# COMP 4601A
# Fall 2023 – Assignment #2

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## Objectives

Within this assignment you will be performing some experimental analysis on a historical movie review dataset. The goal of the assignment is to determine which algorithm (user-based or item-based) and parameter combination (top-K neighbours or similarity threshold, and associated values) provide the best recommendation solution for the given dataset.

## Submitting/Demonstrating

The code and report for your assignment must be submitted on Brightspace before the deadline. If you are submitting as part of a group, only one group member should make a submission that contains all partners' names and student numbers in a README file.

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## Assignment Requirements

The main goal of the assignment will be to perform experimental analysis of the prediction accuracy achieved by the recommender system algorithms we have discussed in the course. The assignment page contains a text file of historical movie review data, which follows the same format as the data used in lab #8. You will be required to submit a short report (<10 pages) outlining the design of your implementation and analyzing/discussing your experimental results within the context of this dataset. Some questions you should aim to answer in your report include but are not limited to:

1) Which algorithms have you implemented? What are the details of these algorithms?
2) How have you minimized the runtime of your implementations?
3) How have you implemented the leave-one out cross validation strategy?
4) Is user-based or item-based nearest neighbour recommendation more accurate for this data?
5) Is top-K (i.e., selecting the K most similar users/items) or threshold-based (i.e., selecting all users/items with similarity above some threshold X) more accurate for this data?
6) Which parameter values produce the most accurate results for this data (e.g., is 2 neighbours best? 10? 100? a threshold value of 0? 0.5?, etc.)? How does the prediction accuracy change as the parameter values change?
7) Does including negative correlations (e.g., top-k based on absolute value of correlation) improve the results?

8) How long does prediction take for each algorithm/parameter combination? Is one solution faster than the other? Is this expected based on the algorithms or is it specific to your implementation?
9) Based on your analysis and knowledge of the algorithms, which algorithm/parameter combination would you use for a real-time online movie recommendation system? Provide some arguments in favor of this conclusion based on your experimental results and the computational requirements for the algorithm. You should also consider the benefits/drawbacks of each algorithm in your comparison (e.g., what values can be precomputed? how will this affect a real-world application?).
10) How will your solution be affected by users with more/less reviews?

To generate data for the report, you are expected to use the 'leave one out' cross validation approach discussed in the Evaluating Recommender Systems lecture (Week #10). This will allow you to compute the mean absolute error across the entire dataset for any single algorithm/parameter combination.

Repeating the experiments for this assignment will involve quite a bit of computation. It may be worth spending some time improving the runtime complexity of your implementation before running the experiments. Look for values you can precompute and reuse/modify to avoid excessive amounts of unnecessary computation. Start your experiments early so you have time to investigate the two algorithms and different parameters.