

CS786 Quiz 4

Q1. The Atkinson-Shiffrin model. (a) Diagrammatically describe the model? (3 marks)

(b) What are the functional commitments about the interactions between different memory components that the model makes? (3 marks)

(c) What are the capacity limitations and timescales of each of the memory model components? (3 marks)

(d) What is the model's explanation for (a) primacy and (b) recency effects? (3 marks)

(e) A human infant has no linguistic capacity. What would this model say about its memory? Would it say anything about how we never have any memory of our early childhood? (3 marks)

Q2.Encoding-retrieval entanglement. (a) If I want to retrieve content from a random access memory with n locations, how many locations must I look in to find the content I'm looking for? Can this looking fail? How? What about if I'm retrieving content from a content addressed memory? How many locations would I have to look in? Can this looking fail? How? (5 marks)

(b) What factors make a retrieval cue a good one? Why? (5 marks)

(c) Here is a simple model of memory encoding. Every time I see an item X alongside a cue Y , I form an association represented by the conditional probability $p(x_i|y_j)$. The probability that I will successfully remember x_i when presented with y_j is proportional to this probability. Let's say I run a memory experiment involving a bunch of items X associated with a single cue ($Y = \{y\}$). What would the graph of presentation position at the time of encoding vs recall accuracy look like? How could I change this model to make the graph look like what is seen in real memory experiments of this nature? (5 marks)

Q3. SAM. (a) What is the difference between recognition and recall memory? How is memory performance measured in both paradigms? (4 marks)

(b) The SAM model differentiates between successful sampling of memory, and successful retrieval of item. Why? What does the probability of sampling a particular memory depend on? What does the probability of retrieving an item correctly depend on? (5 marks)

(c) Depict algorithmically the process used to model (i) recognition and (ii) recall by SAM? (6 marks)

Q4. Memory associativity. You are given the semantic network inside someone's head represented as the activation matrix M , where M_{ij} represents the probability that activation of the i th node in the network will stimulate activation of the j th node. How would you calculate the probability of retrieving item j , given item i as a retrieval cue? Hint: use what you learned in algorithms class, mindful of the constraints on human memory we've discussed (10 marks for giving me a algorithm, 5 for it to be biologically realistic)

Q5. TCM. Complete the temporal context model given in the assignment (10 marks) and modify it so it can predict useful spacing of study intervals (10 marks) by inferring drift of contextual cues from context observations (details in skeleton code). (20 marks)