COMS30017 Computational Neuroscience

Week 5 Problem sheet

Video 1

- Describe an experiment in which you can pharmacologically block a protein involved in LTP and use behavioral assays that would support the role of LTP in learning. In particular:
    - How would you assess the performance of animals?
    - Describe the difficulties with interpreting the results of such an experiment, why it is hard to conclude from it that LTP is sufficient for learning.
    - If you had the opportunity to do in electrophysiological recordings, how would you do them to give further support to your previous results (assuming they were positive)?
- Find a paper on topics in the video (e.g. HM, inception, or the Morris water maze), and write brief notes on it.

Video 2

- Discuss limitations of path integration as a navigational strategy.

Video 3

- Define pattern completion and separation: what do they do?
- How would we obtain total pattern completion (all inputs lead to completely overlapping output), and total pattern separation (all inputs lead to completely non-overlapping output). Is it possible or desirable to implement complete separation?

Video 4

- In the Hopfield network with a zero-threshold (\theta=0), consider the effect on the energy of setting a single neural activation, x_\alpha, to +1 or -1 while freezing all the other neural activations. Thus, show that asynchronous evolution always reduces the energy.