



J. William Fulbright College of Arts & Sciences
Department of Psychological Science

PSYC 6413: Neuroimaging

Spring 2022

Tues & Thur 3:30-4:45pm

Old Main 0327

Instructor: Josiah Leong

Office: Memorial Hall 202F

Email: josiah@uark.edu

Meetings by appointment

Advances in neuroimaging data acquisition and analysis allow researchers to see and measure living human brains. This course surveys the methods that researchers use to characterize the structure and function of the brain. The course includes a laboratory in neuroimaging data analysis with a final project. The course closes with discussion about the promise and the limitations of new technologies that can manipulate brain activity. Prior experience with computer programming is not required.

Laboratory: The course involves working with real magnetic resonance imaging (MRI) data. The instructor will provide the software to perform MRI data analyses (e.g., command line, git, MATLAB / Unix Shell / R). Students will learn the following concepts and skills: measurement reliability / validity / generalizability, data processing / analysis / visualization, computer programming, statistics.

Final project: The course includes a final project that will flow naturally from in-class work. Students will choose an MRI modality (gray-matter volumetrics / white-matter structural connectivity / functional activity) and analyze a real dataset. The project will include all of the computer code the student used to process the data, the raw data and data derivatives, and a brief report. The report should be written like a journal article. Introduce the scientific motivation for the project, describe the methods and results, and discuss the findings. Students will present their project in class.

Reading

The instructor will provide a PDF of the [Functional Magnetic Resonance Imaging](#) 2nd edition textbook by Scott Huettel. The Huettel readings are not required, but you should read them at your leisure to support your learning throughout the course. The instructor will additionally provide 1-3 papers every week. These papers are required reading and will be discussed in class. The purpose of the papers is to practice distilling information from technical writing, and then to critique whether the researchers' data and methods support their conclusions.

Accommodations: <https://cea.uark.edu/>

Communications: <https://fullstackneuro.slack.com>

Masks: Every human in the classroom must wear a mask. <https://health.uark.edu/coronavirus/>

Safety: <https://report.uark.edu/>

Grades do not matter and least in graduate school. The purpose of the course is to help you figure out how neuroimaging analyses might be useful for your research. If you attend class and submit a final project, then you will receive an A.

Schedule (may change)

Dates		Topic	Reading
1/18	1/20	Introduction and setup	
1/25	1/27	Brain anatomy and chemistry	Huettel ch. 1-2
2/1	2/3	Structure: MR physics and data acquisition	Huettel ch. 3-5
2/8	2/10	Volumetric analysis (VBM / FreeSurfer)	Fischl, Ashburner
2/15	2/17	Diffusion MRI acquisition	Basser, Smith
2/22	2/24	Diffusion MRI analysis (TBSS / tractography)	Jones, Behrens
3/1	3/3	Function: electrical recordings & expt design	Huettel ch. 6
3/8	3/10	Functional MRI acquisition (MR physics / BOLD)	Huettel ch. 7, Ogawa
3/15	3/17	Functional MRI analysis (AFNI / SPM / FSL)	Huettel ch. 8-9
(3/22)	(3/24)	(Spring Break no class)	Huettel ch. 10-11, Ban
3/29	3/31	Functional connectivity (resting-state / DCM)	Huettel ch. 12, Friston
4/5	4/7	Other methods (PET / SPECT / ASL / MRS)	Huettel ch. 13-14, Jag
4/12	4/14	Control: Optogenetics / DREADDs / TMS / DBS	Deisseroth, Tyler
4/19	(4/21)	Work on project	Poldrack, Nichols
(4/26)	4/28	Work on project	
5/3	5/5	Projects and presentations	

Miscellaneous

As a core part of its mission, the University of Arkansas provides students with the opportunity to further their educational goals through programs of study and research in an environment that promotes freedom of inquiry and academic responsibility. Accomplishing this mission is only possible when intellectual honesty and individual integrity prevail.

Each University of Arkansas student is required to be familiar with and abide by the University's 'Academic Integrity Policy' at honesty.uark.edu/policy. Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor.

Course:	PSYC 6413 001 - SEMINAR PHYSIOLOGICAL PSY	Department:	PSYC
Responsible Faculty:	Josiah Leong	Responses / Expected:	4 / 5 (80%)
Overall Mean:	4.75 Excellent to Very Poor (8 responses) 4.71 5 Point Likert Scale (28 responses)		

ARSC College Core: Course Questions		PSYC 6413 - 001							--- Survey Comparisons ---					
		Responses (%)					Course		PSYC			All		
		SA	A	U	D	SD	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q1	Assignments are related to goals of this course.	2 50%	2 50%	0	0	0	4	4.50	1.7K	4.72	14	30K	4.57	29
Q2	The teaching methods used in this course enable me to learn.	2 50%	2 50%	0	0	0	4	4.50	1.7K	4.51	36	30K	4.23	54
Q3	The stated goals of this course are consistently pursued.	3 75%	1 25%	0	0	0	4	4.75	1.7K	4.70	49	30K	4.48	65

Responses: [SA] Strongly Agree=5 [A] Agree=4 [U] Undecided=3 [D] Disagree=2 [SD] Strongly Disagree=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

Demographics		PSYC 6413 - 001									
		Responses (%)									Course
		COE	COE	DBC	FJS	JWF	SMW	SOL	GS	U	N
Q4	Your College:	0	0	0	0	4 100%	0	0	0	0	4

Responses: [COE] College of Education and Health Professions
[COE] College of Engineering
[DBC] Dale Bumpers College of Agricultural, Food and Life Sciences
[FJS] Fay Jones School of Architecture and Design
[JWF] J. William Fulbright College of Arts and Sciences
[SMW] Sam M. Walton College of Business
[SOL] School of Law
[GS] Graduate School
[U] UNDECLARED

Demographics		PSYC 6413 - 001					
		Responses (%)					Course
		A	B	C	D	F	N
Q5	Expected grade	4 100%	0	0	0	0	4

Responses: [A] A/PASS [B] B [C] C [D] D [F] F/FAIL

Demographics		PSYC 6413 - 001						
		Responses (%)						Course
		F	S	J	S	G	O	N
Q6	Your class	0	0	0	0	4 100%	0	4

Responses: [F] Freshman [S] Sophomore [J] Junior [S] Senior [G] Graduate [O] Other

Demographics		PSYC 6413 - 001			
		Responses (%)		Course	
		YES	NO	N	
Q7	Course required	1 25%	3 75%	4	

Responses: [YES] Yes [NO] No

University Core Course		PSYC 6413 - 001						--- Survey Comparisons ---						
		Responses (%)					Course		PSYC			All		
		E	G	F	P	VP	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q8	Overall, I would rate this course as:	3 75%	1 25%	0	0	0	4	4.75	1.7K	4.52	63	30K	4.21	76

Responses: [E] Excellent=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

ARSC College Core: Instructor Questions		Josiah Leong						--- Survey Comparisons ---						
		Responses (%)					Individual		PSYC			All		
		SA	A	U	D	SD	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q9	My instructor displays a clear understanding of course topics.	3 75%	1 25%	0	0	0	4	4.75	1.7K	4.81	28	31K	4.64	47
Q10	My instructor is readily available for consultation.	4 100%	0	0	0	0	4	5.00	1.7K	4.60	87	31K	4.46	92
Q11	My instructor explains difficult material clearly.	2 50%	2 50%	0	0	0	4	4.50	1.7K	4.58	29	31K	4.26	49

Responses: [SA] Strongly Agree=5 [A] Agree=4 [U] Undecided=3 [D] Disagree=2 [SD] Strongly Disagree=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

University Core Instructor		Josiah Leong						--- Survey Comparisons ---						
		Responses (%)					Individual		PSYC			All		
		SA	A	U	D	SD	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q12	My Instructor is fluent in English	4 100%	0	0	0	0	4	5.00	1.7K	4.96	68	31K	4.80	75

Responses: [SA] Strongly Agree=5 [A] Agree=4 [U] Undecided=3 [D] Disagree=2 [SD] Strongly Disagree=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

University Core Instructor		Josiah Leong						--- Survey Comparisons ---						
		Responses (%)					Individual		PSYC			All		
		E	G	F	P	VP	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q13	Overall, I would rate this instructor as:	3 75%	1 25%	0	0	0	4	4.75	1.7K	4.62	52	31K	4.42	62

Responses: [E] Excellent=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

Question:	What went well in this course? Suggest ways to improve the course.
Response Rate:	75.00% (3 of 4)
1	The nature of the course itself is extremely applied which makes the work and the content we learn feel useful. There were no instances in which I thought the course was "veering off the tracks" so to speak.
2	The material was incredibly interesting and the hands-on experience of actually getting to manipulate and visualize data was really neat too. The course was great but I think that spread out over two semesters, it would be exceptional.
3	I really enjoyed the content of this course, however I think some things could be changed to improve the flow in future semesters. To me personally, it would've been highly valuable to have the content broken up into two semesters. The first semester could've consisted of lectures over methods used in the field, software, details of the technologies used, and just general paper reading on interesting related topics. Then the second semester could be focused on actually using the software to test questions. So just coding/data in that 2nd course. Overall Josiah has a lot of knowledge in this area and is a passionate instructor. Course layout just may need to be different to account for the level that most of us are currently at.

Question:	How was technology (i.e., remote server access) used well in this course? How could the course improve its usage of technology?
Response Rate:	75.00% (3 of 4)

1	<p>There is a steep learning curve to remotely accessing the processing servers in Josiah's lab. Once I was able to power through that curve, accessing (and by proxy, coding) was extremely useful to deeply understanding how pre-processing works. I would not change this.</p> <p>Ways in which to improve: the small class size is nice because we are all able to have individualized attention in the areas we are struggling. That is also a bad thing in circumstances when everyone has very different programming backgrounds. To improve (or lessen) this gap, I suggest recording class sessions where we are learning how to access the servers so that those who are not able to transfer their coding knowledge can go back and repeatedly learn from the video(s) on their own time.</p> <p>Additionally, I would preface before the course even begins to reach out to students who signed up individually and tell them to install R on their personal laptops and (if this exists) send youtube links on Linux so that they can understand their role in the project beforehand.</p>
2	The server worked well for us in class when we needed to use it!
3	I'm very green when it comes to things like this but, from what I could tell, everything worked well! Any problems were more likely human error on my part.

Faculty:	Josiah Leong
Question:	Comments:
Response Rate:	50.00% (2 of 4)

1	<p>Josiah is a great teacher, fiercely intelligent, and passionate about the subject. I do not have a background in psychology and took this class as an elective fully prepared to drop if I got too far behind. Josiah was willing to work with me though and helped me find ways to participate which I really appreciated! Glad I got to work with him.</p>
2	<p>Josiah is genuinely one of the most engaging and understandable instructors I've ever had.</p> <p>I noticed that he shifted his approach to each student based on their individual backgrounds. For example, those who came in with a stronger neuroscience background were not as "watched over" as students who did not have the same background. Josiah divided his attention appropriately based on this difference.</p> <p>I also noticed that during presentations through the course, his feedback and/or criticisms also varied depending on who presented (which I think is a good thing). The students with neuroscience backgrounds were questioned more in-depth than those without that background. Conversely, I noticed that his questions aimed toward those students with not-so-heavy neuro backgrounds were "easier" because he asked questions that matched their own understanding.</p> <p>I will continuously recommend anyone take this course if they want to deeply understand fMRI and other neuroimaging techniques. Even if students do not have a similar background (or their research experience does not match), Josiah takes that into account in both his expectations and teaching style per student.</p>

**ARSC - 1209 (Fall 2020) Survey
1 - 1209 (2020)**

**University of Arkansas
UARK**

Course: PSYC 6413 001 - SEMINAR PHYSIOLOGICAL PSY

Department: PSYC

Responsible Faculty: Josiah Leong

Responses / Expected: 3 / 5 (60%)

Overall Mean: 5.00 Excellent to Very Poor (6 responses)
4.90 5 Point Likert Scale (21 responses)

ARSC College Core: Course Questions	PSYC 6413 - 001						--- Survey Comparisons ---							
	Responses (%)						Course		PSYC			All		
	SA	A	U	D	SD	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk	
Q1 Assignments are related to goals of this course.	3 100%	0	0	0	0	3	5.00	1.7K	4.71	89	34K	4.58	93	
Q2 The teaching methods used in this course enable me to learn.	1 33.3%	2 66.7%	0	0	0	3	4.33	1.7K	4.44	21	34K	4.19	46	
Q3 The stated goals of this course are consistently pursued.	3 100%	0	0	0	0	3	5.00	1.7K	4.65	91	34K	4.47	95	

Responses: [SA] Strongly Agree=5 [A] Agree=4 [U] Undecided=3 [D] Disagree=2 [SD] Strongly Disagree=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

Demographics	PSYC 6413 - 001										
	Responses (%)										Course
	COE	COE	DBC	FJS	JWF	SMW	SOL	GS	U	N	
Q4 Your College:	0	0	0	0	3 100%	0	0	0	0	3	

Responses: [COE] College of Education and Health Professions
[COE] College of Engineering
[DBC] Dale Bumpers College of Agricultural, Food and Life Sciences
[FJS] Fay Jones School of Architecture and Design
[JWF] J. William Fulbright College of Arts and Sciences
[SMW] Sam M. Walton College of Business
[SOL] School of Law
[GS] Graduate School
[U] UNDECLARED

Demographics	PSYC 6413 - 001					
	Responses (%)					Course
	A	B	C	D	F	N

Q5 Expected grade
 3 0 0 0 0 3
 100%

Responses: [A] A/PASS [B] B [C] C [D] D [F] F/FAIL

PSYC 6413 - 001

Demographics

Responses (%)

Course

	F	S	J	S	G	O	N
Q6 Your class	0	0	0	0	3	0	3
					100%		

Responses: [F] Freshman [S] Sophomore [J] Junior [S] Senior [G] Graduate [O] Other

PSYC 6413 - 001

Demographics

Responses (%)

Course

	YES	NO	N
Q7 Course required	0	3	3
		100%	

Responses: [YES] Yes [NO] No

PSYC 6413 - 001

--- Survey Comparisons ---

University Core Course

Responses (%)

Course

PSYC

All

	E	G	F	P	VP	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q8 Overall, I would rate this course as:	3	0	0	0	0	3	5.00	1.7K	4.48	94	34K	4.18	96
	100%												

Responses: [E] Excellent=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

Josiah Leong

--- Survey Comparisons ---

ARSC College Core: Instructor Questions

Responses (%)

Individual

PSYC

All

	SA	A	U	D	SD	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q9 My instructor displays a clear understanding of course topics.	3	0	0	0	0	3	5.00	1.7K	4.77	85	36K	4.59	89
	100%												
Q10 My instructor is readily available for consultation.	3	0	0	0	0	3	5.00	1.7K	4.58	87	36K	4.42	92
	100%												
Q11 My instructor explains difficult material clearly.	3	0	0	0	0	3	5.00	1.7K	4.53	91	36K	4.23	95
	100%												

Responses: [SA] Strongly Agree=5 [A] Agree=4 [U] Undecided=3 [D] Disagree=2 [SD] Strongly Disagree=1
Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

University Core Instructor

Josiah Leong

--- Survey Comparisons ---

	Responses (%)					Individual		PSYC			All		
	SA	A	U	D	SD	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q12 My Instructor is fluent in English	3	0	0	0	0	3	5.00	1.7K	4.93	69	36K	4.78	76

Responses: [SA] Strongly Agree=5 [A] Agree=4 [U] Undecided=3 [D] Disagree=2 [SD] Strongly Disagree=1
 Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

University Core Instructor	Josiah Leong					--- Survey Comparisons ---							
	Responses (%)					Individual		PSYC			All		
	E	G	F	P	VP	N	Mean	N	Mean	Pct Rnk	N	Mean	Pct Rnk
Q13 Overall, I would rate this instructor as:	3	0	0	0	0	3	5.00	1.7K	4.60	89	36K	4.38	93

Responses: [E] Excellent=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1
 Pct Rnk: Percentile Rank (100 is best, calculated vs. precise Mean)

Question: Suggest ways to improve the course.

Response Rate: 66.67% (2 of 3)

- Improvements to technology requirements to speed up the troubleshooting issues and get to data cleaning and analysis better.
- I think 2 days a week would be awesome - 1 day to focus on theory/things like that - and maybe an example. Just looking at data and such and the next is more individual focusing on computer problems and getting the data ourselves.

Faculty: Josiah Leong

Question: Comments:

Response Rate: 33.33% (1 of 3)

- This class has been amazing so far! I have learned so much about how neuroimaging and the brain works and how to use various technologies to process and analyze neurological data. I greatly appreciate the opportunity to take this class. It is important to ensure proper technology before starting class.