Hypothetically, if I were a neurologist studying MS, its really important for me to look and study the human brain. But right now if I wanted to do that, I would have to use a human, cat,e tc subject for the stidy/experiment to get cnducted. THe problem with this that it is inefficient in temrs of time and cost as you make the subject appear in physical, you spend time in monitoring, spend capita on subject and lab resources, etc. With the amount of tech, I have 1 cm instead of having 1km.

I can have way more data and can experiment way more using this software than in actual tangible way.

Problem:
Replace humans or other real life subjects for recording EEG(electroencephalogram, electrical activity of the brain) data in neuro-scientific research by building software: EEG Simulator.
Find a way to analyze patients without making subjects to the study; identify troubles with patients withoout going through the trouble of actually making patients go through it.

Reason: inefficient system of subjecting humans, cats, etc on a real system in terms of time and cost. [At AIIMS (receives more than 2k patients in a day), EEG recordings are given after a week of testing and patients are called more than once for some minor change in medications. This can be reduced significantly via simulation.]

Tag Line:
Study the EEG patterns to find diseases, abnormalities, etc using my designed software.

Consumers: B2B model where second B is research labs and RnD departments of medical industry.

So, you have an EEG recording of an activity X, you then make some change in the model(say membrane weight, etc) and then simulate EEG readings using this software. Now, compare the two readings for the same activity X and draw out your conclusions based on the differences in the readings.

What Change would this tool bring?

1. **Given the current inefficient system of subjecting humans, cats, etc on a real system(real machine on a subject) is impractical, often because of cost or time; this software would enable you to work more on your hypothesis and analysis**
2. **Identify diseases faster and with more accuracy**
3. **Build consumer behaviour driven tools in any industry using medical inputs.**

In what ways will the consumer be benefitted?

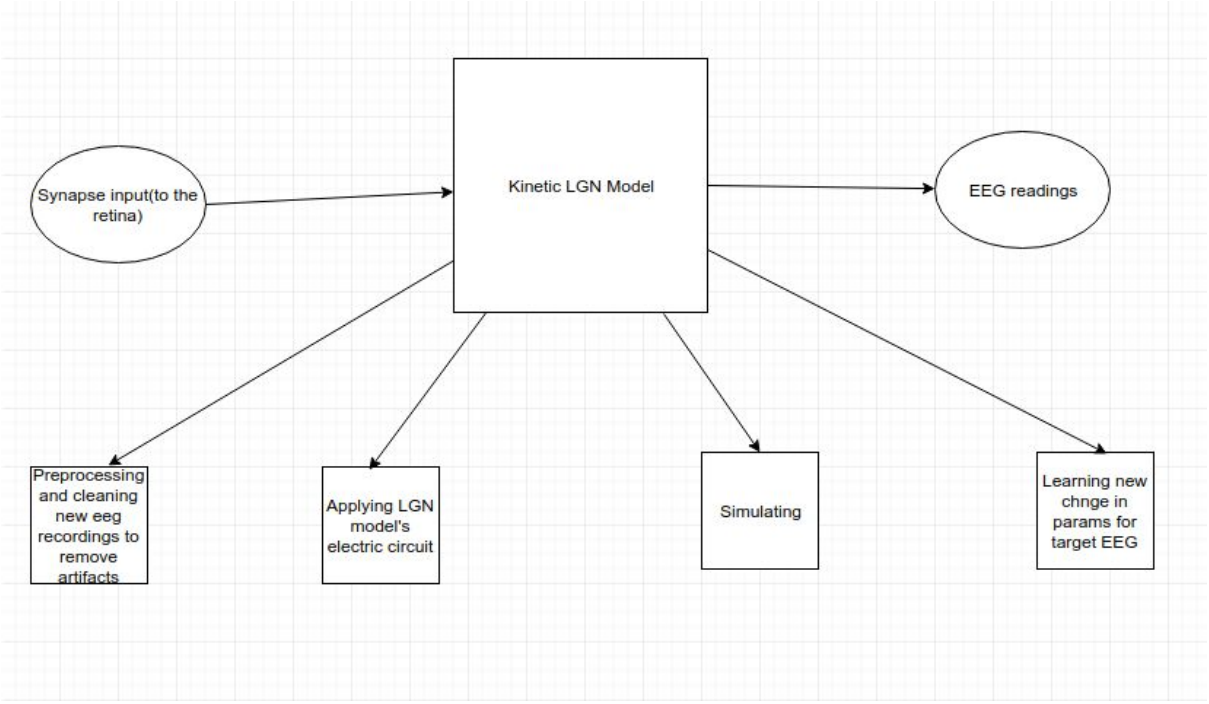
1. **EEG simulation used in research can provide important information about disease trends and risk factors, outcomes of treatment.**
2. **Mimicking brain rhythms of both health and disease conditions.**

Novelty:
The biological model which is used to make this software already exists, however, no software is found to use this model. It is faster and cheaper in terms of computation. Faster by a factor of 10 than the traditional ross alpha model earlier proposed for simulation. Cheaper as no heavy processing is involved, a 4GB RAM PC can run the software within 2 seconds: easily scalable.

However, my product is not a mere implementation; for I have kind of optimised the synapse weight and applied Machine learning to make this model more flexible: be able to simulate different states of brain: resting, gaming(flight state).

Further extensions/improvements/versions:
Introduce plasticity as in the real world to imitate learnings of humans(probably mammals) as one of the primary use case of this simulator.

System Architecture:



Detailed Problem:

In order to gather EEG data, humans are used in neuro-scientific trials. Gathering EEG readings with varied customizations(changing certain processing parameters in the biological model) as a part of a research or experimentation (or both) on a real system(real machine on a subject) is impractical, often because of cost or time. Consumers: Researchers in Universities and in RnD departments in industry: tech, medical, consumer pattern, data driven companies.

Tag Line:
The motivation for these works have been to take a step forward in building computational tools that can complement experimental research in understanding the underlying cellular mechanisms of anomalous EEG signals in neurological and psychiatric disorders. "*Simulate EEG corresponding to different states of the brain like resting, gaming, etc.*"

What change would this simulation bring?

1. **More work on your hypothesis and analysis. Simulation tool can also be used in a lot of other tools for eg "Imitate Individual's learnings by membrane plasticity" will be using simulated data with different levels of concentrations of Calcium in the membrane layer(for eg) needs simulated EEG data for different levels of conc**
2. **Identify diseases faster and with more accuracy**
    a. **Once you have a validated data from a validated model, you can generate more data without human input and hence, experiment with statistical models of the membrane layer in thalamus eg frequency, leakage current, etc.**
3. **Build consumer behaviour driven tools: reading EEGs on certain inputs for eg on a certain Android game, study what EEGs are generated and then study which state of mind does this data correspond to(if drowsing, is it a boring game?)**

In what ways will the end consumer be benefited?

1. **EEG simulation used in research can provide important information about disease trends and risk factors, outcomes of treatment.**
2. **Set a 'trend' of adopting neural mass models of thalamocortical circuitry in clinical neuroscience research towards mimicking brain rhythms of both health and disease conditions**
3. **Similarly, thalamocortical dysrhythmia (TCD), a shift of peak frequency from alpha to theta, is an EEG marker of several disorders such as Tinnitus, Neurogenic Pain, Depression**
4. **Alpha to theta (4–7 Hz) shift is an EEG marker of brain state transition from quiet wakefulness (preceding sleep) to a state of drowsiness (sleep stage-I). At the same time, anomalies of alpha rhythmic oscillations are indicators of**

several disease conditions, for example ‘slowing’ (reduced frequency of peak power) of the alpha rhythm is a hallmark of EEG in Alzheimer’s disease

Novelty:
The kinetic model exists but no software is found to use this model. This model is better since it is faster and cheaper. Hence, finding diseases will be easier.

However, my product is not a mere implementation; for I have kind of optimised the synapse weight and applied Machine learning to make this model more flexible: be able to simulate different states of brain: resting, gaming(flight state).

Further extensions/improvements/versions:
Introduce plasticity as in the real world to imitate learnings of humans(probably mammals) as one of the primary use case of this simulator.