# Meeting Notes

### 11-06-2024

**Best ideas**

* Change topology (right now random in the code)
  + Check in the literature for known structures of the hippocampus
  + Create a section (rectangle shape or snake shape) with different layers. Keep attention to keep the density of the neurons the same. If you increase the size, increase the number of neurons (of the overall number, for the different layer it can be different). If it is too complicated, start with 2 or 3 of the layers instead of the 5-6 layers (cortical). In the hippocampus it is 4 layers. Check the documentation of Brian2.
* Change synaptic connections (in order to change the connectivity of neurons). Check with literature
* 🡪 both influence each other already (closer neurons have a higher probability of being connected)

**Other ideas**

* Influence of the locations of the device
* Model different kind of epileptic seizures (e.g. different frequencies)

**In the next step**

* parameter sensitivity analysis and explore the parameter space:
  + How do changes in baseline excitability levels (Eke\_baseline, Eki\_baseline), connection probabilities (p), and treatment parameters (e.g., device\_sensitivity, firing\_rate\_threshold, Eke\_treatment, Eki\_treatment) influence the simulation
* Evaluate treatment effectiveness – does the device effectively reduce or eliminate epileptic discharges?
* 🡪 optimize treatment: find the optimal combinations of treatment parameters that lead to the most effective suppression of epileptic discharges

**Possible Research Question**

How does the incorporation of anatomically accurate cortical / hippocampal layer topologies and synaptic connectivity patterns influence the suppression of epileptic discharges with the special device in the computational neural network model?

**Plan**

* Literature Review on the structural and functional organization of the cortex and hippocampus to inform the design of the network topology and synaptic connectivity rules
* Model Development with Brian2 to construct the new topologies and connectivity features
* Simulation under various conditions and altering parameters to observe their impact on network dynamics + analysis of the results to draw conclusions about the model's behavior and the efficacy of different treatment strategies.