropping, trimming and change in format and frame rate so the videos meet the necessary requirements for training.

We used the following human fall video datasets:
1. UR Fall Detection Dataset
2. Kinetic Human Action Video Dataset
3. Multiple Cameras Fall Dataset
After editing the videos they’re uploaded to Power AI Insights for labeling and model training. The videos must be labeled such that the model can know what actions are that we are interested in recognizing. These actions must be short and precise so that the accuracy of the model is higher.

After we developed an acceptable model on IBM Power AI Insights, we then implemented a python script which returns a Boolean representing whether the person had fallen or not.

Since the model can’t receive live footage, the script was updated to cut the live footage into batches of five seconds using OpenCV library so that the model can inspect it and notify if the action has occurred. The Web App code we have made in Python was built using the Power AI Vision API shown below.

RESULTS

IBM Power AI Insights provides Structured Segment Network (SSN) model for action recognition. We were able to get a 92% accuracy by training this model on 150 videos from a fall dataset. This model was then deployed and used with a RESTful API to connect it with our native Python application. Using OpenCV we captured frames from our webcam and stitched them into a 5 seconds mp4 file. These files are fed into the model to enable near-real-time fall detection. SSN models are a framework for temporal action detection in untrimmed videos. This is achieved by modeling temporal structures of activity instances in an end to end manner.

FUTURE APPLICATIONS

Besides the obvious application of this model and application for helping old people, we believe this technology can be leveraged to help other groups in society who are prone to injure themselves during falls. For instance a lot of disabled people may find this of use as it can quickly detect when someone has had an unnatural fall and can quickly alert the caregivers or authorities. Additionally, it could also be used to provide the same level of attention to small children who are first learning to walk. This can be a tool which correctly lets parents know about their children falling down.

The approach described here can be used to build other types of applications that relay on action recognition.

CONCLUSIONS

In the end we have managed to form a working web application deployment via Python of this tool which can be used to detect real time human falls.

REFERENCES

1. IBM PowerAI Insights (link)
2. Structured Segment Network (SSN) (link)
3. Datasets:
   a. UR Fall Detection Dataset (link)
   b. Kinetic Human Action Video Dataset (link)
   c. Multiple Cameras Fall Dataset (link)

ACKNOWLEDGEMENTS

This work utilizes resources supported by the National Science Foundation’s Major Research Instrumentation program, grant #1725729, as well as the University of Illinois at Urbana-Champaign.