I want you to create a full experiment using PsychToolbox. This is a fairly simple experiment, but a full experiment nonetheless.

In a classic recognition memory experiment, subjects first study a list of items one at a time. After study, subjects are tested on old items and new items one at a time and simply need to decide whether every test item is “old” (studied) or “new” (not studied).

For this experiment, your items will be images of common objects. The images I want you to use are available on Tim Brady’s web site at UCSD: bradylab.ucsd.edu/stimuli.html. These images were used in this well-known paper: Brady, T. F., Konkle, T., Alvarez, G. A., & Oliva, A. (2008). Visual long-term memory has a massive storage capacity for object details. Proceedings of the National Academy of Sciences, USA, 105 (38), 14325-14329. For this assignment, use the image set linked under 2400 Unique Objects.

In addition to demonstrating that you can implement a well-designed experiment, I want you to show me that you can code up your experiment efficiently and logically, with comments and proper structure. Use proper Matlab and PsychToolbox style as it relates to displaying images, controlling display timing, obtaining responses and response times, using try-catch to recover gracefully from errors, and the like. Make sure you seed the random number generator so that different runs of the experiment produce different randomizations, but also make sure that the seed is saved so that the experimental sequence can be reproduced.

I also want to see that your code is flexible enough to allow several aspects of the experiment to be parameterized by the experimenter. Before launching PsychToolbox, your program should ask the experimenter to enter in (a) the length of the study list (between 5 and 50 images), (b) the time each study image is to be presented (in seconds, allowing for times less than a second to be entered), and (c) the length of the break between the study and test phase (in seconds). These can be entered using the getinfo command from the Command Window, but you should make sure you check that the values entered are valid. I will try to “break” your program when I grade it.

For the study phase, you should randomly select the specified number of study images needed from the folder of images you downloaded. You should use the technique demonstrated in class of reading a folder of files names, not hard-coding the image names into Matlab. I want to see that you use Textures for displaying images in PsychToolbox in the appropriate way, as discussed in class.

Of course, these study images should be presented in random order to the subject.

Each study image should be presented one at a time, with the presentation time given by the time entered by the experimenter. Assume a 0.5 second blank interval between study
items (but make sure your program is coded so that this is a variable that can easily be found and set to a different value if needed).

I will want test to make sure your actual study sequence timing matches precisely (within a few milliseconds) what it should be based on the length of the study list and the time each study image is to be presented. So please add a \( t_1 = \text{GetSecs}; \) at the start of the main code for your study sequence, add a \( t_2 = \text{GetSecs}; \) at the end of the main code for your study sequence, and compare \( t_2 - t_1 \) with what that time should be based on the study parameters entered at the start of the program.

For the test phase, you should randomly select an equal number of new images from the folder of images. Old items and New items should be randomly intermixed. Each test image should be presented until the subject makes an old/new recognition response. You should add some text on the screen telling the subject (and me) which button corresponds to “old” and which button corresponds to “new”.

Record both the choice and the response time using the methods we discussed in class. Since you are recording response times, make sure you catch cases where someone hits an invalid key first.

I want you to write out a well-formatted text data file that not only contains the recorded data and all relevant trial-related information but also contains a header in the first few lines of the data file that would allow someone to understand the conditions under which these data were collected.

Also write a short program that reads your text file and stores the data internally in a format that would allow you to analyze it. For this assignment, I simply want you to calculate (and print to the Command Window) the proportion of hits (saying “old” to an old image) and proportion of false alarms (saying “old” to a new image).

Note: We will cover file I/O in detail in class on November 5th.

For this assignment, you can assume that a subject only participates in one study-test sequence. But you should write your code so that it would be relatively easy for someone to take what you wrote and embed it in a larger program where, for example, each subject might study lists of three different lengths and study images for one of two different study intervals. So while I’m not asking you to write code for this more complex experiment, I am asking you to write your code so that it could be easily ported over and used in a more complex experiment. That means that you will need to break down your code into logical functions that can be reused.

*Unexcused late assignments will be penalized 10% for every 24 hours late, starting from the time class ends, for a maximum of two days, after which they will earn a 0.*