MKTG 2380 / 7380
Introduction to Consumer Neuroscience
Fall 2023
Professor Gideon Nave

Schedule and Location: TR (1:45 / 3:30), JMHH #250

1. Course Team

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2. Overview

How can studying the brain improve our understanding of consumer behavior?

While Neuroscience made tremendous strides throughout the past few decades, rarely were meaningful applications developed outside of medicine. Recently, however, breakthroughs in measurement and computation have accelerated brain science, and created an array of opportunities in business and technology. Currently, applications to marketing research and product development are experiencing explosive growth that has been met with both excitement and skepticism. This mini course provides an overview of the neuroscience behind and the potential for these applications. Topics range from well-known and widely used methods and measures such as eye-tracking, response times and skin conductance, to emerging technologies such as face-reading, EEG and fMRI.

The course is self-contained and has no prerequisites. However, students with some background in business, economics, psychology, and/or neuroscience are likely to find some of the material

covered in this course complementary to their existing knowledge. Much of the foundational work in Consumer Neuroscience involves laboratory experiments. Accordingly, we will read and discuss several experimental papers and the craft of designing an experiment will occasionally be discussed. However, we will not dedicate significant time to the methodology of experimental design and analysis. As will become clear as the course progresses, Consumer Neuroscience can be used to study almost any aspect of consumer behavior.

3. Objectives

By the end of this course, students will be familiar with:

- Fundamental facts and misconceptions about the brain and the tools for studying it.
- Key theoretical concepts, scientific discoveries and measurement techniques that can guide future work in research and industry.
- Applications of neuroscience to consumer research.

Students will be asked to apply their knowledge in several ways:

- Think critically about existing uses of neuroscience in industry.
- Identify insights and applications from the existing scientific literature.
- Construct an original research question.

4. Grades and Assignments (further details below)

- Attendance 5%
- "Reverse Inference" Essay 10%
- Online quizzes: 10%
- Online Tutorials: 10%
- Group Project: 20%
- Final Exam: 40%
- Discussion Participation: 5%
- No additional "grade-improvement" for-credit assignment will be offered.

Grade Cut-offs

Tentative cut-offs for determining your final letter grade are:

A	93%
A-	90%
B+	87%

B	83%
B-	80%
C+	77%
C	73%
C-	70%
D	60%

These are the lowest possible scores to achieve each letter grade. A+ will be awarded at my discretion only. In the past, A+ was given for achieving a high total score (>97%), together with actively attending and participating in class.

5. Generative AI policy

Unless stated otherwise, you may use generative AI programs (e.g., tools like ChatGPT) to help generate ideas and brainstorm. However, you should note that the material generated by these programs may be inaccurate, incomplete, or otherwise problematic. Beware that use may also stifle your own independent thinking and creativity. You may not submit any work generated by an AI program as your own. If you include material generated by an AI program, it should be cited like any other reference material (with due consideration for the quality of the reference, which may be poor). Any plagiarism or other form of cheating will be dealt with severely under relevant Penn policies.

6. Textbook

The required textbook is Consumer Neuroscience (hereafter referred to as CN), edited by Cerf and Garcia-Garcia (MIT Press, 2017). You can rent a digital copy of this book ($37.50 for a 4-months period) here: https://mitpress.ublish.com/book/consumer-neuroscience#purchase
Additional required and recommended readings are listed below and will be made available via study.net.

7. Modules

The core of the course is eleven modules, each of which is dedicated to a different set of theoretical concepts and research tools.

Each module includes a combination of the following components:

1. **In-person lectures.** Some lectures will include real-time demonstrations of data collection and others will involve a short guest lecture (some of the speakers may be joining us remotely).

2. **Attendance**

   We monitor attendance passively (no need to do anything) beginning the third lecture (11/2/2023), and you can miss up to three lectures without a penalty.

   To avoid being considered as "absent" from a given lecture, you can either:

   - Attend class.
   - Watch the recorded video lecture within a week of the lecture.

IMPORTANT: unless you have already missed more than three classes, please do not contact the course team regarding attendance.

3. **Discussions.** Each module has an associated discussion board. After the lecture's date in the course schedule, we will post several questions for discussion. Students are required to respond to these questions, post new discussion questions and further interact with one another and the course team. Participating in discussions is voluntary. **When calculating the discussion participation grade, we will only consider participation that occurred within the first week after each discussion's corresponding lecture.**

4. **Quizzes.** The quizzes are brief exercises based on the class lectures and TED talks. They will be posted on Canvas after most lectures, are to be completed outside of class and are due one week after the lecture. Quizzes can be taken as many times as you wish, though keep in mind that your quiz grade will be based on the last time you took it. After a quiz's due date has passed, a copy of it will be made available as a practice quiz. You can miss up to two quizzes without penalty.

5. **TED talks** (about 5-15 minutes each). Think of them as 'guest lectures' by high profile speakers. There may be questions about them in the online quizze, and potentially in the final exam.

6. **Readings.** There are three types of readings.
   - **Mandatory readings:** Material that is an integral part of the course and is not fully covered by the lectures. There is only one such reading assignment, in module 11.
   - **Recommended readings:** Material that is mostly covered by the lectures. Reading it can be useful for review and deeper understanding of the material.

- **Optional readings:** Material that goes beyond the lectures, typically academic publications (available on study.net). The optional readings are intended to those who would like to learn more about specific topics.
- There will not be questions in the final exam about materials that only appear in 'recommended' and 'optional' readings.

7. **Screencasts** (10-20 minutes each): As supporting material, I made pre-recorded mini lectures (recorded during the COVID-19 lockdown on 2020) available to watch. These screencasts mostly cover the same material taught in class. There will not be questions in the final exam about any material that appears in the screencasts and not in the lecture.

Some modules include additional Assignments — see further below.

8. Assignments

Essay. Each student will write a short essay (1-2 paragraphs, up to 300 words) on 'reverse inference' — a topic covered in Module 3. Instructions are available on Canvas; submissions are also via Canvas. Due 11/9/2023.

Interactive tutorials. Modules 2, 4 and 5 include interactive online tutorials that take 20-30 minutes to complete each. They are due about two weeks after the time of the lecture in the course calendar, though I recommend completing them soon after attending (or watching) the lectures. Tutorials can be taken as many times as you wish, though keep in mind that your grade will be based on the last time you took it. The tutorials are designated for understanding basic concepts in the analysis of biometric data:

(1) Brain imaging (module 2), due: 11/6/2023
(2) Eye-tracking (module 4), due: 11/15/2023
(3) Skin conductance (module 5), due: 11/20/2023

Project. Groups of 4 to 6 students will complete a project addressing a question(s) in consumer behavior that can be addressed using neuroscience data. One of the projects' deliverables is a five-minute video summary, submitted in the final week. Instructions and exemplary projects from recent years will be available on Canvas.
The project is due on 12/12/2023
NOTE: Late assignments will not be accepted.
There will be no make-up or extra credit assignments given.

9. Final Exam

The final exam be taken online, and it will be available between 6 AM EST 12/13/2023 and 11:59 PM on 12/14/2023. It will cover concepts presented in lectures, the mandatory assigned readings, and the TED talks. This is an open-book, open notes exam, but it must be done individually (no open-internet!). The exam has about 25 questions (multiple choice, sometimes with more than one correct answer), and it takes 1 hour and 15 minutes. Please make sure that the SDS contact me if you need additional accommodation. The exam's instructions will be posted online in advance, so you have a chance to ask questions before starting it.

10. Office hours

I am available for office hours (online; by appointment) on Fridays, just email me to schedule.

11. Class Schedule

Module 1 10/24/2023	**Class Introduction** Overview of Consumer Neuroscience <u>Optional readings:</u> Ariely, D., & Berns, G. S. (2010). Neuromarketing: the hope and hype of neuroimaging in business. *Nature reviews neuroscience*, *11*(4), 284-292 Plassmann, H., Venkatraman, V., Huettel, S., & Yoon, C. (2015). Consumer neuroscience: applications, challenges, and possible solutions. *Journal of Marketing Research*, *52*(4), 427-435. <u>Watch**:**</u> Laurie Santos — A monkey economy as irrational as ours
Module 2 10/26/2023	**Brain Structure and Function; The Neuromarketing Toolkit Part I** Brain Structure and Function The Neuron, Neurotransmitters Lateralization, The Four Lobes, Subcortical Structures EEG, fMRI, MEG, NURS, TMS Brain Imaging Tutorial (due 11/6/2023)

	Watch: Moran Cerf — What if we could look inside human brains? Recommended readings: CN Chapters 2, 4
Module 3 10/31/2023	**The Neuromarketing Toolkit Part II; Neuroscience Gone Wrong** Response Times, Mouse Tracking Reverse Inference, Multiple Hypothesis Testing Neuroscience Hype – The Case of Oxytocin Reverse Inference Essay (due 11/9/2023) Watch: Molly Crockett — Beware of Neuro-Bunk Optional readings: Bennet, C., Baird, A., Miller, M., & Wolford, G. (2010). Neural correlates of interspecies perspective taking in the post-mortem Atlantic salmon: An argument for proper multiple comparisons correction. Journal of Serendipitous and Unexpected Results, 1(1), 1-5. Poldrack, Russell A. "Inferring mental states from neuroimaging data: from reverse inference to large-scale decoding." Neuron 72.5 (2011): 692-697.
Module 4 11/2/2023	**Attention and Eye Tracking** Visual Perception and The Visual System Two Types of Attention Measuring Attention using Eye Tracking Saliency Eye Tracking Tutorial (due 11/15/2023) Watch: Ray Burke — How stores track your shopping behavior

	Recommended readings: CN Chapter 5 Optional readings: Milosavljevic, Milica, et al. "Relative visual saliency differences induce sizable bias in consumer choice." *Journal of Consumer Psychology* 22.1 (2012): 67-74. A. Selin Atalay, H. Onur Bodur, and Dina Rasolofoarison. Shining in the Center: Central Gaze Cascade Effect on Product Choice. Journal of Consumer Research, 39(4):848-866, 2012
Module 5 11/7/2023	**Emotion, Skin Conductance and Face Reading** Emotions vs. Feelings Theoretical Frameworks for Studying Emotions Consequences of Emotions Neural Substrates of Emotion Measuring Emotion Skin Conductance Tutorial (due: 11/20/2023) Eye-tracking and Skin conductance demo: Robert Botto (Wharton Behavioral Lab) Watch: Roz Picard — Technology and Emotions David Anderson — Your brain is more than a bag of chemicals. Recommended readings: CN Chapter 7 Optional readings: Brian Knutson, Scott Rick, Elliott Wimmer, Drazen Prelec, George Loewenstein. Neural Predictors of Purchases. Neuron, 53(1): 147-156, 2007

	Teixeira, Thales, Rosalind Picard, and Rana El Kaliouby. "Why, when, and how much to entertain consumers in advertisements? A web-based facial tracking field study." Marketing Science 33.6 (2014): 809-827. Reeck, C., Wall, D., & Johnson, E. J. (2017). Search predicts and changes patience in intertemporal choice. Proceedings of the National Academy of Sciences, 114(45), 11890-11895.
Module 6 11/9/2023	**Reward and Conditioning** Reward, Liking and Wanting Neuro-forecasting Pavlovian Conditioning Learning about Actions <u>Watch:</u> Brian Knutson — Neuro-forecasting internet market success <u>Recommended readings:</u> CN Chapter 9 <u>Optional readings:</u> Bushong, Benjamin, et al. “Pavlovian processes in consumer choice: The physical presence of a good increases willingness-to-pay.” *American Economic Review* 100.4 (2010): 1556-71. Genevsky, Alexander, and Brian Knutson. “Neural affective mechanisms predict market-level microlending.” Psychological science 26.9 (2015): 1411-1422.
Module 7 11/14/2023	**Expectations, Valuation, Decisions** Marketing Placebo Effects (MPEs) Value in the Brain The Drift Diffusion Model (DDM) – Part I

	The Drift Diffusion Model (DDM) – Part II Watch**:** Antonio Rangel — The Neuroeconomics of simple choice Mini guest lecture: Sorin Patilinet (Mars) Optional readings: Plassmann, Hilke, et al. "Marketing actions can modulate neural representations of experienced pleasantness." Proceedings of the National Academy of Sciences 105.3 (2008): 1050-1054. Krajbich, Ian, Carrie Armel, and Antonio Rangel. "Visual fixations and the computation and comparison of value in simple choice." *Nature neuroscience* 13.10 (2010): 1292.
Module 8 11/16/2023	**Memory and Brands** Introduction to Memory Taxonomy of Memory Systems Forming Long Lasting Memories Remembering Experiences Measuring Memory Portable EEG demo: Michael Platt (Director, Wharton Neuroscience Initiative) Watch Daniel Kahneman — The Riddle of Experience vs. Memory Recommended readings: CN Chapter 6,10 Optional readings: McClure, Samuel M., et al. "Neural correlates of behavioral preference for culturally familiar drinks." Neuron 44.2 (2004): 379-387. Chen, Yu-Ping, Leif D. Nelson, and Ming Hsu. "From “where” to “what”:

	distributed representations of brand associations in the human brain." *Journal of Marketing Research* 52.4 (2015): 453-466.
Module 9 11/21/2023	**Individual Differences: Personality** Introduction to Personality: The Big Five Predicting Personality from Digital Footprints Optional reading: Matz, S. C., Kosinski, M., Nave, G., & Stillwell, D. J. (2017). Psychological targeting as an effective approach to digital mass persuasion. Proceedings of the national academy of sciences, 114(48), 12714-12719. Watch: Sam Gosling — Personality of Place Portable EEG Demo: Michael Platt (UPenn)
Module 10 11/28/2023	**Individual Differences: Genetics** The Three Laws of Behavioral Genetics The Human Genome, Genome-Wide Association Studies Ethics and Regulation of Genetic Data Watch: Three Identical Strangers Trailer Optional reading: Daviet, R., Nave G., and Wind J., “Genetic Data: Potential Uses and Misuses in Marketing." Journal of Marketing (2020): 0022242920980767.
Module 11 11/30/2023	**Ethical Conduct of Research (watching and reading Only)** Watch:

	Martha Farah — Introduction to Neruoethics **Mandatory** Reading: CN Chapter 15 Optional reading: Farah, Martha J. "Neuroethics: the practical and the philosophical." Trends in cognitive sciences 9.1 (2005): 34-40.

Final exam: available between 6 AM EST 12/13/2023 and 11:59 PM on 12/14/2023