

Workshop Week 11 - COMP20008 2021

1. Suppose you are conducting data linkage between two databases, one with m records and the other with n records (assume $m < n$). Under a basic approach, $m \times n$ record comparisons will be needed.

- Assume there are no duplicates. What is the maximum number of record matches? What is the corresponding number of non-matching comparisons required in this circumstance?

Now suppose a blocking method is employed, where each record is assigned to exactly one block. Assume this method results in b number of blocks.

- What is the smallest possible number of comparisons?
 - What is the smallest possible number of comparisons that will return all matches? What is the value of b ?
 - What is the largest possible number of comparisons?
 - If records are evenly allocated to b blocks, how many comparisons will be needed?
 - What is the advantage with a large b ? What is the advantage with a small b ?
 - In practice, a record is assigned to more than one block and records are not evenly allocated to blocks. How would this affect your analysis of large b vs small b ?
 - What is the advantage of records being assigned to multiple blocks?
2. Explain how the data duplicate detection problem relates to the data linkage problem. What are the major differences?
 3. One may evaluate the output of a data linkage system according to how many records are linked correctly and how many records are linked incorrectly.
 - What are the reasons two records could be linked incorrectly?
 - Suppose a false positive (FP) is two records that are linked by the system, which a human believes should not have been linked. Suppose a false negative (FN) is when two records are not linked by the system, which a human believes should have been linked. A true positive (TP) is two records linked by the system which a human believes should have been linked and a true negative (TN) is two records not linked by the system which a human believes should not have been linked.
 - What are the relative sizes of the categories TP, TN, FP, FN? In practice, how might one calculate these sizes?

- It is desirable to minimise both FP and FN, but it may be difficult to minimise both simultaneously. Give an example application where minimising FP is more important than minimising FN. Give an example application where minimising FN is more important than minimising FP.

4. Consider the following dataset: -

User	Iron Man	Superman	Batman	Spiderman	Ant-Man	Wonder Woman
Anne	3		3	3.5	2.5	3
Bob	4	3.5	2.5	4	3	3
Chris	3	3	3			4
Dave		3.5	2	4	2.5	
Eve		3		3	2	5
Frank	2.5	4		5	3.5	5
Gary		4.5	3	4	2	

- Use the Item-based recommender systems approach discussed in lectures to predict Frank's rating for Batman.
 - Use the User-based recommender systems approach to predict Frank's rating for Batman
 - Identify the advantages and disadvantages of each approach
5. Recommender systems are challenged by the "cold start" problem - how to make recommendations to new users, about whom little is known, and how to make recommendations about new items. Suggest three strategies that might be used to address this.
6. Recommender systems are sometimes criticised for over-recommending popular items to users and under-recommending rarer items. Why do you think this happens? How might it be addressed?