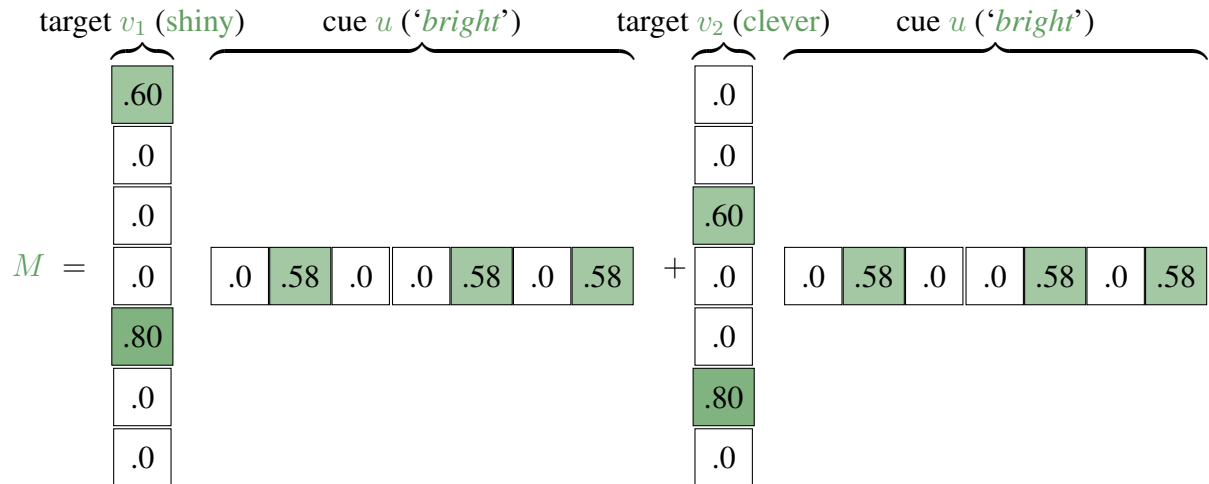


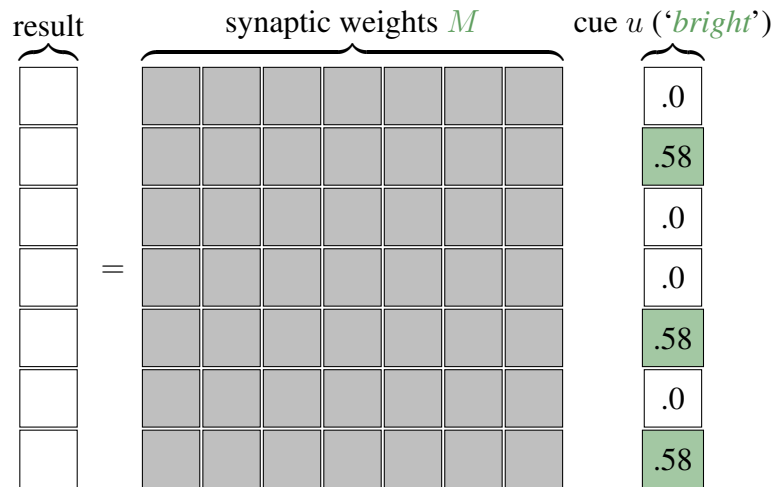
LING5702: Problem Set 3

Due via Carmen dropbox at 11:59 PM 2/17.

1. (a) [7 pts.] If associative memory M is made from one cue u and two targets v_1 and v_2 :

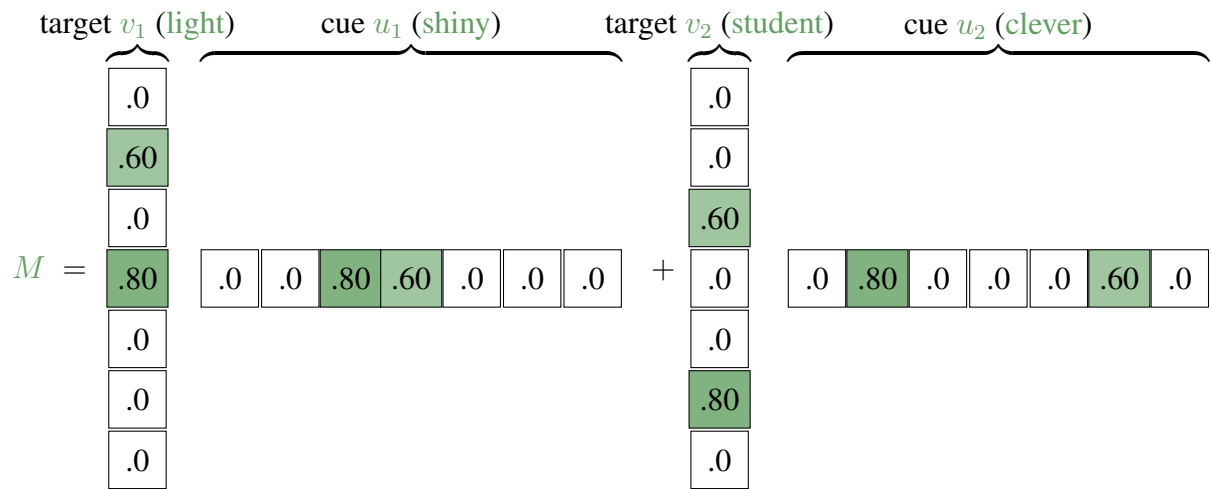


what is the result of cueing M with u ? (HINT: You don't need to calculate the matrix!)

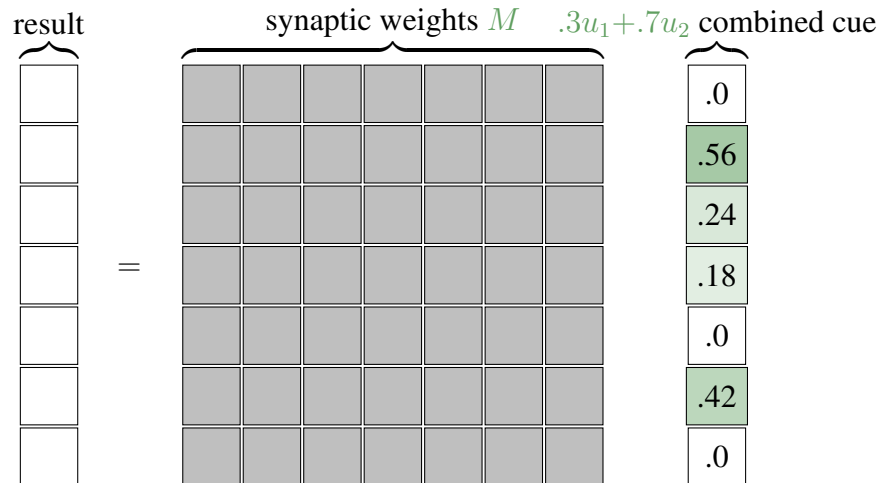


- (b) [3 pts.] Describe the result in a sentence in terms of v_1 and v_2 .

2. (a) [7 pts.] If associative memory M is made from cues u_1 and u_2 and targets v_1 and v_2 :



what results from cueing M with a mixture of $.3u_1 + .7u_2$? (You needn't calculate the matrix!)



- (b) [3 pts.] Describe the result in a sentence in terms of v_1 and v_2 .

3. (a) [7 pts.] If a filter F is made from auto-associated vectors v_1 and v_3 (NOTE variable names!):

$$F = \begin{matrix} v_1 \text{ (light)} \\ \begin{bmatrix} .60 \\ .0 \\ .80 \\ .0 \\ .0 \\ .0 \\ .0 \end{bmatrix} \end{matrix} + \begin{matrix} v_3 \text{ (flight)} \\ \begin{bmatrix} .0 \\ .0 \\ .0 \\ .58 \\ .58 \\ .58 \\ .0 \end{bmatrix} \end{matrix}$$

The diagram shows the construction of filter F as the sum of two auto-associated vectors. The first vector, labeled v_1 (light), is a 7x1 column vector with values [.60, .0, .80, .0, .0, .0, .0]. The second vector, labeled v_3 (flight), is a 7x1 column vector with values [.0, .0, .0, .58, .58, .58, .0]. The resulting filter F is a 7x7 matrix, which is the outer product of the first vector and the second vector. The matrix is shown as a 7x7 grid of cells, with the first column containing the values of the first vector and the first row containing the values of the second vector. The diagonal elements are the products of the corresponding elements in the two vectors: .60, .0, .80, .0, .0, .0, .0.

what is the result of cueing F with a mixture of $.2v_1 + .8v_2$? (You needn't calculate the matrix!)

$$\text{result} = \text{filter } F \cdot (.2v_1 + .8v_2 \text{ combined cue})$$

The diagram shows the calculation of the result of cueing the filter F with a mixture of $.2v_1 + .8v_2$. The result is a 7x1 column vector with values [.12, .64, .16, .0, .0, .0, .48]. The filter F is a 7x7 matrix, and the combined cue is a 7x1 column vector with values [.2, .8, .0, .0, .0, .0, .0]. The result is calculated as the product of the filter F and the combined cue.

- (b) [3 pts.] Describe the result in a sentence in terms of v_1 , v_2 and v_3 .
4. (a) [3 pts.] Using the grammar rules defined in the lecture notes on syntax, draw an analysis tree for the sentence *Who will leave?* using the following categories:
- **N-iN** for *Who*
 - **V-aN-b(B-aN)** for *will*
 - **B-aN** for *leave*
- (b) [3 pts.] Label the rules used in your analysis.

5. (a) [3 pts.] Using the grammar rules defined in the lecture notes on syntax, draw an analysis tree for the sentence *Who do you think left?* using the following categories:
- **N-iN** for *Who*
 - **V-aN-b(B-aN)** for *do*
 - **N** for *you*
 - **B-aN-bV** for *think*
 - **V-aN** for *left*
- (b) [3 pts.] Label the rules used in your analysis.