**Dataset Collection Setup**

1. Define Research Question
   * **Type of data you need**

The study requires a video data of activities of daily living of the targeted patients. Acquiring videos will define the daily habits or life pattern of the patient.

* + **Your Hypothesis**

Targeted audience of the study are older patients having chronological disorders and have episodic attacks. Based on this situation, the hypothesis of the study is that older patients have limited daily activities. So, machine can model their behavior that the patient will do this activity on this time of the day. The same rule applies for the abnormal activity (Episodic Attack). So, if machine could forecast episodic attack of the patient before it happens, then needed actions could be taken to prevent the patient to undergo his/her episodic attack.

* + **Method that study propose**

Study proposed the method of personalized behavior modeling for each patient. Each patient would have his/her own smart caretaker that knows what is patient doing right now and an idea what the patient will do in near future.

1. Selecting Activities
   * **Select activities you want to capture**

These are some activities that trigger seizure:

* + - Medicine Skip
    - Lack of Sleep
    - Stress
    - Boredom
    - Alcohol
    - Dehydration
    - Skipping Meals
    - Light Fleshing
    - Food Triggers
    - Hormonal Changes

Select normal day activities through which above mentioned triggers could be detected.

1. Selecting Equipment and settings
   * **Camera on roof**

Camera would be installed on roof with 45-degree inclined down ward. This is the hypothesis that inclination of camera would cover the patient completely.

* + **Memory Card storing videos**

Memory card is the option for storing the live stream coming from camera. Memory card size could vary from 128 to 256 GB according to requirement and cost best fit ratio.

* + **Google Cloud platform (Optional)**

Google cloud platform has several services that attracts the ML Engineers to use it for dataset handling and training of machine learning models. Following are some prominent services of GCP (Google Cloud Platform):

* **Cloud Storage**

Allow large amount of video data to upload from anywhere and can be accessed from authorized users from anywhere of the world.

* **Cloud Pub/Sub**

Pub/Sub Stands for Publisher/Subscriber. Pub/Sub mainly used for messaging service in surveillance store. But in our case this service could be used in the sense that multiple cameras uploading stream to GCP and GCP managing logs of streams and sending stream to some central location.

* **Cloud Video Intelligent API**

This service used to extract some important features form the data. In our case API can be used to detect objects, faces, and scenes in video.

1. Capture video dataset
   * **Chose the sight that cover all activities of patient**

Location or of the room from where camera can easily monitor patient all the time. It depends on multiple parameters like shape of the room, location and position of patient in room, objects placement in room, etc. Choosing camera location would be managed by technical team by best suiting for individual user.

1. Labeling video data
   * **Use labeling tool for data labeling (Annotation of Data) => BMN/ BSN**

Following are the steps involved in data annotation:

* *Define the scope of annotation*

Define specific activities that need to be recognized. For example, the goal and scope of annotation is to recognize the activities of cooking in the video.

* *Select annotation tool:*

Following are some tools for data annotation:

* + VGG Image Annotator
  + Labelbox
  + RectLable
  + Dataturks
  + Scalabel
* *Break down the video into smaller clips:*

Use the pretrained models BMN (Boundary Matching Network)/ BSM (Boundary Sensitive Network) for dividing complete untrimmed video into smaller chunks of individual activity.

* *Identify the activities:*

Watch the complete video chunk and assign an activity from one of the activities that is under your scope.

* *Label the video:*

Use the annotation tool to label activities in the video. Annotation could be in the form of text, tags, or activity label with time duration.

* *Validate the annotations:*

This is the process of cross-verify that activities are annotated correctly. This process could be done manually or by using the tool of annotation.

1. Processing the data
   * **Data cleaning**

Following are some steps that involve in data cleaning:

* *Data Inspection*

Inspect the dataset that any video is missing from annotation. Also identify and standardize the format and resolution of videos.

* *Noise reduction*

Video data may contain multiple types of noise like camera noise or environmental noise. This can be reduced by using filtering technique like denoising.

* *Image Enhancement*

Some videos or video portions may have multiple glitches like brightness issues, visualization issues. These issues may reduce the performance of model. To overcome multiple techniques can be used like contrast adjustment or color correction, etc.

* *Standardization*

Standardize the format, resolution and naming pattern of the dataset. This ensures the consistency of the dataset.

* *Data normalization*

Normalize the videos of dataset to some common resolution and common scale or range.

1. Analyzing the data
   * **Pass data to model for activity prediction (Check your collected data working for your model)**

Pass videos to your selected model to make sure that your collected videos are compatible to your model. Also verify how model predicts the activities of the video. It could further be analyzed for multiple cases. Following are some cases:

* How model predicts the activities in the video
* How model treat for videos of different length
* How model act when multiple activities are in single video
* How model treat to activities of multiple length
* How model handle course grained and fine-grained activities

1. Evaluating the results
   * **Check how activities are correctly predicting on your dataset**

Now train and test activity recognition model on annotated data. Evaluate the model on performance measuring metrics like precision, recall, F1 score.