Group 5: Project 1

1) Implement the leaky competing accumulator (LCA) and bounded diffusion (BD) models as described in Tsetsos et al. (2012). Show that the BD model predicts a primacy effect, as demonstrated by the motion pulse experiments of Kiani et al. (2008). In particular, these experiments found that adding a motion pulse to the stimulus had a stronger effect on decisions when the pulse was applied earlier. Then show that the LCA model predicts the opposite result (recency effect) when the leak parameter is strong relative to the inhibition parameter. Finally, show that the LCA model predicts a primacy effect when inhibition is strong relative to leak.

2) Compute the reward rate (total reward divided by total time) for the LCA model with different inhibition and leak parameter values. How do the optimal parameters change for early vs. late motion pulses?

3) Discuss the possible biophysical mechanisms that could give rise to LCA-like dynamics, using Wang (2012) as a reference.

References:

Kiani, R., Hanks, T.D., & Shadlen, M.N. (2008). Bounded integration in parietal cortex underlies decisions even when viewing duration is dictated by the environment. *Journal of Neuroscience, 28,* 3017-3029.

Tsetsos, K., Gao, J., McClelland, J.L., & Usher, M. (2012). Using time-varying evidence to test models of decision dynamics: bounded diffusion vs. the leaky competing accumulator model. *Frontiers in Neuroscience, 6,* 1-17.

Wang, X-J. (2012). Neural dynamics and circuit mechanisms of decision-making. *Current Opinion in Neurobiology, 22,* 1039-1046.