

Group 1: Project 3

1) Implement the model of Usher et al. (1999) and show that it reproduces the results shown in Figure 3. Explain why coupling is important for model performance.

2) How does the network's performance change in unstable environments (where the target and distractor change) or in environments where the target probability is low? How does coupling influence performance in these different environments?

3) Discuss how this account of norepinephrine and locus coeruleus might be related to work on pupillary correlates of change detection in dynamic environments (Nassar et al., 2012). See Aston-Jones & Cohen (2005, p. 421) for a review of evidence that pupil diameter tracks locus coeruleus activity.

References:

Aston-Jones, G. & Cohen, J.D. (2005). An integrative theory of locus coeruleus–norepinephrine function: adaptive gain and optimal performance. *Annual Review of Neuroscience*, 28, 403–450.

Nassar, M.R., Rumsey, K.M., Wilson, R.C., Parikh, K., Heasley, B., & Gold, J.I. (2012). Rational regulation of learning dynamics by pupil-linked arousal systems *Nature Neuroscience*, 15, 1040–1046.

Usher, M., Cohen, J.D., Servan-Schreiber, D., Rajkowski, J., Aston-Jones, G. (1999). The role of locus coeruleus in the regulation of cognitive performance. *Science*, 283, 549–554