Psych 429: Homework 1

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09/12/17

Question 1: Serial Position Curve

One of the major laws memory is the law of recency, observing that recent memories are more easily retrieved than distant ones. For this reason, in a free recall experiment, people are more likely to recall the last few words given to them. For example, Figure 1A and 1B show examples of serial position curves for two subjects demonstrating the recency effect. In parallel to the recency effect is the primacy effect, the observation that subjects often exhibit superior memory for the first few items in a series. Figure 1C and 1D show examples of serial position curves for two subjects demonstrating the primacy effect. These data thus support these two laws.

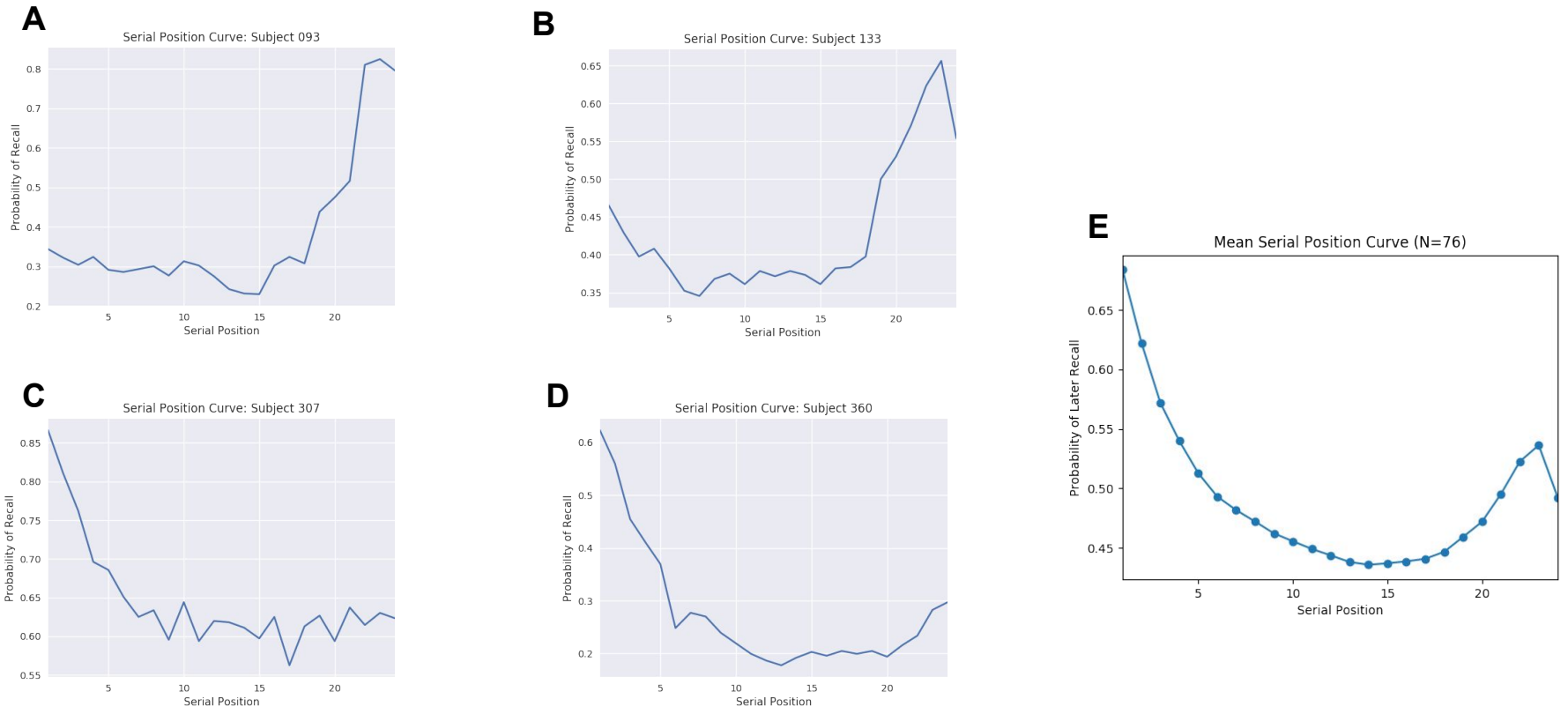


Figure 1:
(A-D) Example Serial Position Curves for Individual Subjects, averaged over all sessions and all trials
(E) Average Serial Position Curve over all subjects (N=76)

Question 2: Inter Response Time

In a free recall experiment, the subject simply recalls any of the words that he/she remembers being on the list. However, often times some memories are “easier” to retrieve than others. Here, a useful measure of how “easy” a memory was to retrieve can be the time spent retrieving it. Figure 2 shows how the memory retrieval time increases exponentially as the subject remembers more words. Each curve represents a trial in which the subject remembered a certain number of the words. For that total number of recalled words, the shape of the curve shows that the time required for retrieval of the memories grew exponentially as the subject tried to recall more and more words. Here, intrusions and repetitions were deleted from the data as responses, as they are not true memories and thus should not be considered as memories that were retrieved.

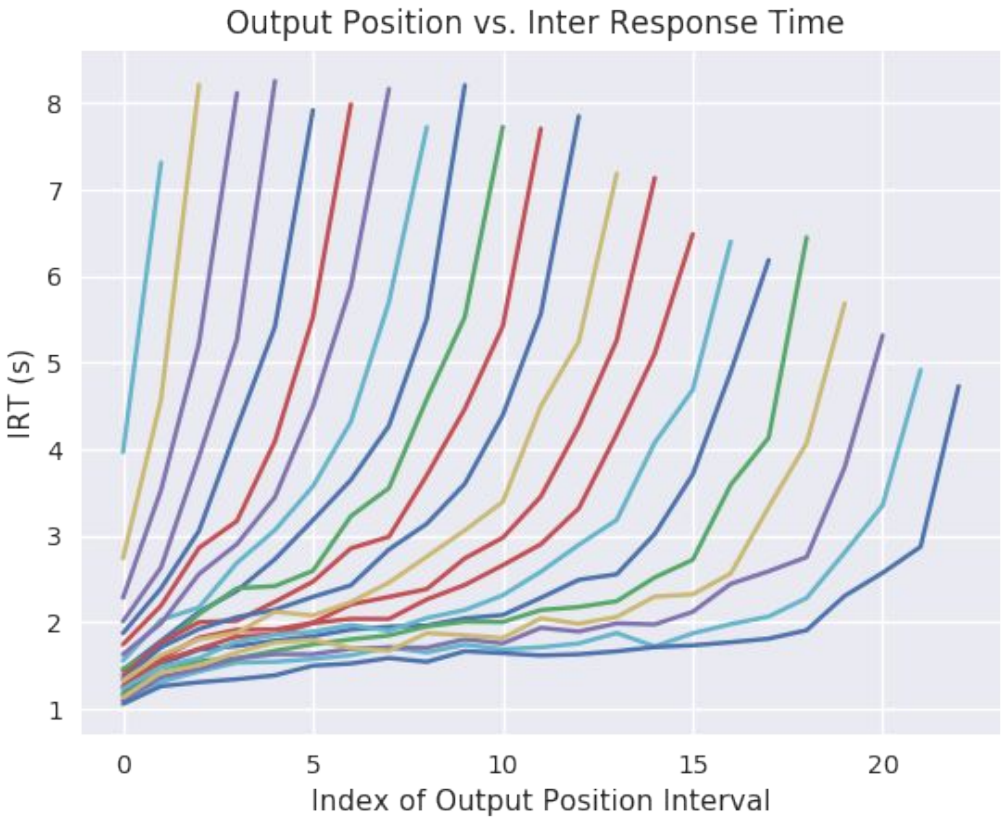


Figure 2:
Each of the curves represents the average IRT as a function of output position for a specific total recall amount. This family of curves share the same shape, but are scaled according to their TR value. These curves are the average across all subjects (N=76), across all sessions (N-23), across all recall trials that shared that number of recalled words (TR1=TR2=TR3...)

Question 3: Lag CRP

Here we examine temporal clustering in free recall. Since the subjects were able to recall words in any order, it is interesting to look at which order they did in fact use. Here we analyze the probability that a subject recalled the words in temporal clusters. For any given word that was remembered, what was the probability that the subject also remembered the word immediately before it, immediately after it, etc.? Here we plotted the conditional probability of words of various lags from another word (defined as positive for words that were presented after the recalled word and negative for words presented before) being recalled given that the other word was remembered. We see that there is strong temporal clustering for lags in both directions, slightly favoring the positive direction over the negative. These results are a demonstration of the law of contiguity.

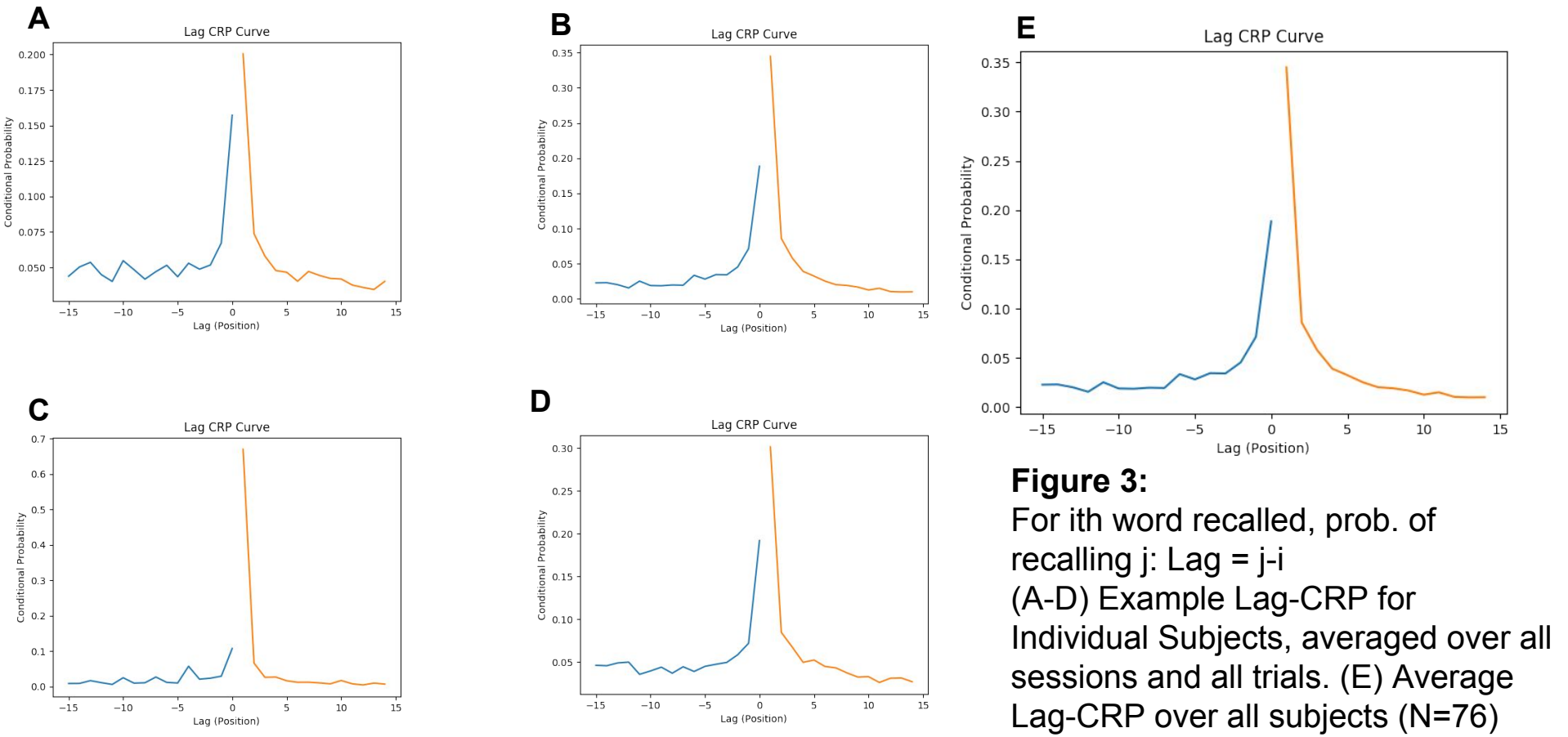
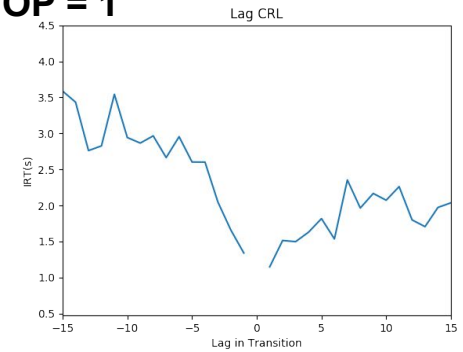


Figure 3:
For ith word recalled, prob. of recalling j: Lag = j-i
(A-D) Example Lag-CRP for Individual Subjects, averaged over all sessions and all trials. (E) Average Lag-CRP over all subjects (N=76)

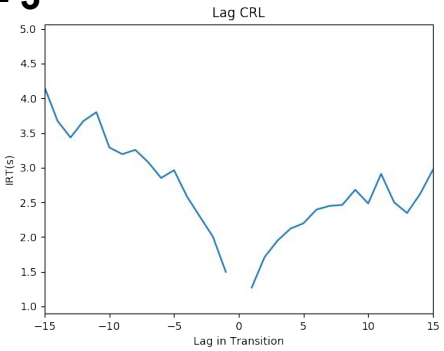
Question 4: Lag CRL

Similar to the Lag CRP, the Lag CRL looks at the Inter Response Time as a function of lag, as defined above. Here we see that transitions made in temporal proximity were much faster than transitions made from places further away in the list. This shows that the law of contiguity is not only relevant for probability of recall, but it also relevant for the speed of recall. Its shape is similar to the inverse of the CRP curve, as here the y-axis increases as it takes longer to retrieve, showing that smaller values for smaller lags demonstrate the law of contiguity. This effect is less pronounced for the first few output positions, perhaps due to the nature of the first few recalls in a list being more rapid and random, possibly causing them to be less confined to the law of contiguity.

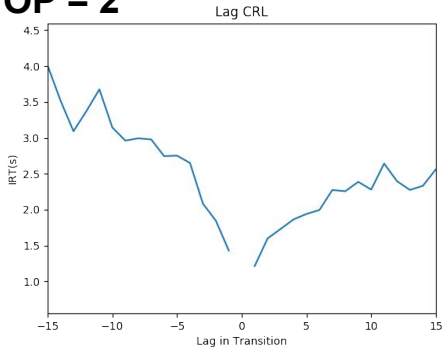
OP = 1



OP = 3



OP = 2



Mean for all OPS

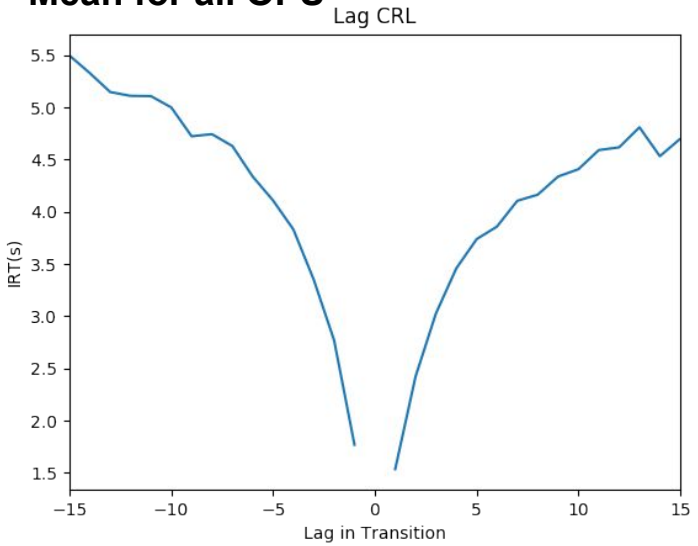


Figure 4:
For ith word recalled, IRT for recalling j after j-1: Lag = j-i
(A-C) Lag-CRL for first few output positions
(D) Average Lag-CRL over all output positions

Question 5: Prior-List Intrusions

Since the subjects were given a different list each trial, often they confused a word from a previous trial's list as belonging to the current list they were supposed to recall. We call an incorrect recall an "intrusion," and this specific type a "prior list intrusion" (PLI). Due to a broader application of the law of contiguity, we see that PLIs are more common when the prior list comes from the trials immediately preceding the current list. This shows that the law of contiguity applies to intrusions as well, showing how the recently completed trials' lists are still extant in the memory of the subjects, and intrude on the current list, and the more recent the trial the more intrusion it causes. We started the intrusion analysis at trial 10 so as to ensure that there were enough prior lists possible to cause intrusions. Otherwise we would be biasing towards small numbers of recency artifactually.

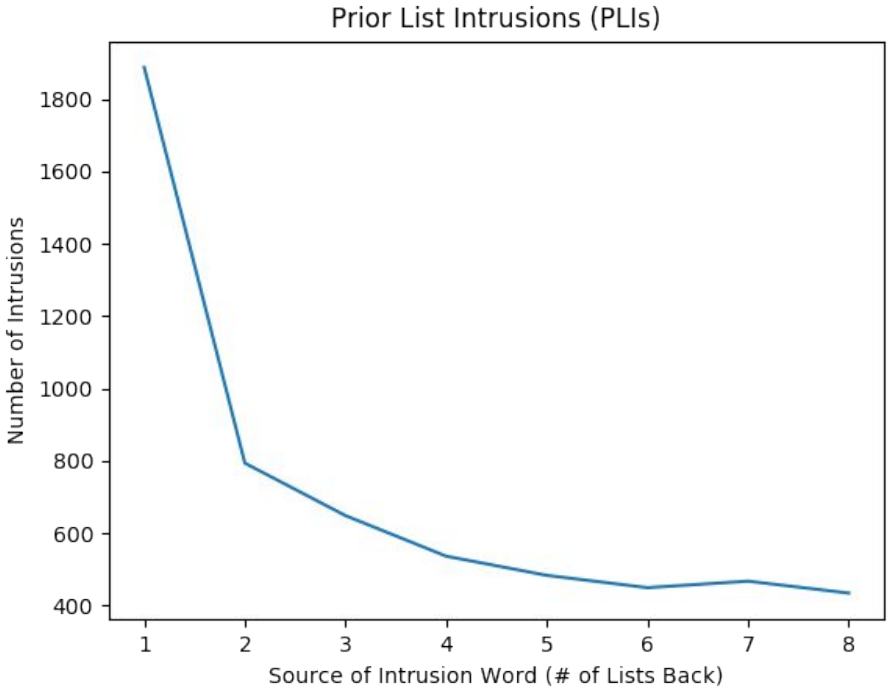


Figure 4:
Prior list intrusion occurrence as a function of recency of intruding trial.
We looked at intrusions from trial 10 and onward, and counted how many trials ago the intrusion word was a recall word. The y-axis is the total amount of intrusions seen at that trial recency
Average over all subjects, sessions, and trials (10 and on)