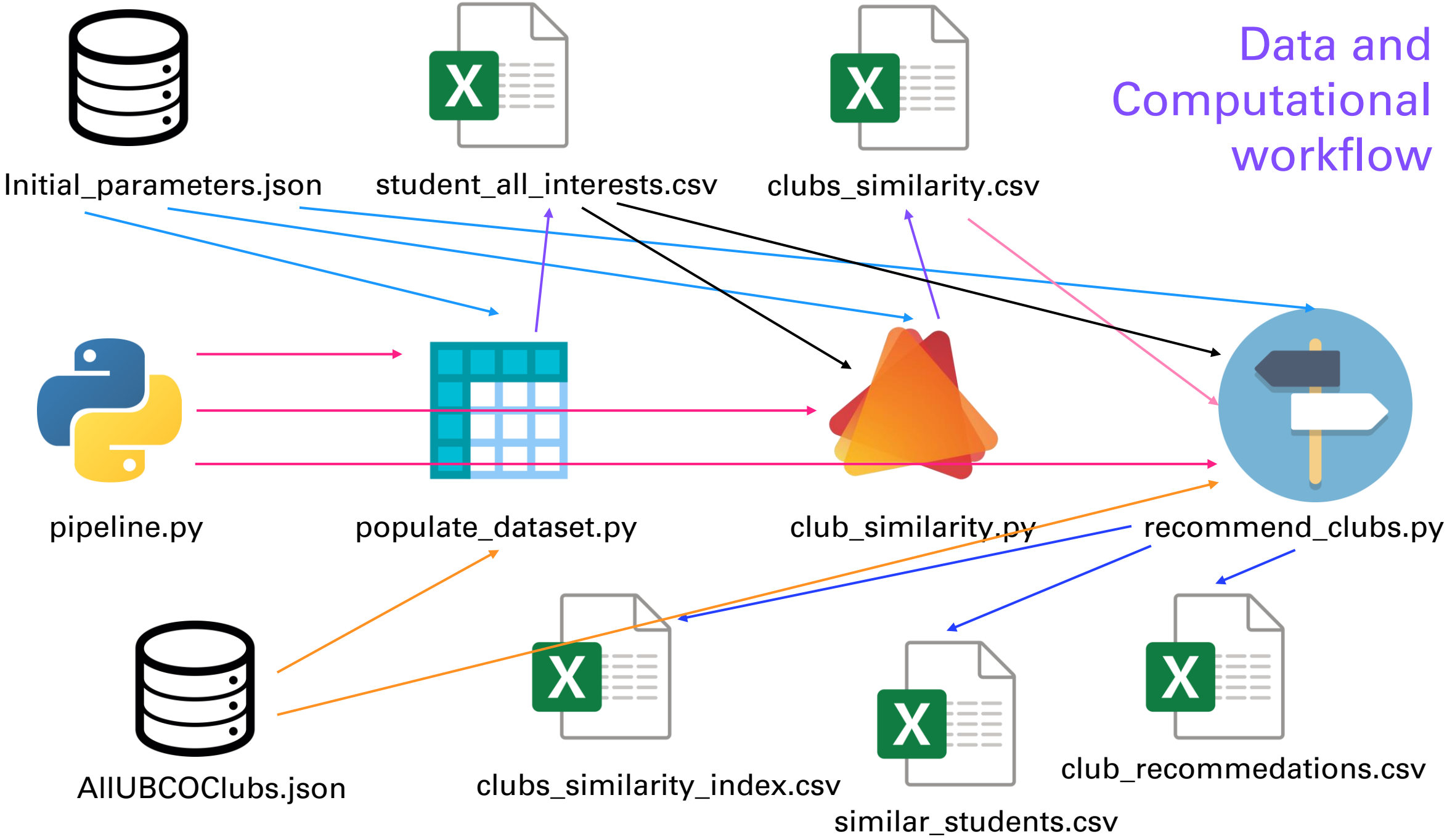
RECOMMENDATION SYSTEM WITH MINIMAL IDENTIFIABLE FEATURES

Exploring the possible feature / stretch goal

Data and Computational workflow



populate_dataset.py

Objective: Creates a random dataset for *n* students

- Generates random e-mails
  - Random characters
  - Random special characters
  - Random presence and position of special characters
  - Random domains
- One-way one-time PBKDF2-HMAC-SHA1 encryption of e-mails
- Generates random club interests
  - Random number of interested clubs
  - Random choice of clubs
- Generates random event interests [still under development]

club_similarity.py

Objective: Finds similar clubs between all pairs of students

- Computes the intersection of a pair of club lists from two different students
- Generates club_similarity.csv for better interpretability of the recommendation system

recommend_clubs.py

Objective: Generates a .csv of club recommendations

- Finds similarity indices between a pair of different students (how many clubs are similar?)
  - Stored as clubs_similarity_index.csv
- Sorts these values for each student to find most similar students
  - Stored as similar_students.csv

recommend_clubs.py

- Computes importance of a similar user
  - Importance = similarity_index(this_user, other_similar_user)

- Importance-based scoring system

  - (Let) “student” be 1 student for whom we need recommended clubs
  - (Let) “other_students” be a list of other students ranked by similarity

  For “each_student” in “other_students”

  1) Find clubs that “student” is not a part of (np.setdiff1d of the club lists)
  2) Update the “weight” for each club based on importance(each_student)

  - Normalise the weights for each club

  - Store them from highest weight to lowest weight (i.e. most recommended to least recommended)

  - Generates club_recommendations.csv

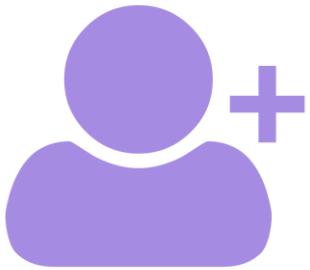
Advantages

- Requires minimal personal student information (one-time one-way encryption of e-mail IDs or any other personally identifiable information)
- Highly interpretable and intuitive model: better for scalability and for adding new parameters/features in the future
- Importance-based scoring removes any advantage that may arise due to a happenstance order
- Recommendations takes all user interests into account, not just those that are most similar. (Can be treated as a hyper-parameter to include n-most similar users).
- Generates a unique order of all clubs and not just a subset of recommended clubs. This can be used as a native club-view order for each student (each student sees all clubs but in a unique order, personalized to them)

Areas of improvement

- For better personalized lists, more data is needed
    - Women in engineering
    - Indonesian students of Okanagan
    - African Caribbean Students Club
    - Asian Student Association
    - Bible Discussion Club
- Personal data vs Personalized results trade-off
    - Example: biased results (Women in engineering)
    - Using “categories” data in AllUBCOClubs.json

What about new users?



- Initial run: no club interests for any student
- Three possible approaches:
  1. Recommend top clubs from each category
     - Some clubs are “uncategorized”
  2. [Currently more do-able] Use a questionnaire to select those categories that the student is interested in
     - Reluctance to answer a questionnaire (cannot assume that everyone will respond)
  3. (Best case but more high-effort)
     - Obtain the dataset of current students and what clubs they are a part of
     - Generate an average portfolio by faculty
     - Display this order

RECOMMENDATION SYSTEM WITH OPTIMAL IDENTIFIABLE FEATURES

Exploring the possible feature / stretch goal

NEW

What if we had the following features?

1. Gender
    - Women in Engineering
    - Inclusive Men's Health Partnership

2. Ethnicity
    - Asian Student Association
    - African Caribbean Student Club
    - Chinese Students and Scholars Association

3. Country
    - Hong Kong Student Club

4. Religion
    - Bible Discussion Club
    - Not including this would only affect 1 club (unless new religious clubs form in the future)

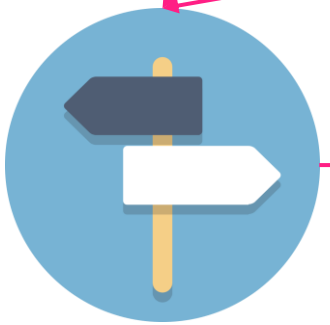
student_all_interests.csv

clubs_similarity.csv

recommend_clubs.py

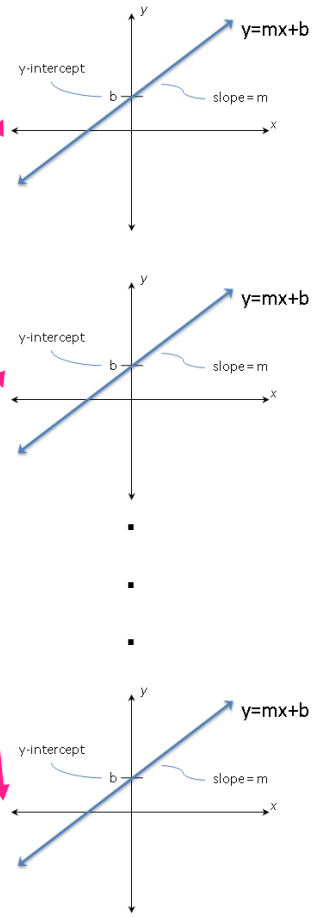
student_all_interests.csv

clubs_similarity.csv



recommend_clubs.py

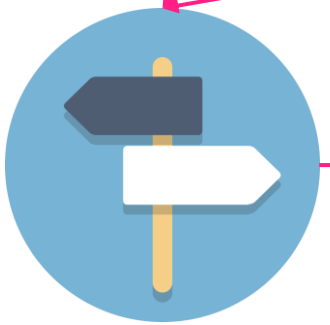
For each student



All other students

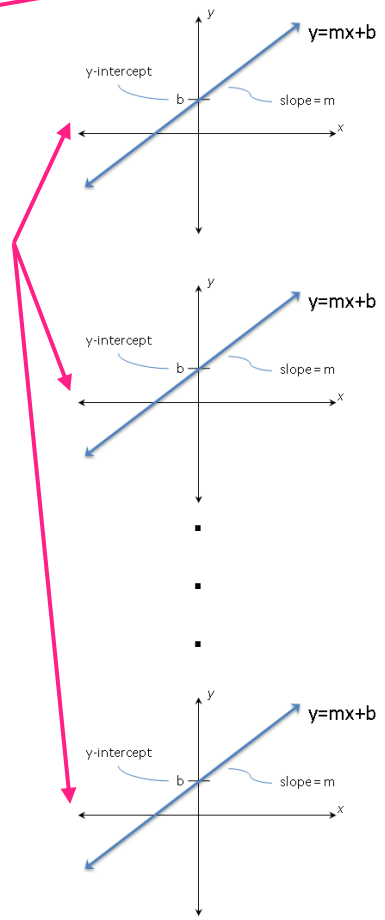
student_all_interests.csv

clubs_similarity.csv

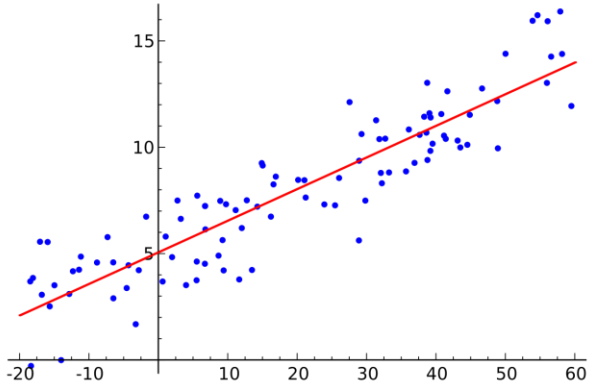


recommend_clubs.py

For each student



All other students

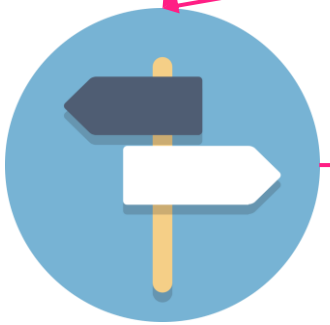


student_all_interests.csv

clubs_similarity.csv

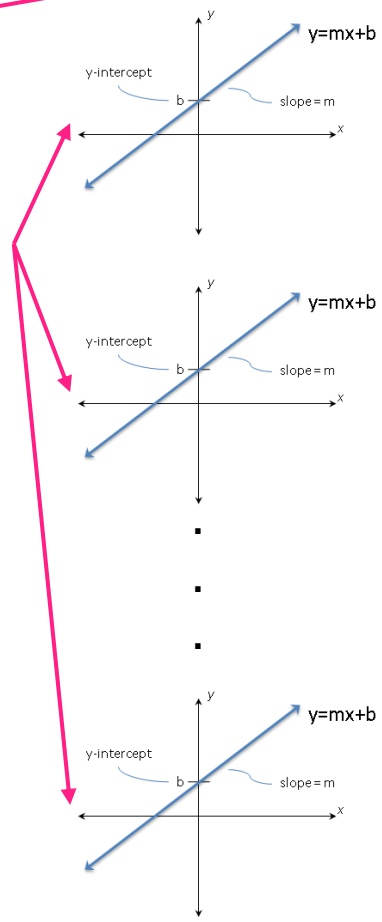
clubs_similarity_index.csv

similar_students.csv

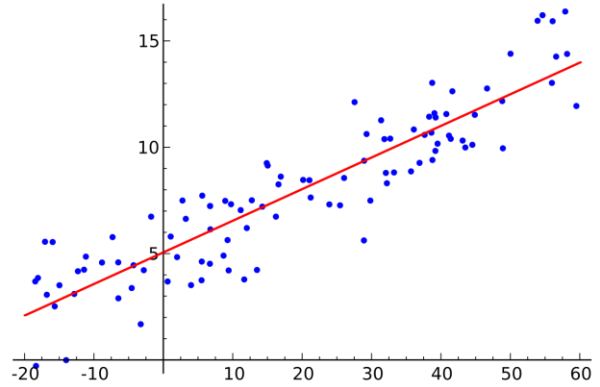


recommend_clubs.py

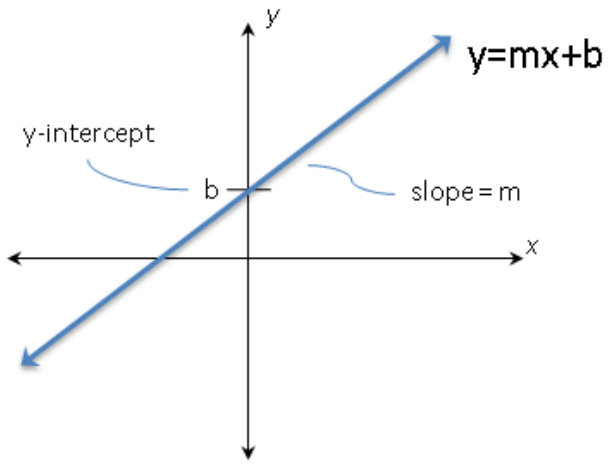
For each student



All other students



club_recommedations.csv



Importance of a pair of students

- One dimensional linear equation: y = mx +c

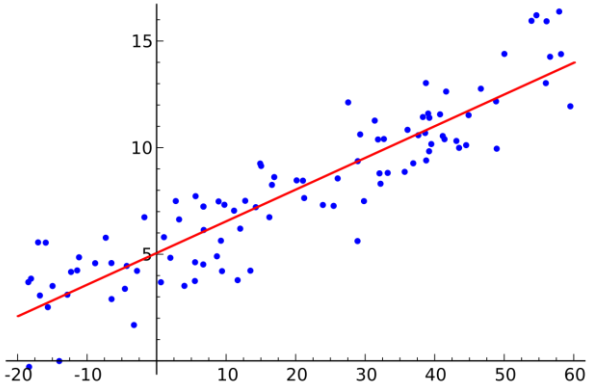
- In this context:

importance = similarity_coefficient * club_similarity + bias

- similarity_coefficient: how similar are 2 students based on their gender, ethnicity, country, and religion?

- club_similarity: how many clubs do these 2 students have in common?

- bias: function parameter, non-zero x ∈ Z^(++)
  - To ensure that even those with nothing in common get some unit importance, for completeness



Finding similar students

- Each regression line enlists similar students w.r.t. one particular student
- Each point can be seen as a unit vector with magnitude=importance
- Pop out similar users from highest importance to lowest importance
- Find unique clubs (algorithm similar to the previous one with minimal features)