

RECOMMENDER SYSTEMS

Course Syllabus for CS 538 (*Recommender Systems*), Spring 2017

O V E R V I E W

This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences. We will discuss how recommender systems are deployed in e-commerce sites, social networks, and many other online systems, with readings from current research in the field.

C O U R S E L O G I S T I C S

Course Title	CS 538: Recommender systems
Credits	3
Schedule	MW 3:00–4:15 in CCP 259
Readings	<i>Practical Recommender Systems</i> (textbook) <u>Collaborative Filtering Recommender Systems</u> Additional research papers and online articles
Software	Python, PyData, and LensKit

I N S T R U C T O R

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R E S O U R C E S A N D R E A D I N G S

Textbook

Our primary (and required) textbook is *Practical Recommender Systems* by Kim Falk Jørgensen (Manning, 2018). It is not yet in print as of the beginning of the term; it is available electronically through the [Manning Early Access Program](#).

You may also find the video lectures in the *Recommender Systems* specialization on Coursera a useful addition to your study. The lectures are free; payment is only required if you wish to take the Coursera assignments and get a certificate.

Supplemental Books

The following optional textbook may be useful if you wish to dive deeper into some of the topics we cover in a more traditional textbook:

Recommender Systems: An Introduction by Jannach, Zanker, Felfernig, and Friedrich
(Cambridge, ISBN 978-0-52-149336-9)

You will likely find this survey article useful to read:

Collaborative Filtering Recommender Systems by Ekstrand, Riedl, and Konstan (now publishers; *Foundations and Trends in Human-Computer Interaction* 4(2)).
Available free from [my web site](#).

Finally, the *Recommender Systems Handbook* (edited by Ricci, Rokach, and Shapira) is a good resource for overviews of many topics in recommender systems.

Research Readings

Throughout the course, we will be reading and discussing a number of research papers. The currently-planned list of papers is in the appendix of this syllabus; links to each paper will be provided in Blackboard.

Software Resources

This course contains several programming assignments in Python using the LensKit library and PyData stack. For more information on programming with PyData, I recommend *Python for Data Analysis* or *Python Data Science Essentials*.

The current LensKit documentation can be found at <https://lkpy.lenskit.org>.

C O U R S E S T R U C T U R E

You are responsible for reading the textbook. We do not have time to discuss everything that you need to know in class; our time there is better spent diving deeper into the topics.

Course Components

The work in this course falls into several categories:

- **Reading reports** ask you to briefly summarize a research paper from the readings.

- **Assignments** to give you experience building, testing, and analyzing recommender systems.
- A **research project** to understand, communicate, and extend recent recommender systems research.
- **Midterm and final exams.**

Your final grade will be computed from these components as follows:

Category	%
Reading Reports	5
Assignments	35
Exams	30
Research Project	30

The standard 70/80/90 scale determines the minimum grade you will receive (that is, if you have 80 total course points, you will receive at least a B-).

Readings and Reports

Each week has an assigned research reading. These readings will also form the basis of the Reading Reports. For each week's reading, write 2–3 paragraphs briefly addressing the following:

- What question is the paper trying to answer, or what problem is it trying to solve?
- What is the key idea of the solution or experimental method?
- What are the main lessons from the paper?

In addition to the assigned course readings, you must find and read some additional research papers. You must submit a total of **15 reading reports**: 12 from the assigned readings and 3 from additional research papers you find on your own.

Do not neglect the reading reports. The research project will be *much* easier if you are regular in doing the readings and their reports. Each reading report is due by **noon on Wednesday**.

I also encourage you to discuss the readings with your fellow students in advance of class; you may even do this before submitting the reading reports. The reading report itself must be your own work, but discussion is fine.

Assignments

There will be several assignments throughout the semester. Many of these assignments will require you to implement and/or test one or more recommender algorithms using the [LensKit toolkit](#).

Some assignments will involve analyzing or designing recommender applications.

Each assignment is due at **midnight on Tuesday** of the week in which it is due.

You may work in groups of up to 2 on the assignments. If you work with a group, only submit the assignment under **one group member**, and list all members of your group in your assignment submission.

Research Project

The final component of this class is the research project. Tentatively, I expect there to be three options:

- A new recommender systems experiment, with related work.
- A survey and research proposal, surveying and summarizing several research papers and proposing a new experiment to extend their results or answer new questions they raise.
- A replication study, where you attempt to reproduce a recent recommender systems algorithm or experiment paper.

I encourage you to work with a partner on this project. Each student or group will present their research project at the end of the semester. More details will be available in the research project description.

C O U R S E P O L I C I E S

Attendance

You should attend all class sessions if possible. If you need to be absent for some reason, such as conference travel or illness, please let me know as soon as you can.

Late Work

You may submit **assignments** late with a 10% penalty for each day late.

Each **research project deliverable** must be submitted on time. Deliverables will be accepted up to 24 hours late with a 25% grade penalty.

Late reading reports are not accepted, but only the required number of reading reports will affect your grade.

The mid-term and final exams will be at the published times. Makeup exams will only be given in exceptional circumstances.

Cheating and Academic Integrity

As both a programmer and a student, you are expected to do your own work, attribute sources, and respect the legal and moral rights of others with respect to their work; as a student, you are also required to abide by the university policies regarding academic integrity. While I aim to allow you to make reasonable use of resources, cheating (including copying code, using unauthorized resources during tests, etc.) will not be tolerated. If you are found to be cheating, the penalty may range from an F on the assignment to an F on the course, and will also be reported to the university.

External Resources

You may consult external resources such as other books and web sites for understanding how to solve assignments or portions of the project. In your assignment solution, list all external resources you used; if they are available online, provide the URL. You do not need to cite the textbook, or the official documentation for the software we are using (Python, Pandas, Numpy, LensKit, etc.).

Besides the course forum, you may ask questions related to the course material and concepts required to complete the work on publicly accessible discussion forums such as Stack Overflow, newsgroups, or publicly-archived mailing lists. To qualify as publicly-accessible, a site must provide access to complete discussions without requiring payment or registration. Provide URLs to the forum discussion on the relevant web site or archive (Google Groups works well for newsgroup archives) with your project deliverable submission. When you ask a question for one of the assignments, mention that it is for a course project and that your instructor permits you to make reasonable use of discussion forums. You may also freely use the LensKit Gitter chat room.

A good question will ask about how to go about a particular sub-portion of the problem, how something works, why something you are trying doesn't work, or other specific difficulties. Do not ask "how do I solve <the problem description>?", or similarly direct translations of the project requirements, or for specific code. Questions should be written to fill in a gap in your understanding that will then enable you to continue your work, not to get a solution to the assignment.

Conduct

I expect you to behave in a civil, respectful manner in all class interactions, both in official meetings such as lectures and out-of-classroom activities such as project group meetings and study sessions, and to contribute to a constructive learning environment.

The [Recurse Center Social Rules](#) are a good source of guidance on how to maintain a constructive and educational environment.

If you experience or witness harassment of any form, please let me know.

Disability Accommodations

If you need particular accommodations to be able to fully participate in this course, please talk with me as soon as possible. I may ask that you provide documentation from the Office of Disability Services, so if you have such documentation please bring it.

S C H E D U L E

Following is an approximate schedule. I will probably adjust it as we progress through the semester. **Bold** items are key dates for the project and exams.

Week	Date	Topic	Chapter	Assignment
1	1/14	Intro, Concepts, and Data	1,2	
2	1/21	Recommending Items & Non-Personalized Stats	5	
3	1/28	Content-Based Recommendation	7,10	A1
4	2/4	Neighborhood-Based Recommendation	8	
5	2/11	User Feedback and Input Data	4	A2
6	2/18	Evaluating Recommenders	9	
7	2/25	Matrix Factorization	11	A3
8	3/4	Midterm (Wednesday)		
9	3/11	Machine Learning	12	A4
<i>B</i>	3/18	<i>Spring Break</i>		
10	3/25	Psychology of Preference and Choice		
11	4/1	Recommendation in Context	14	A5
12	4/8	Learning to Rank	13	
13	4/15			A6
14	4/22			<i>Draft Report</i>
15	4/29	Research Presentations		
F	5/6	Final Exam (Wed. May 6 2:30-4:30 PM)		<i>Final Report</i>

Assignments (*An*) are due **on Tuesday at midnight** the week they are listed.

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