GU4239: Cognitive neuroscience of narrative and film

Fall 2020 (3 points)

Section 1: Mondays 10:10-12:00
Section 2: Mondays 2:10-4:00

Instructor: Dr. Christopher Baldassano [c.baldassano@columbia.edu]
Office Hours Wednesday 3-4pm or by appointment

Prerequisites: UN1001 **and** instructor's permission

Course description: This seminar will provide a broad survey of how narrative stories, films, and performances have been used as tools to study cognition in psychology and neuroscience.

Detailed description: Stories and movies drive activity in almost every region of the brain, making them powerful stimuli for experiments in psychology and neuroscience. Understanding the construction, perception, and recall of narratives touches on many different areas of cognition, and provides a testing ground for applying theories based on highly-controlled experiments to more realistic, dynamic experiences. Each week we will discuss how a different field of cognition has been studied with naturalistic stimuli, with readings that include both primary results from specific experiments as well as review and theory papers that synthesize results from a body of research. You are expected to read all of the required papers before class and submit a brief response of questions or comments about the readings. Everyone will be responsible for a detailed presentation on two papers to the class, describing the primary arguments of the paper and proposing open questions for discussion. At the end of the course, you will discuss how the course topics relate to a specific movie of your choice, both in a written paper and by sharing a movie clip with the class.

Course goals and learning objectives: This seminar will expose you to cutting-edge research on the use of narrative stimuli to probe cognitive processes in the mind and brain, and provide you with a deep understanding of the promises, challenges, and open questions of this field.

- A primary focus of the course will be on presenting scientific material: summarizing complex research papers into their primary ideas, and constructing effective and engaging slide presentations.
- By reading and discussing research articles, the course will help you develop the skills to understand and critically evaluate academic papers.
- Through in-class discussions, you will gain experience in how to constructively debate scientific results and how to place scientific results in context.
- The final project will encourage you to creatively apply the course material to interpret a movie from a new perspective, connecting psychology research to the artistic domain of filmmaking.

Grading:

- **25% participation:** You are expected to come to class having read and thought about the week's assigned readings, and you should contribute to class discussions each day. If you unable to attend class (due to a religious holiday, illness, technical issues), you should email me to avoid losing participation points for that session.

- **20% Courseworks responses**: Every week (except for the first and last week), you should create a short (1-2 paragraph) post on the Courseworks Discussion board about the week's readings. This response should serve as a starting point for in-class discussions, such as:
    - Comments on experimental findings that you found particularly interesting or surprising, and why you found them surprising
    - Links between these readings and topics you have covered in other courses
    - Questions about specific parts of the analyses you found confusing or unclear
    - Questions about the rationale for the experimental design of the experiments, and proposals of alternative designs
    - Suggestions for follow-up experiments based on these results

  Each response will be graded out of 5 points: 2 points for posting, and 3 points for demonstrating that you have read and thought about the readings. You will also receive 1 point of extra credit if your post is selected by me as a topic for us to discuss in class. Brief feedback will be provided on your posts with suggestions for improvement. **Responses must be posted by Sunday night in order to receive credit.**

- **35% class presentations:** Everyone is required to give two 30-minute slide presentations during two class periods, on one of the papers assigned that week. Paper assignments will be decided during the first week. Each presentation will be graded out of 50 points:
    - 10 points: What question is this paper trying to answer? This will require reading some of the papers cited in this paper's introduction, to help provide context.
    - 10 points: For papers reporting a new experiment, what is the experimental method? For review or theory papers, what are the details of the theory or theories being proposed?
    - 10 points: What evidence is given in support of the hypothesis or theory?
    - 10 points: Propose questions for discussion. Are there potential weakness or limitations to the conclusions of the paper? Do these results connect to topics from other sessions of the class or from other classes you've taken? Do these findings have implications for how writing or filmmaking can be made more effective?
    - 10 points: Clarity of slides, presentation, and class engagement. Slides should consist primarily of figures, images, and diagrams with only small amounts of text. You should engage your classmates by posing questions throughout your presentation, and answering their questions about the paper (when possible).

  You do not need to cover all the details of paper, especially for experimental studies (e.g. the precise methodological details of how neuroimaging data was acquired or

stimuli were presented); your talk should focus on the on the main points and takeaway conclusions of the paper. Since reading and presenting academic papers is challenging, **all students must schedule a time to meet with me by the Friday before each of their presentations, at the latest**, to review the slides and to ask questions about confusing parts of the paper (a penalty of 5 points will be applied if the student does not schedule a meeting).

- **20% movie report and presentation:** By **6pm Eastern Time the day before the last class session**, you must submit a report (7-9 pages, double-spaced, excluding references) on a movie (or television show) of your choice. The content of the movie you select should be related to the cognitive psychology/neuroscience topics discussed in the course (e.g. memory, schemas, persuasion, magic). You should cite **at least four academic papers outside those on the course reading list.** This report will be graded out of 30 points:
    - 5 points: Summarize the movie, in terms of plot, characters, and themes.
    - 10 points: Discuss how the characters and events of the movie relate to cognitive neuroscience. If there is a character with a cognitive disorder or impairment, is their behavior realistic and consistent with studies of this disorder? If the movie describes cognitive enhancement through drugs or technology, how plausible is it based on current methods of brain modulation or stimulation?
    - 10 points: Discuss how the writing style, production style, editing techniques, and artistic style of the film relate to topics discussed in the course. For example, what techniques does the film use to direct the viewer's attention? How is information about a character's mind communicated or miscommunicated to the viewer or other characters? How does the movie manipulate temporal or spatial scales? How are boundaries marked between events? How are schemas or scripts used to enable or subvert predictions?
    - 5 points: In-class presentation. You should select a short (<5 minute) scene from their movie that is especially relevant to the topics of the course, and present this scene to the class. You should provide me with a link to the clip through Youtube or a video streaming service, or you can stream the video directly from your computer. You will briefly introduce the scene to the class and describe how it is related to our discussions.

  You are **required to submit a one-paragraph description of the movie you plan to write about and its relevance to the course before class on November 16** (otherwise a penalty of 5 points will be applied).

- Grades will be rounded *only* to the nearest 0.1%, and assigned letter grades as follows:

A+: 97-100%	B+: 87-89.9%	C+: 77-79.9%	D: 60-69.9%
A: 93-96.9%	B: 83-86.9%	C: 73-76.9%	F: 0-59.9%
A-: 90-92.9%	B-: 80-82.9%	C-: 70-72.9%	

Course rationale: This seminar is designed for graduate students, for advanced undergraduates majoring in Psychology or Neuroscience & Behavior, and for students participating in the Psychology Post-Baccalaureate Certificate program. It fulfills the following degree requirements:

- For graduate students, GU4239 can partially fulfill the seminar requirement for the M.A. or the elective requirement for the M.Phil.
- For the Psychology major or concentration in Columbia College and in the School of General Studies, and for the Psychology Post-Baccalaureate Certificate program, this class will meet the Group I (Perception & Cognition) distribution requirement.
- For the Neuroscience and Behavior joint major, it will fulfill the Psychology requirement for an advanced psychology seminar.
- For Psychology Post-Baccalaureate students and for Psychology majors, it will fulfill the seminar requirement.
- For the Barnard Psychology major, this class may fulfill the senior seminar requirement.

Academic integrity: Maintaining academic integrity is a critical responsibility of all Columbia students. Academic dishonesty includes (but is not limited to): plagiarism (using another person's work without attribution), misrepresentation of authorship (e.g. having work prepared by or purchased from someone else), and lying about completion of work (e.g. claiming that you submitted a post when you did not, or purposefully submitting a corrupted file to obtain more time to complete an assignment). Violations of the Honor Code will not only result in a failing grade for this course, but can also lead to serious disciplinary actions from the University, including expulsion. If you are falling behind in the course, know that you will be unable to finish work on time, or otherwise feel that you cannot complete your work, please talk to me as soon as possible to make a plan, rather than taking actions that will jeopardize your academic career.

Students with disabilities: In order to receive disability-related academic accommodations, students must first be registered with Disability Services (DS). More information on the DS registration process is available online at www.health.columbia.edu/ods. I must be notified of registered students' accommodations before exam or other accommodations will be provided. Students who have, or think they may have, a disability are invited to contact DS for a confidential discussion at (212) 854-2388 (Voice/TTY) or by email at disability@columbia.edu.

Online course expectations: All students should sign into Zoom *before* the start time of the class, to ensure that we can begin on time and give everyone their full 30-minute presentation slot. Keeping cameras on during class is highly encouraged but not required. Please keep your mic muted when not talking; you can unmute your mic to indicate to me and/or the speaker that you have a question and would like to speak. Classes will not be recorded.

Learning during 2020: This is a very unusual semester for all of us. All of you have had your lives disrupted, and for many of you or your family members you've lost jobs, been sick, and/or been given extra caregiving responsibilities. A study from the CDC found that 31% of all people in the US have been experiencing symptoms of anxiety or depressive disorders during the summer, and that number jumps to 63% for the 18-24 age group. If you are struggling with the course or facing logistical challenging participating in class, please contact me. All of the dates and requirements listed in this syllabus are flexible, and I can work with you if face changing circumstances over the semester. I hope that you will enjoy the class discussions and meet all the learning goals for the course, but your most important goal for this semester is to safeguard your mental and physical health.

Weekly topics and readings

September 14: Introduction (no Courseworks response required)
Hasson, U., Landesman, O., Knappmeyer, B., Vallines, I., Rubin, N., & Heeger, D. J. (2008). Neurocinematics: The neuroscience of film. *Projections*, *2*(1), 1–26.

Sonkusare, S., Breakspear, M., & Guo, C. (2019). Naturalistic Stimuli in Neuroscience: Critically Acclaimed. *Trends in Cognitive Sciences*. https://doi.org/10.1016/j.tics.2019.05.004

September 21: Directing attention
Smith, T. J. (2012). The Attentional Theory of Cinematic Continuity. *Projections*, *6*(1), 1–27.

Hutson, J. P., Smith, T. J., Magliano, J. P., & Loschky, L. C. (2017). What is the role of the film viewer? The effects of narrative comprehension and viewing task on gaze control in film. *Cognitive Research: Principles and Implications*, 2(1), 46.

Brunick, K. L., Cutting, J. E., & DeLong, J. E. (2013). Low-Level Features of Film: What They Are and Why We Would Be Lost Without Them. In *Psychocinematics: Exploring Cognition at the Movies*. New York: Oxford University Press, 133-148.

September 28: Theory of Mind
Moraczewski, D., Chen, G., & Redcay, E. (2018). Inter-subject synchrony as an index of functional specialization in early childhood. Scientific Reports, 8(1), 2252.

Paunov, A. M., Blank, I. A., & Fedorenko, E. (2019). Functionally distinct language and Theory of Mind networks are synchronized at rest and during language comprehension. *Journal of Neurophysiology*, 121(4), 1244–1265.

Yeshurun, Y., Swanson, S., Simony, E., Chen, J., Lazaridi, C., Honey, C. J., & Hasson, U. (2017). Same Story, Different Story. *Psychological Science*, *28*(3), 307–319.

October 5: Hierarchies of space and time
Lerner, Y., Honey, C. J., Silbert, L. J., & Hasson, U. (2011). Topographic mapping of a hierarchy of temporal receptive windows using a narrated story. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience*, *31*(8), 2906–2915.

Honey, C. J., Thesen, T., Donner, T. H., Silbert, L. J., Carlson, C. E., Devinsky, O., … Hasson, U. (2012). Slow cortical dynamics and the accumulation of information over long timescales. *Neuron*, 76(2), 423–434.

Cohn, N. (2013). Visual narrative structure. *Cognitive Science*, *37*(3), 413–452.

October 12: Making memories

Hasson, U., Furman, O., Clark, D., Dudai, Y., & Davachi, L. (2008). Enhanced intersubject correlations during movie viewing correlate with successful episodic encoding. *Neuron*, *57*(3), 452–462.

Ben-Yakov, A., & Dudai, Y. (2011). Constructing realistic engrams: poststimulus activity of hippocampus and dorsal striatum predicts subsequent episodic memory. The Journal of Neuroscience: The Official Journal of the Society for Neuroscience, 31(24), 9032–9042.

Cohen, S. S., & Parra, L. C. (2016). Memorable Audiovisual Narratives Synchronize Sensory and Supramodal Neural Responses. *eNeuro*, *3*(6), 1-11. *[presented by guest speaker]*

October 19: Retrieving memories

Milivojevic, B., Vicente-Grabovetsky, A., & Doeller, C. F. (2015). Insight reconfigures hippocampal-prefrontal memories. *Current Biology*, 25(7), 821–830.

Chen, J., Leong, Y. C., Honey, C. J., Yong, C. H., Norman, K. A., & Hasson, U. (2017). Shared memories reveal shared structure in neural activity across individuals. *Nature Neuroscience*, 20(1), 115–125.

Kauttonen, J., Hlushchuk, Y., Jääskeläinen, I. P., & Tikka, P. (2018). Brain mechanisms underlying cue-based memorizing during free viewing of movie Memento. *NeuroImage*, *172*, 313–325.

October 26: Evoking emotion

Lettieri, G., Handjaras, G., Ricciardi, E., Leo, A., Papale, P., Betta, M., Pietrini, P., & Cecchetti, L. (2019). Emotionotopy in the human right temporo-parietal cortex. Nature Communications, 10(1), 5568.

Sontheimer, A., Vassal, F., Jean, B., Feschet, F., Lubrano, V., & Lemaire, J.-J. (2017). fMRI study of graduated emotional charge for detection of covert activity using passive listening to narratives. Neuroscience, 349, 291–302.

Cowen, A. S., & Keltner, D. (2017). Self-report captures 27 distinct categories of emotion bridged by continuous gradients. Proceedings of the National Academy of Sciences of the United States of America, 114(38), E7900–E7909.

November 9: Event boundaries

Zacks, J. M., Speer, N. K., Swallow, K. M., & Maley, C. J. (2010). The Brain's Cutting-Room Floor: Segmentation of Narrative Cinema. Frontiers in Human Neuroscience, 4.

Swallow, K. M., Barch, D. M., Head, D., Maley, C. J., Holder, D., & Zacks, J. M. (2011). Changes in events alter how people remember recent information. *Journal of Cognitive Neuroscience*, *23*(5), 1052–1064.

Baldassano, C., Chen, J., Zadbood, A., Pillow, J. W., Hasson, U., & Norman, K. A. (2017). Discovering Event Structure in Continuous Narrative Perception and Memory. *Neuron*, *95*(3), 709–721.

November 16: Schemas and scripts

Bower, G. H., Black, J. B., & Turner, T. J. (1979). Scripts in memory for text. *Cognitive Psychology*, *11*(2), 177–220.

van Kesteren, M. T. R., Fernández, G., Norris, D. G., & Hermans, E. J. (2010). Persistent schema-dependent hippocampal-neocortical connectivity during memory encoding and postencoding rest in humans. *Proceedings of the National Academy of Sciences of the United States of America*, *107*(16), 7550–7555.

Parkinson, C., Kleinbaum, A. M., & Wheatley, T. (2018). Similar neural responses predict friendship. *Nature Communications*, *9*(332), 1-14.

November 23: Persuasion and engagement

Schmälzle, R., Häcker, F. E. K., Honey, C. J., & Hasson, U. (2015). Engaged listeners: shared neural processing of powerful political speeches. *Social Cognitive and Affective Neuroscience*, 10(8), 1137–1143.

Butler, A. C., Zaromb, F. M., Lyle, K. B., & Roediger, H. L., 3rd. (2009). Using popular films to enhance classroom learning: the good, the bad, and the interesting. *Psychological Science*, *20*(9), 1161–1168.

Vezich, S., Falk, E. B., & Lieberman, M. D. (2016). Persuasion neuroscience: New potential to test dual-process theories. In Harmon-Jones, E. & Inzlicht, M. (Ed.), *Social Neuroscience: Biological Approaches to Social Psychology*. Psychology Press, 34-58.

November 30: Computational models of naturalistic stimuli

Huth, A. G., de Heer, W. A., Griffiths, T. L., Theunissen, F. E., & Gallant, J. L. (2016). Natural speech reveals the semantic maps that tile human cerebral cortex. *Nature*, *532*(7600), 453–458.

Vodrahalli, K., Chen, P.-H., Liang, Y., Baldassano, C., Chen, J., Yong, E., Honey, C., Hasson, U., Ramadge, P., Norman, K. A., & Arora, S. (2018). Mapping between fMRI responses to movies and their natural language annotations. NeuroImage, 180(Pt A), 223–231.

Broderick, M. P., Anderson, A. J., Di Liberto, G. M., Crosse, M. J., & Lalor, E. C. (2018). Electrophysiological Correlates of Semantic Dissimilarity Reflect the Comprehension of Natural, Narrative Speech. *Current Biology* 28, 1-7.

December 7: Magic

Rensink, R. A., & Kuhn, G. (2014). A framework for using magic to study the mind. *Frontiers in Psychology*, *5*(1508), 1-14.

Olson, J. A., Landry, M., Appourchaux, K., & Raz, A. (2016). Simulated thought insertion: Influencing the sense of agency using deception and magic. *Consciousness and Cognition*, *43*, 11–26.

Ekroll, V., Sayim, B., & Wagemans, J. (2017). The Other Side of Magic. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science,* 12(1), 91–106.

December 14: Final presentations (no Courseworks response required)