Cog Sci 242 **Unit 3 Lab Review** *Fall 2018*

This handout contains a number of questions related to reviewing for the Unit 3 Exam which the partners and computing resources of lab can be helpful in addressing.

Understanding the Role of Lateral Inhibition in the Salience Map

I've placed three new MATLAB functions in our directory on the S: drive:

SalienceMap2, *AverageSalienceMap2*, and *SalienceMap2_MAPlot*.

1. Begin by using the **type** command to read each of these functions in turn.

- How is Gaussian noise generated in *SalienceMap2*?

- How many runs of *SalienceMap2* are averaged together in *AverageSalienceMap2*?

- What is the syntax for *SalienceMap2_MAPlot*?

- How is a plot of average mean activation vs. set size created and labeled in *SalienceMap2_MAPlot*?

SalienceMap2 is the heart of this set of functions. It performs the essential calculations of the network through 50 iterations, and in this way is similar to the Excel file *Cog Sci 242 F18 SalienceMap.xlsx* .

2. From the topmatter comments for *SalienceMap2*, record the <u>range of values</u> to use for the parameters *alpha*, *beta*, and *sigma*.

3. Now consider the following figure from Sengupta et al. (2014).[1]

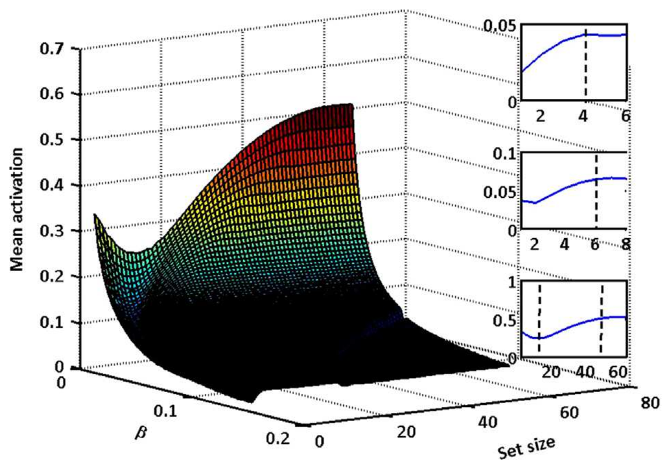

Fig. 2 – Mean activation vs. set size and β. The plot was derived at $\alpha=2.2$ as an average of 100 simulations. The insets show the mean activation vs. set size plot for three particular β values – low: 0.01 (bottom inset), medium: 0.1 (middle inset), and high: 0.15 (top inset). The vertical line in the insets denotes the limits to the monotonic region. For instance we can see from the top inset that the mean activation ($\bar{x}(n)$) is monotonically increasing up to set size 4 for high β, but for low β (bottom inset) we can see that $\bar{x}(n)$ is monotonically increasing with numerosity for set sizes greater than 15. The dashed lines in the insets provide the limits of the monotonic region in the insets.

Focus on the small inset graphs at the top right of this figure.
From reading the caption, determine the values of *beta* to use to produce each graph.
Then **use *SalienceMap2_MAPlot* to produce each of these graphs yourself**!

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[1] Sengupta, R. et al. (2014). A visual sense of number emerges from the dynamics of a recurrent on-center off-surround neural network. *Brain Research* 1582, 114-124.

4. Sengupta et al. call attention to "monotonic regions" in each of these graphs.

What does "monotonic" mean? Why is this relevant to the purpose of a salience map?

5. Now open *Cog Sci 242 F18 SalienceMap.xlsx*, which you'll find in the *Unit 3 Classes* folder on our Moodle site.

Scroll to the bottom of the main table of calculations. Notice that Cowan's K is being computed. How is it being computed? In particular, you need to determine how the probabilities of a hit and of a false alarm are being computed.

6. Knops et al. used this network with $\beta = 0.28$ to simulate a visual short-term memory faced with a demanding visual memory task, and they used the network with $\beta = 0.12$ to simulate subitizing.

Perform several runs under each condition. Do the results you obtain make sense according to the interpretation of Knops et al.?

7. With your lab partners, carefully read through the "Analog Magnitude Model" section of the *Unit 3 Review Guide*.

Check your understanding of all the "You Should Know" items at the end of that section.

Write summaries of each of these in the space below, and ask questions if you're not sure of something!