INFSCI 2300 Human Information Processing[1]

Spring 2023

Instructor: Na Du
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Office Hours: Mon, 3:00 PM- 4:00 PM, or by appt.
Class Meets: Mon 12:00 PM – 2:50 PM
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Overview: Through this course you will become familiar with the research and theories in the field of human information processing and develop the tools necessary to evaluate such research. The focus will be on basic research (e.g., how do we encode, store, and process information; what are the limits on each stage of human information processing; what heuristics are used in processing information), rather than on applied questions. However, at several points during the semester, we will examine studies which show connections to the applied questions.

Course Work and Grading: Components of the final grade include, reading summary, discussions, a final exam, and the course group project. Each component bears certain number of points. The instructor also reserves the right to administer unannounced quizzes in class. The final grade depends on the percentage of points you have earned, and the definition of letter grades is:

1. 90 <= A- < 93, 93 < A <= 97, 97 < A+ <= 100
2. 80 <= B- < 83, 83 < B <= 87, 87 < B+ < 90
3. 70 <= C- < 73, 73 < C <= 77, 77 < C+ < 80
4. 60 <= D < 70,
5. F < 60

Reading Notes (11pts):
There is no required textbook for this class, instead there will be about 1-2 required background readings each week. Most of the readings are conference papers, journal articles or online materials. Every week, the student is required to submit ONE reading note for all the required background readings. The notes should be submitted to the Canvas by Sunday 11:59 PM before each week's class. Each reading note should consist of the reflections of all the readings, and the reflection has to be at least one of the following three comments:
- CONNECTIONS to one of the research problems that the student is interested in. The connection could be providing theoretical foundations, enabling better models, providing dataset or other resources, etc.
- CRITIQUES on drawbacks or limitations of the approaches.
- EXTENSIONS to the original paper so that further meaningful research can be conducted

The reading notes may be discussed during the class, and students need to able to elaborate their comments and give feedbacks to other's notes.

Discussion and Resource Finding (12pts): The readings and the lecture on each topic will be followed by an online discussion where you are encouraged to ask questions, connect material to your experience, and answer to other posts. At least one post to the topic discussion is required: you are also requested to find and examine *one* relevant educational or information resource (a video, an article, a case, etc), which you believe could be used to acquire more knowledge on the topic. Research papers could be posted, but will not be counted as a resource (you will engage into finding research papers as a part of your final project). Post the resource on the lecture topic of the course reading forum. Add a few lines to introduce the nature of resource and explain to which section of the book (or part of the lecture) it is related and why it is relevant. Meanwhile, each student should sign up to present at least once at the beginning of the lecture about the discussion and resource they propose. Depending on the resource relevance, you will receive up to 1 point for each post for the max of 12 points. This activity assesses your understanding of the lecture and readings and your ability to apply the knowledge to find relevant content.

- **Sign up link:**
  https://docs.google.com/spreadsheets/d/1Ra4qP7Ga9y1T9jOlQUvraDnn421xyJBpoQ451wI0t1Y/edit#gid=0
- **Presentation link:**
  https://docs.google.com/presentation/d/1domjHTIb6NZX_ptISJCiOl6Ilpt4H3Ruek9qnXIxy-o/edit#slide=id.g1c9183575b6_0_1

Exam (30pts): The midterm exam will test your ability to integrate material from the course. The exams will cover the material in the readings and lectures presented before the exam. It will consist of multiple choice, short answer questions, and essay portions. There may be a few in-class activities that will prepare you for the exam.

Quizzes and activities (7pts): A few interactive activities will be conducted during the lectures and will be unannounced. Quizzes will test the students' knowledge about their homework. Quizzes aim to motivate students to prepare for each class in advance. Activities will be group or individual in-class assignments that will help students to develop a deeper understanding of the topics under study. All quizzes and some activities will be graded to encourage participation.

Course Project (40pts): The focus of the course project is to prepare and present a research proposal that addresses a specific methodological or theoretical issue that arises during the course or in the reading of the related material. The proposal should be an experimental proposal, such as would be found in a grant proposal, to resolve an issue. The project's goal is to encourage students to understand, critically assess the results and argue about the implications of research studies on human information processing. The research proposal project should be undertaken by groups of **five** people.

The project work will be organized in four iterations. Each iteration has a separate deadline and deliverable and will be graded separately as a component of the total grade. Each deliverable

should be submitted online before the due date. The detail of each submission please refer to the "**Project Schedule**".

- Iteration 1: Literature Review
    - Select **one** research article that investigates a specific phenomenon of human information processing.
    - Find at least **four** other **related research articles** that investigate the same phenomenon.
- Iteration 2: Identify Problems
    - **Review** all selected articles and identify: phenomenon or problem under study, findings of prior work, research question, study design (independent and dependent variables, confounders, kind of empirical study, sample size), results, contributions, limitations, and implications;
    - Identify **one implication** for the development of a specific kind of information systems
    - Provide a **rationale** to logically deduct this implication, use references that can help you to make your point stronger, and provide specific ideas about how this implication could be tested in a future study (or studies).
- Iteration 3: Connecting Studies
    - **Find relationships** among the findings of all the selected articles;
    - Provide rationale for potential differences/similarities among the results of the selected articles;
    - Discuss potential differences/similarities among the implications of all selected articles
    - Brainstorm how these implications can be **related to the development of information systems** (in general or a specific kind) and how they could be studied.
- Iteration 4: Research Proposal
    - Select at least **three** potential implications of the phenomenon under study (considering the results of all selected studies) for the development of a specific kind of information system.
    - For each implication, provide a rationale to logically deduct this implication, use references that can help you to make your point stronger, and provide specific ideas about how this implication could be **evaluated** in a future study (or studies).

Course Policies

Academic Integrity: You are expected to be fully aware of your responsibility to maintain a high quality of integrity in all of your work. All work must be your own, unless collaboration is specifically and explicitly permitted as in the course group project. Plagiarism on the submissions may result in a failing grade for the course (not just the proposal), so be sure you understand the limitations of using others work and proper methods of citation. All papers will be checked using Pitt's standard plagiarism software, which compares papers against various on-line sources and previously submitted assignments. Any unauthorized collaboration or copying will at minimum result in no credit for the affected assignment and may be subject to further action under the University Guidelines for Academic Integrity. You are expected to have read

and understood these Guidelines. A document discussing these guidelines was included in your orientation materials.

Late Submissions: All components of course work submitted after due date will be accepted, but your grade will be scaled so that you lose 10% of the grade for every late working day. I.e., if you will submit your work one week late, you will lose 50% of the grade.

Class Attendance: The class attendance is not mandatory, but it is expected to succeed in this course. Each class covers the topics discussed in the reading materials and it will complement those topics with additional content.

Email: All emails to the instructor and TA about this class should contain "INFSCI 2300" in the subject line to be read. For example, the subject line might read "INFSCI 2300: Question about memory". Email without this information might be deleted by spam filters or placed in a folder to be read at a later date. Email with the appropriate identifier will usually be read within 48 hours of receipt.

Special Considerations: If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 216 William Pitt Union, (412-648-7890/TTY:412-383-7355) as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Course Plan and Reading List - *Subject to Change!*

		Section 1: Introduction
Jan 9	**Week 1**	**Introduction to the Course**
Jan 16		**Martin Luther King Jr. Day**
Jan 23	**Week 2**	**Cognitive Psychology: History and Overview**
		Norman, D. 2013. The psychopathology of everyday things. *The Design of Everyday Things*. Basic Books. New York. Chapter 1.
		Section 2: Acquiring Information
Jan 30	**Week 3**	**Perception**
		Rensink, R. A., O'Regan, J. K., & Clark, J. J. (1997). To see or not to see: The need for attention to perceive changes in scenes. *Psychological Science, 8*, 368-373. Johnson, J. (2014). Our perception is biased. *Designing with the mind in mind: simple guide to understanding user interface design guidelines.* 2nd ed. Burlington, MA: Morgan Kaufmann. Chapter 1.
Feb 6	**Week 4**	**Attention**
		Healey, C. G., & Enns, J. T. (2012). Attention and visual memory in visualization and computer graphics. *IEEE Transactions on Visualization and Computer Graphics, 18*, 1170-1188.
Feb 13	**Week 5**	**Application: Phoning, Texting, and Driving**
		Strayer, D. L., Drews, F. A., & Crouch, D. J. (2006). A comparison of the cell phone driver and the drunk driver. *Human Factors, 48*, 381-391. Wan, J., & Wu, C. (2018). The effects of lead time of take-over request and nondriving tasks on taking-over control of automated vehicles. *IEEE Transactions on Human-Machine Systems*, *48*(6), 582-591.
		Section 3: Memory Processes
Feb 20	**Week 6**	**Remembering New Information**
		Johnson, J. (2014). Our attention is limited; our memory is imperfect. *Designing with the mind in mind: simple guide to understanding user interface design guidelines.* 2nd ed. Burlington, MA: Morgan Kaufmann. Chapter 7.
Feb 27	**Week 7**	**Memory Systems**
		Sparrow, B., Liu, J., and Wegner, D. M. (2011). Google effects on memory: Cognitive consequences of having information at our fingertips. *Science, 333*, 776-778.

		Section 4: Higher Cognitive Processes
Mar 6		**Spring Recess (no classes)**
Mar 13	**Week 8**	**Decision Making**
		Tversky, A., Kahneman, D. (1986). Rational choice and the framing of decisions. Journal of Business, S251-S278.
Mar 20	**Week 9**	**Application: Spatial Knowledge**
		Hirtle, S. C., & Sorrows, M. E. (2007). Navigation in electronic environments. In G. Allen (Ed.), *Applied spatial cognition: From research to cognitive technology* (pp. 103-126). Mahwah NJ: Erlbaum. Shekhar, S., Feiner, S. K., & Aref, W. G. (2016). Spatial computing. *Communications of the ACM, 59*(1), 72-81.
Mar 27	**Week 10**	**Application: Theory of Mind for Human-robot interaction**
		Scassellati, B. (2002). Theory of mind for a humanoid robot. Autonomous Robots, 12 (1), 13-24. Devin, S., & Alami, R. (2016, March). An implemented theory of mind to improve human-robot shared plans execution. In 2016 11th ACM/IEEE International Conference on Human-Robot Interaction (HRI). (pp. 319-326). IEEE.
		Section 5: Special Topics
Apr 3	**Week 11**	**Human-artificial intelligence interaction**
		Adadi, A., & Berrada, M. (2018). Peeking inside the black-box: a survey on explainable artificial intelligence (XAI). *IEEE access*, 6, 52138-52160.
Apr 10	**Week 12**	**Situational awareness, emotion, and mental models**
		Ensley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. *Human factors*, 37, 85-104.
Apr 17	**Week 13**	**Final Project Presentation**
Apr 24	**Week 14**	**Final Exam**

Project Schedule

Iteration	Deliverable	Grade
<u>Iteration 0</u> Group formation Due Feb 13	• If you want to form your own likeminded group, please, report group members by e-mail to the TA before the deadline. • Target group size is 5 members • Students who do not belong to the self-reported groups will be assigned to groups randomly	

<u>Iteration 1</u> Literature Review Due Feb 20	• 1-2 pages written report describing:
	   o Group members
	   o Phenomenon to be studied + description
	   o Main & 4+ complementary articles
	   o A short explanation about why these articles were chosen
	 • The selection of the phenomenon can be discussed with the instructor before the deadline.
		5pt

<u>Iteration 2</u> Identify Problems Due Mar 6	• 5 pages written report that provides:
	   o Explanation of the phenomenon under each study
	   o Analysis of each study according to the guidelines (see I2 above)
	   o A table summary of the analysis according to the same I2 guidelines (no more than one page).
	   o All text should provide proper reference with APA format.
		5pt

<u>Iteration 3</u> Connecting Studies Due Mar 20	• Oral 6-minute presentation describing the progress of the project. It should include 5-7 slides:
	   o Description of the phenomenon
	   o How the studies have investigated it
	   o Main results of the studies
	   o Summarize your findings
	   o 3+ ideas of potential implications
	 • The goal of the presentation is that your classmates and the instructor give you feedback
		5pt

<u>Iteration 4</u> Research Proposal Due Apr 17	• 10-pages final written report that includes:
	   o A revised version of the sections included in the mid-term report
	   o Analysis of the connections among studies
	   o Discussion about three potential implications for a specific kind of information systems and their associated future studies (see I4 above)
	   o References
		25pt