Adaptive Decision Support Systems

HCC 8810.001

This is the syllabus website for Clemson University Fall 2022 course HCC 8810.001: Adaptive Decision Support Systems.

Meeting information:

Credit hours: 3

Room: Poole A103

Day and time: Monday & Wednesday, 4:00 – 5:15 pm

Instructor information:

Prof. Bart Knijnenburg

Email: bartk@clemson.edu

Office location: McAdams Hall 205

Office hours: by appointment

Teaching assistant

Mehtab (Shahah) Iqbal

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Office hours: TBA

Important: The information below may change!

Changes will be announced in class and through email.

Course description

This course will teach you how to design, build and evaluate adaptive systems that help people make decisions. The starting point will be traditional "recommender systems" which recommend items to users by leveraging the preferences expressed by similar users. While these systems help users find items they might like to purchase or consume based on their preferences, they assume that users' preferences are well-established based on rational evaluations—something that we will learn is rarely the case!

To resolve this issue, we will work towards a more challenging goal: particularly, we will design systems that support decisions through **self-actualization**, by covering a broader spectrum of the users' preferences based on their long-term goals, supporting rather than replacing users' decision-making, and focusing users' activities on active exploration rather than passive consumption.

We will discuss several means to help users explore, understand, and evolve their preferences, including infographics that help them reflect on their preferences ("personalized preference profiles") and algorithmically constructed online communities that allow for discussion and peer-to-peer recommendation ("preference-based communities").

In a series of user research and design assignments, student teams will design an innovative *system* or *interaction mechanism* to support a selected user group (middle and high school students, undergrads, or retirees) in a specified choice domain (career planning or volunteering). Upon special request I may allow teams to pursue a different user group and/or choice domain.

What are we going to do?

This course roughly consists of 4 parts (or 8, depending on how you count):

- Part 1a (weeks 1-5): After a brief introduction to recommender systems, we will focus on the user-centric aspects of such systems. In particular, we will learn about the study of preferences and about the potential positive and negative impact of decision support systems on preference construction. In week 5, the paradigm of "recommender systems for self-actualization" is introduced.
- Part 1b (weeks 2-4): In parallel, the TA will give hands-on tutorials in the use of our live recommender system toolkit, which you will use to build your own recommender system in assignment 1.
- Part 2a (weeks 6-7): In this part we will learn about two types of mechanisms that can support self-actualization: "personalized preference profiles" and "preference-based communities". I will also teach you about grounded user research methods, which you will use to investigate how to best support users in a specific user group and choice domain in assignment 2.
- Part 2b (weeks 4-6): In parallel, you will build your own recommender system (assignment 1).
- Part 3a (weeks 7-12): In this part, you will form a team of 4 students, conduct a user research study (assignment 2), and based on the results you will design an innovative *system* or *interaction mechanism* to support the selected user group in the specified choice domain (assignment 3).
- Part 3b (weeks 8-12): In parallel, I will teach you two methods to evaluate your innovative solutions: controlled user experiments (which can be used to evaluate interaction mechanisms) and think-aloud studies (which can be used to evaluate systems). You will use one of these methods in assignment 4.
- Part 4a (weeks 13-16): In this part your team will conduct one of two assignments, depending on whether you decided to design a system or an interaction mechanism: if you chose the former, you will conduct a think-aloud study with a paper prototype of your system (assignment 4A); if you chose the latter, you will design a user experiment to formally test the efficacy of your interaction mechanism (assignment 4B).
- Part 4b (weeks 9-15): In parallel with parts 3 and 4, we will use a number of lectures to cover several user-centric aspects of recommender system development, including preference elicitation, transparency and control, and privacy.

Preparation and organization

Prerequisites: This course has no formal prerequisites, but I expect that you have basic knowledge of human-computer interaction and web development. There will be opportunities to catch up if you familiarity with these topics is low, but expect to do a bit of extra work in that case.

Course materials: Throughout the semester you are expected to watch videos and read academic papers and selected handbook chapters. These will be linked in the syllabus table below and/or made available via Canvas. The videos are part of the Coursera Recommender Systems Specialization. To watch even more videos, you can "audit" the four courses that are part of this specialization for free.

Software/development environment: The tools and software needed for the system development assignment include Python 3 (and a Python environment manager), node.js v16, NPM v8, React v18 and (optionally) NVM.

Office hours: Office hours will be by appointment. If you want to attend office hours, please let me know at the end of the class, or send me an email.

Slides: Presentation slides will be made available before each class and linked in the course schedule below (topics listed in orange are clickable and link to the slides).

Assignments and grading

Overview and structure: Your course grade will be determined by:

- A1: System development: 15% (individual)
- A2: User research: 15% (group)
- A3: Design: 10% (group)
- A4: Think aloud / user experiment design: 15% (group)
- Final: Term paper: 15% (group)
- 10 reflections: 3% each (individual)

In unusual circumstances these percentages could change, but I do not expect that to happen. Your final grade will be calculated by multiplying the percentages with the points you achieve on each assignment and reflection. In my default grading scheme, 85+ is an A, 80+ is an A-, 75+ is a B+, 70+ is a B, 65+ is a B-, 60+ is a C+, 55+ is a C, 50+ is a C-, 45+ is a D, and less than 45 is an F. I sometimes apply a curve to lower some of these thresholds (this has historically happened mostly for the threshold between B and C).

System development assignment (A1): This assignment requires some familiarity with web development environments. For this assignment you do not have to build a recommender system from scratch—you will make a "meaningful modification" to an existing basic recommender system. In a series of hands-on lectures, the TA will help you set up the basic recommender platform and walk you through its operations. Your task will be to edit the underlying algorithm, make a change in the user interface, or both.

Group assignments (A2-A4): These assignments are performed in groups of 4 students. We will create teams of students with complementary skills, taking individual preferences into account. A lot of the group work is meant to be collaborative: you are supposed to meet for several hours to do the work together. Please make sure that you schedule about 3 hours each week where you are all available to work on the collaborative parts of the assignments for this course. Plan your individual contributions around these meetings (i.e., get your individual stuff done before the meeting) so that you can make optimal use of the time you have to work together. I expect that all team members participate equally in each assignment. Right after you hand in an assignment, each group member will fill out a peer evaluation stating who did what on the assignment. If we believe that certain a group member did significantly less work than the others, we may give this member (instead of the entire group) a lower grade on the assignment. Still, it is your shared responsibility to make sure that everyone does their fair share of work, but please notify the instructor if a certain team member consistently fails to do the required work.

Final: This course has no traditional final. Instead, you will write up your user research, design, and think aloud / user experiment design in a term paper, which must include an introduction motivating the work, a background section with related work, a methods and results section detailing the work, and a discussion and conclusion reflecting on your findings.

Reading reflections: Twelve times throughout the semester students will be expected to prepare a reflection of 1-2 pages on a paper that will be discussed in class. You must submit your reflection *before* the start of the class. The reflections should include:

- A summary of about one paragraph on the scientific contribution of the paper (one paragraph). This summary is not for me but rather for you, the student, to have a chance to articulate what the paper is about. It is often the case that we cannot understand the contribution of a paper until we begin to articulate in writing what it contributes.
- Your reflection on the paper (one paragraph). You can view this as your position statement. Here are some possible examples of what you might write about for this part of the reflection (you are of course not limited to these topics): A reaction to the reading, e.g. a critique; A theoretical position on the broader topic that the paper addresses; Supplementary ideas, taken from other sources on the topic. Be prepared to present and discuss your position statement in class.
- An initial idea of (A) a related/follow-up research study that you could conduct, or (B) a potential implementation of the presented research in a real-world system (choose either A or B; one paragraph).

You must address all three components in your writing. The summary is to help you articulate what the paper is about. The position statement is to help you think more deeply about the work. The research study/application is to help you think about the work from a research perspective. Total length is about 1-2 pages for each reflection. You only have to submit 10 reading reflections, so you are allowed to skip 2 of them. The 10 reflections are each worth 3% of your grade.

Late submissions: Late submissions are allowed, but I will deduct *2% per hour* if your submission is late. Excusable late submissions (e.g. due to sickness) are an exception.

Grading feedback: You will receive an assignment grade with general feedback on how this grade was determined. If you want more feedback on your grade, please contact the TA. Since grading is the main responsibility of the TA, please do not assume that the instructor is aware of your grades (to request instructor feedback on your grades, see "regrading requests" below).

Regrading requests: Regrade requests must be submitted via email to the instructor, copying the TA. You must meet with the TA to get more feedback on your grade (see above) before requesting a regrade. Regrade requests must include the specific part of the assignment you want to be regraded and your reason for requesting a regrade. The instructor will regrade the assignment, but please keep in mind that the new grade is not guaranteed to be higher (and may in fact be lower) than the original grade. All regrades are final.

Grading timing: The TA and I will attempt to grade your assignments and midterm within 10 days of the submission deadline, but given the amount of work grading takes we cannot guarantee this schedule.

Course schedule

For your convenience, you can add the course schedule to your calendar (ICAL or HTML).

Week	Dates	Topic and contents	Work
1.2	Wednesday Aug 24	**Online (via Zoom):** Overview and welcome	Watch (before class): Introduction to Recommender Systems
2.1	Monday Aug 29	Introduction to recommender systems and algorithms	Watch: Taxonomy of Recommenders II
2.2	Wednesday Aug 31	Hands-on tutorial: LensKit	Watch: User-User Collaborative Filtering
3.1	Monday Sep 5	Beyond accuracy	Read: Being Accurate is not Enough, Making Recommendations Better, and Explaining the User Experience of Recommender Systens **Due before class: reflection 1**
3.2	Wednesday Sep 7	Hands-on tutorial: The recommender system interface	Watch: Introduction to Item-Item Collaborative Filtering and Introduction to Matrix Factorization and Dimensionality Reduction Optional videos: Item-Item Algorithm and Singular Value Decomposition
4.1	Monday Sep 12	Hands-on tutorial: Changing the recommender system	Watch: The Goals of Evaluation, Hidden Data Evaluation, Prediction Accuracy Metrics and Decision Support Metrics Optional video: Rank-Aware Top-N Metrics A1 (system development) available
4.2	Wednesday Sep 14	Human decision-making	Read: Contructive Consumer Choice Processes and Human Decision Making and Recommender Systems **Due before class: reflection 2**
5.1	Monday Sep 19	Filter bubbles	Read: Captivating Algorithms and chapter 1 of You Are Not A Gadget Watch video: Beware Online "Filter Bubbles" **Due before class: reflection 3**
5.2	Wednesday Sep 21	Self-actualization	Read: Behaviorism is not Enough and Recommender Systems for Self-Actualization **Due before class: reflection 4**
6.1	Monday Sep 26	Contextual inquiry and contextual design	Read: chapters 3 and 7 of *Contextual Design: Design for Life* (optional: chapters 1-8)
6.2	Wednesday Sep 28	Grounded theory	Read: chapters 3 and 4 of *Constructing Grounded Theory* (optional: chapters 1-6) A2 (user research) available **Due before class: A1 (system development)**
7.1	Monday Oct 3	Preference-based visualizations	Read: Capturing Interest Through Inference and Visualization, Knowing the Unknown, and Reading News with a Purpose **Due before class: reflection 5**
7.2	Wednesday Oct 5	Choice-based communities	Read: Social matching **Due before class: reflection 6**
8.1	Monday Oct 10	User experiments	Read: Evaluating Recommender Systems with User Experiments
8.2	Wednesday Oct 12	Scale development	Read: chapter 5 of *Scale Development* (optional: chapters 1-5)
9.1	Monday Oct 17	Preference elicitation and expertise	Read: Adaptive Preference Elicitation Methods and Each to His Own **Due before class: reflection 7**
9.2	Wednesday Oct 19	**Students present:** User research results	Read: Evaluating recommender systems from the user's perspective A3 (design) available **Due before class: A2 (user research)**
10.1	Monday Oct 24	Choice overload and diversification	Read: Understanding Choice Overload in Recommender Systems and Using Latent Features Diversification to Reduce Choice Difficulty in Recommendation Lists **Due before class: reflection 8**
10.2	Wednesday Oct 26	Usability evaluation	Read: *Heuristic Evaluation* and *Think–Aloud Usability Testing*
11.1	Monday Oct 31	Inspectability and control	Read: Inspectability and Control in Social Recommenders **Due before class: reflection 9**
11.2	Wednesday Nov 2	**Students present:** Preliminary design results	
12.1	Monday Nov 7	No class - Fall break	
12.2	Wednesday Nov 9	Hands-on tutorial: Think-aloud testing	A4 (think aloud / user experiment design) available **Due before class: A3 (design)**
13.1	Monday Nov 14	Alternative algorithms	Read: TBA **Due before class: reflection 10**
13.2	Wednesday Nov 16	Emotions	Read: TBA **Due before class: reflection 11**
14.1	Monday Nov 21	Make-up class slot (if needed)	
14.2	Wednesday Nov 23	No class - Thanksgiving	
15.2	Monday Nov 28	Privacy	Read: Privacy Aspects of Recommender Systems **Due before class: reflection 12**
15.2	Wednesday Nov 30	**Students present:** Preliminary think aloud results / experiment design	
16.1	Monday Dec 5	Writing a research paper	Read: Writing the Empirical Journal Article
16.2	Wednesday Dec 7	Wrap-up	**Due before class: A4 (think aloud / user experiment design)**
exam	Thursday Dec 13	***Submit your term paper by 6pm***	

Attending class, etc.

Things discussed in class are part of the course materials, and although the slides will be put on this website, I cannot guarantee that no additional material are discussed in class. Hands-on classes will include "follow along" examples, so please bring your laptop with the requisite software installed.

You will get an email notification in the event that class is cancelled. If the instructor is more than 15 minutes late, you can assume a last-minute cancellation. Hopefully this will not happen!

Academic integrity

Please refer to the following official statement on academic integrity:

As members of the Clemson University community, we are supposed to have a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn trust and respect of others. Futhermore, we are supposed to recognize that academic dishonesty detracts from the value of a Clemson degree.

Practically speaking: Do not cheat (e.g.: do not collaborate on the midterms and/or final). Plagiarism will not be tolerated, and be dealt with through official university channels, see: http://www.clemson.edu/academics/integrity/plagiarism.html.

Disability access

Students with disabilities requesting accommodations should contact the Office of Student Disability Services in Suite 239, Academic Success Center building and/or call 864-656-6848 to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors. Accomodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Title IX (Sexual Harassment) statement

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-life/campus-services/access/title-ix/. Alesia Smith is the Clemson University Title IX Coordinator. She is also the the Executive Director of Equity Compliance. Her office is located at 223 Brackett Hall, phone: 864-656-3181, email: alesias@clemson.edu.