

## Neuroscience 721, section 1 (Fall 2020): Seminar in Neuroscience

### Course Description:

This is a weekly seminar on Neural Networks of Learning and Memory.

### Learning Outcomes and Course Expectations:

Students in this course will learn about the neural basis of learning and memory from a systems neuroscience perspective; how to read scientific articles; and how to lead seminar discussions.

Students are expected to attend class and do all readings before the material is covered in class. If students do not attend class, they will be held responsible for all material covered in class as well as announcements that are made. The instructor WILL NOT make missed notes available. **Electronic devices other than those being used for taking notes are to be turned off during class.** Any disruption may result in excusal.

### Assignments:

1. **Participation** counts for **40%** of the course grade.
2. **Presentation** to the class counts for **20%** of the course grade.
3. **Writing** responses to assigned reading count for **20%** of the course grade.
4. **Final paper** counts for **20%** of the course grade.

### Grading Scale, Curving, and Disputes:

**A** = 93 – 100%; **A-** = 90 – 92%; **B+** = 87 – 89%; **B** = 83 – 86%; **B-** = 80 – 82%; **C+** = 77 – 79%; **C** = 73 – 76%; **C-** = 70 – 72%; **D** = 60 – 69%; **F** = 0 – 59%.

It is possible that the final grade or individual assignments will be **curved**.

**DO NOT come to office hours to dispute grading.** If you have any dispute regarding grading, you must email the Instructor stating: 1) assignment in question, 2) question number if applicable, 3) your dispute, 4) what action you feel should be taken (e.g., how many points you should receive on the question).

### Schedule (subject to change):

Week	Topic
1	Introduction, Methods Overview
2	The Hippocampus
3	The Hippocampal Circuit
4	Hippocampal Units– Place Cells
5	Hippocampal Units – Place Cells cont'd.
6	Hippocampal Units –Replay
7	Hippocampal Units – Episodic memory
8	Entorhinal Cortex- Grid cells
9	From Grids to Places
10	Theta Rhythm - Overview
11	Theta Rhythm – Units
12	Theta Rhythm – Circuit interactions

13	Working Memory – Lessons from imaging
14	Working Memory – Lesion studies
15	Working Memory – Units and ensembles

**Readings:**

J Neurol Neurosurg Psychiatry. 1957 Feb;20(1):11-21.

Loss of recent memory after bilateral hippocampal lesions.

SCOVILLE WB, MILNER B.

Nature. 1982 Jun 24;297(5868):681-3.

Place navigation impaired in rats with hippocampal lesions.

Morris RG, Garrud P, Rawlins JN, O'Keefe J.

Behav Neurosci. 2005 Feb;119(1):145-53.

The role of hippocampal subregions in detecting spatial novelty.

Lee II, Hunsaker MR, Kesner RP.

Philos Trans R Soc Lond B Biol Sci. 1982 Jun 25;298(1089):83-95.

A memory system in the monkey.

Mishkin M.

Brain Res. 1971 Nov;34(1):171-5.

The hippocampus as a spatial map. Preliminary evidence from unit activity in the freely-moving rat.

O'Keefe J, Dostrovsky J.

Exp Neurol. 1976 Apr;51(1):78-109.

Place units in the hippocampus of the freely moving rat.

O'Keefe J.

J Neurosci. 1987 Jul;7(7):1935-50.

Spatial firing patterns of hippocampal complex-spike cells in a fixed environment.

Muller RU, Kubie JL, Ranck JB Jr.

Science. 1993 Aug 20;261(5124):1055-8.

Dynamics of the hippocampal ensemble code for space.

Wilson MA1, McNaughton BL.

Neuron. 2001 Jan;29(1):145-56.

Temporally structured replay of awake hippocampal ensemble activity during rapid eye movement sleep.

Louie K1, Wilson MA

Nature. 2013 May 2;497(7447):74-9. doi: 10.1038/nature12112. Epub 2013 Apr 17.

Hippocampal place-cell sequences depict future paths to remembered goals.

Pfeiffer BE1, Foster DJ.

J Neurosci. 1987 Mar;7(3):716-32.

Cue-sampling and goal-approach correlates of hippocampal unit activity in rats performing an odor-discrimination task.

Eichenbaum H, Kuperstein M, Fagan A, Nagode J.

Nature. 1999 Feb 18;397(6720):613-6.

The global record of memory in hippocampal neuronal activity.

Wood ER1, Dudchenko PA, Eichenbaum H.

Nature. 2005 Aug 11;436(7052):801-6. Epub 2005 Jun 19.

Microstructure of a spatial map in the entorhinal cortex.

Hafting T1, Fyhn M, Molden S, Moser MB, Moser EI.

Nature. 2007 Mar 8;446(7132):190-4. Epub 2007 Feb 25.

Hippocampal remapping and grid realignment in entorhinal cortex.

Fyhn M1, Hafting T, Treves A, Moser MB, Moser EI.

Neuron. 2008 Jan 24;57(2):290-302. doi: 10.1016/j.neuron.2007.11.034.

Impaired spatial representation in CA1 after lesion of direct input from entorhinal cortex.

Brun VH1, Leutgeb S, Wu HQ, Schwarcz R, Witter MP, Moser EI, Moser MB.

J Neurosci. 2009 Jun 10;29(23):7504-12. doi: 10.1523/JNEUROSCI.6048-08.2009.

The input-output transformation of the hippocampal granule cells: from grid cells to place fields.

de Almeida L1, Idiart M, Lisman JE.

Nat Neurosci. 2013 Feb;16(2):130-8. doi: 10.1038/nn.3304. Epub 2013 Jan 28.

Memory, navigation and theta rhythm in the hippocampal-entorhinal system.

Buzsáki G1, Moser EI.

Neuroimage. 2014 Jan 15;85 Pt 2:656-66. doi: 10.1016/j.neuroimage.2013.06.022. Epub 2013 Jun 14.

Theta rhythm and the encoding and retrieval of space and time.

Hasselmo ME1, Stern CE.

Hippocampus. 1993 Jul;3(3):317-30.

Phase relationship between hippocampal place units and the EEG theta rhythm.

O'Keefe J1, Recce ML.

Nat Neurosci. 2008 May;11(5):587-94. doi: 10.1038/nn.2106. Epub 2008 Apr 20.

Theta phase-specific codes for two-dimensional position, trajectory and heading in the hippocampus.

Huxter JR1, Senior TJ, Allen K, Csicsvari J.

PLoS Biol. 2005 Dec;3(12):e402. Epub 2005 Nov 15.

Theta rhythms coordinate hippocampal-prefrontal interactions in a spatial memory task.

Jones MW1, Wilson MA.

PLoS One. 2013 Oct 24;8(10):e77707. doi: 10.1371/journal.pone.0077707. eCollection 2013.

Directional theta coherence in prefrontal cortical to amygdalo-hippocampal pathways signals fear extinction.

Lesting J1, Daldrup T, Narayanan V, Himpe C, Seidenbecher T, Pape HC.

Neuroimage. 2001 Jul;14(1 Pt 1):48-59.

Direct comparison of prefrontal cortex regions engaged by working and long-term memory tasks.

Braver TS1, Barch DM, Kelley WM, Buckner RL, Cohen NJ, Miezin FM, Snyder AZ, Ollinger JM, Akbudak E, Conturo TE, Petersen SE.

J Cogn Neurosci. 2001 Nov 15;13(8):1059-70.

When keeping in mind supports later bringing to mind: neural markers of phonological rehearsal predict subsequent remembering.

Davachi L1, Maril A, Wagner AD.

Cereb Cortex. 2007 Sep;17 Suppl 1:i41-50.

The representation of multiple objects in prefrontal neuronal delay activity.

Warden MR1, Miller EK.

2015 Jun 19;348(6241):1352-5. doi: 10.1126/science.aab0551.

BRAIN PROCESSING. Cortical information flow during flexible sensorimotor decisions.  
Siegel M1, Buschman TJ2, Miller EK3.

### **Academic Misconduct**

Academic integrity is a legitimate concern for every member of the Campus community; we all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility, and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy, and are encouraged to always take the ethical path whenever faced with choices. Students enrolling at UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's educational mission. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another person, from the Internet or any other source without proper citation of the sources. See the Student Conduct Code, <https://www.unlv.edu/studentconduct/student-conduct>.

### **Auditing Classes**

Auditing a course allows a student to continue attending the lectures and/or laboratories and discussion sessions associated with the course, but the student will not earn a grade for any component of the course. Students who audit a course receive the same educational experience as students taking the course for a grade, but will be excused from exams, assessments, and other evaluative measures that serve the primary purpose of assigning a grade.

### **Classroom Conduct**

Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the rights of other students to learn or of instructors to teach. Use of electronic devices such as pagers, cellular phones, or recording devices, or potentially disruptive devices or activities, are only permitted with the prior explicit consent of the instructor. The instructor may rescind permission at any time during the class. If a student does not comply with established requirements or obstructs the functioning of the class, the instructor may initiate an administrative drop of the student from the course.

### **Copyright**

The University requires all members of the University Community to familiarize themselves with, and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The University will neither protect nor defend you, nor assume any responsibility for employee or student violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional copyright policy information is available at <http://www.unlv.edu/provost/copyright>.

### **Disability Resource Center (DRC)**

The UNLV Disability Resource Center (SSC-A, Room 143, <https://www.unlv.edu/drc>, 702-895-0866) provides resources for students with disabilities. Students who believe that they may need academic accommodations due to injury, disability, or due to pregnancy should contact the DRC as early as possible in the academic term. A Disabilities Specialist will discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your

Academic Accommodation Plan from the DRC to the instructor during office hours, so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

### **Final Examinations**

The University requires that final exams given at the end of a course occur on the date and at the time specified in the Final Exam schedule. The general schedule is typically available at the start of the semester, and the classroom locations are available approximately one month before the end of the semester. See the Final Exam Schedule, <https://www.unlv.edu/registrar/calendars>.

### **Identity Verification in Online Courses**

All UNLV students must use their Campus-issued ACE ID and password to log in to WebCampus.

UNLV students enrolled in online or hybrid courses are expected to read and adhere to the Student Academic Misconduct Policy, <https://www.unlv.edu/studentconduct/misconduct/policy>, which defines, “acting or attempting to act as a substitute for another, or using or attempting to use a substitute, in any academic evaluation or assignment” as a form of academic misconduct. Intentionally sharing ACE login credentials with another person may be considered an attempt to use a substitute and could result in investigation and sanctions, as outlined in the Student Academic Misconduct Policy.

UNLV students enrolled in online courses are also expected to read and adhere to the Acceptable Use of Computing and Information Technology Resources Policy, <https://www.it.unlv.edu/policies/acceptable-use-computing-and-information-technology-resources-policy>, which prohibits sharing university accounts with other persons without authorization.

To the greatest extent possible, all graded assignments and assessments in UNLV online courses should be hosted in WebCampus or another UNLV-managed platform that requires ACE login credentials for access.

### **Incomplete Grades**

The grade of “I” (Incomplete) may be granted when a student has satisfactorily completed three-fourths of course work for that semester/session, but cannot complete the last part of the course for reason(s) beyond the student’s control and acceptable to the instructor, and the instructor believes that the student can finish the course without repeating it. For undergraduate courses, the incomplete work must be made up before the end of the following regular semester. Graduate students receiving “I” grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the period indicated, a grade of “F” will be recorded, and the student’s GPA will be adjusted accordingly. Students who are fulfilling an Incomplete grade do not register for the course, but make individual arrangements with the instructor who assigned the “I” grade.

## **Library Resources**

Librarians are available to consult with students on research needs, including developing research topics, finding information, and evaluating sources. To make an appointment with a subject expert for this class, please visit the Libraries' Research Consultation website: <http://guides.library.unlv.edu/appointments/librarian>. You can also ask the library staff questions via chat and text message at: <http://ask.library.unlv.edu/>.

## **Missed Classwork**

Any student missing class, quizzes, examinations, or any other class or laboratory work because of observance of religious holidays will be given an opportunity during that semester to make up the missed work. The make-up opportunity will apply to the religious holiday absence only. It is the responsibility of the student to notify the instructor within the first 14 calendar days of the course for Fall and Spring courses (except for modular courses), or within the first 7 calendar days of the course for Summer and modular courses, of their intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit the Policy for Missed Work, under Registration Policies, on the Academic Policies webpage, <https://catalog.unlv.edu/content.php?catoid=6&navoid=531>.

In accordance with the policy approved by the Faculty Senate regarding missed class time and assignments, students who represent UNLV in any official extracurricular activity will also have the opportunity to make up assignments, provided that the student provides official written notification to the instructor no less than one week prior to the missed class(es).

The spirit and intent of the policy for missed classwork is to offer fair and equitable assessment opportunities to all students, including those representing the University in extracurricular activities. Instructors should consider, for example, that in courses which offer a "Drop one" option for the lowest assignment, quiz, or exam, assigning the student a grade of zero for an excused absence for extracurricular activity is both contrary to the intent of the Faculty Senate's policy, and an infringement on the student's right to complete all work for the course.

This policy will not apply in the event that completing the assignment or administering the examination at an alternate time would impose an undue hardship on the instructor or the University that could reasonably have been avoided. There should be a good faith effort by both the instructor and the student to agree to a reasonable resolution. When disagreements regarding this policy arise, decisions can be appealed to the Department Chair/Unit Director, College/School Dean, and/or the Faculty Senate Academic Standards Committee.

For purposes of definition, extracurricular activities may include, but are not limited to: fine arts activities, competitive intercollegiate athletics, science and engineering competitions, liberal arts competitions, academic recruitment activities, and any other event or activity sanctioned by a College/School Dean, and/or by the Executive Vice President and Provost.

## **Rebelmail**

Rebelmail is UNLV's official email system for students, and by University policy, instructors and staff should only send emails to students' Rebelmail accounts. Rebelmail is one of the

primary ways students receive official University communications, information about deadlines, major Campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the University. Emailing within WebCampus is also acceptable.

### **Tutoring and Coaching**

The Academic Success Center (ASC) provides tutoring, academic success coaching, and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, please visit the ASC website, <https://www.unlv.edu/asc>, or call 702-895-3177. The ASC building is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of SSC A, Room 254. Drop-in tutoring is located on the second floor of the Lied Library, and on the second floor of the College of Engineering building (TBE A 207).

### **UNLV Writing Center**

One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, <https://writingcenter.unlv.edu/>, located in the Central Desert Complex, Building 3, Room 301 (CDC 3-301). Walk-in consultations are sometimes available, but students with appointments receive priority assistance. Students may make appointments in person or by calling the Center, 702-895-3908. Students are requested to bring to their appointments their Rebel ID Card, a copy of the instructions for their assignment, and two copies of any writing they have completed on their assignment.