In Blodgett’s (1929) experiments, rats that were pre-exposed to a maze without rewards were able to learn a task on that maze faster. This phenomenon was termed latent learning. In this work we present a model of Blodgett’s multiple-T maze experiments, and we hypothesize that latent learning could be explained by improved replay events at the start of the rewarding trials due to having a “better cognitive map”.

Our replay model, based on Johnson & Redish (2005), updates intra-hippocampal synaptic weights during navigation. Then, during resting periods these weights are used to generate replay events which, when rewarded trials begin, can then be used to drive off-line learning.

We show that pre-exposed artificial rats are able to learn the task significantly faster, validating the hypothesis of the model. We also show that the effect is increased with the number of pre-exposed trials. We also present an analysis of the shortcomings of this replay model and propose possible solutions. This work is part of our current project on assessing the role of the intra-hippocampal synapse modulation in tasks reminiscent of the “Traveling Salesperson Problem” (TSP), where rats have to optimize their navigation to multiple rewarded feeders.

For future work, matrix dynamics that learn “the map” rather than “the path” could be used, but this would require adapting the current replay model to use this information, and somehow also store the traversed path information on it.