

## Assignment 3 – Normalization

### Your tasks

1. Provide a program to create a new relation which is the result of joining Movie, Movie\_Genre, Genre, Member, Movie\_Actor, and Actor\_Movie\_Role from assignment 2. Restrict yourself to the following attributes: movieId, type, startYear, runtime, avgRating, genreId, genre, memberId, birthYear, role. Only use movies whose runtimes are greater or equal than 90 minutes and those where an actor only plays a single role in a given movie. Explain your decisions. (Hint: When creating the new relation, you need to uniquely identify each tuple.)  
**(10 points)**
2. Provide a program implementing the naïve approach to discover functional dependencies on the relation from question 1. Run your program for a while and provide an estimate on the time it should take to complete. Explain your answer.  
**(20 points)**
3. Provide a program implementing the pruning approach to discover functional dependencies on the relation from question 1. Your program needs to discover functional dependencies with combinations of no more than two attributes on the left-hand side in the previous relation in less than five hours. Report the functional dependencies your program finds and provide examples of pruning functional dependencies. Explain your answer.  
**(40 points)**
4. Assuming that there are no more minimal functional dependencies than the ones computed in Question 3 (combinations of no more than two attributes on the left-hand side), explain the outcome if we do not restrict that “an same actor only plays a single role in a given movie” as in question 1.  
**(10 points)**
5. Implement all necessary steps to compute a 3NF decomposition of the relation from question 1 given the set of functional dependencies discovered in question 3. Provide the results (candidate keys, canonical cover, final decomposition).  
**(20 points)**