

# Recommender Systems

ECS 189G (AI series)

Winter 2020

Prof. Norm Matloff

**Units:** 4 (formalized after the quarter starts)

**Days/Time:** Lecture MWF, 2:10-3, Hutchison 115; discussion T 8:00-8:50 a.m.; Olson 250; **CRN 76808**

**Prerequisites:**

- Probability and statistical modeling. Course 132 or one of STA 32/STA 130A/STA 131A/MAT 135A
- Linear algebra: MAT 22A or equivalent.
- Programming: Course 30.

Machine learning methods will be used but no prior background assumed.

**Non-CS majors welcome!**

**Description:**

Collaborative filtering and content-based methods for building recommender systems. Machine learning, statistical, matrix factorization and nearest-neighbor approaches. Use of sentiment analysis. Google PageRank. Case studies.

**Workload:**

Comparable to typical non-programming upper-division CS courses, say ECS 152A. (Less intensive than my ECS 132 class. :-) )

Weekly or biweekly open-book quizzes (no midterm or final exam); group assignments (mainly analysis of real data); group term project.

Required probability/stat background is light; STA 32 is enough. However, the field is fundamentally quantitative and probabilistic in nature, so you need to be comfortable with quantitative reasoning in general, have good mathematical intuition, and enjoy delving through real datasets.

**The field of recommender systems (RS):**

- A branch of machine learning.
- Prediction of how well a given “user” will like a given “product.”

- Companies like 



use RS to recommend mer-

chandise, songs and potential dates to their users.

- Other sample apps:
  - University of Minnesota RS system aids students in selecting courses. Predicts how well a student would like a certain course, and even predicts his/her grade!
  - Predict whether a given patient will have an adverse reaction to a given prescription drug.

- Suggest “friend” relations in social networks.
- Software: Various packages available in R and Python. We will use R (no prior R background assumed). My students and I have developed the **rectools** package; see [github.com/matloff/rectools](https://github.com/matloff/rectools) and a great Stanford presentation by Pooja Rajkumar (then a UCD undergrad), [https://www.youtube.com/watch?v=G\\_z4sXiYGog](https://www.youtube.com/watch?v=G_z4sXiYGog).

**Topic outline:**

- Review of probability concepts and linear algebra (both using R), using RS concepts and methods as examples.
- Collaborative filtering. Functional relations between users, items and ratings.
- Content-based systems. Text processing.
- Graphical methods, e.g. PageRank and Random Walk with Restart.