CSC343 Assignment 1

Yuchen Lu, Dan Li, Farzaneh Tabandeh

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1 Part 1: Queries

Question1
Find all the users who have never liked or viewed a post or story of a user that they do not follow. Report their user id and " information. Put the information into a relation with attributes "username" and "description".

– Find all user pairs
$AllUsers(uid1, uid2) := \Pi_{U1.uid,U2.uid}\ \sigma_{U1.uid<U2.uid}(\rho_{U1}(User) \times \rho_{U2}(User))$

– Find pairs where uid1 not follow uid 2
$NotFollow(uid1, uid2) :=$
$AllUsers - \Pi_{follower,followed}\ follows$

– Find pairs where uid1 liked uid2 but not follows uid2
$LikedButNotFollow(uid1, uid2) :=$
$\Pi_{NF.uid1,NF.uid2}\ \sigma_{NF.uid1=LP.liker \wedge NF.uid2=LP.uid}(\rho_{NF}(NotFollow) \times \rho_{LP}(likes \bowtie Post))$

– Find pairs that uid1 only liked users they follow
$OnlyLikedFollow(uid1) := \Pi_{uid1}(AllUsers - LikedButNotFollow)$

similarly:

– Find pairs where uid1 viewed uid2 but not follows uid2
$ViewedButNotFollow(uid1, uid2) :=$
$\Pi_{NF.uid1,NF.uid2}\ \sigma_{NF.uid1=T2.viewerid \wedge NF.uid2=T2.uid}(\rho_{NF}(NotFollow) \times \rho_{T2}(likes \bowtie Saw \bowtie Story))$

– Find pairs that uid1 only viewed users they follow
$OnlyviewedFollow(uid1) := \Pi_{uid1}(AllUsers - ViewedButNotFollow)$

– Find users only view or liked users they follow
$GoodUsers(uid1) := OnlyLikedFollow \cup OnlyviewedFollow$

– Find about, reformat
$Answer(username, description) := \Pi_{uid,about}\ (GoodUsers \bowtie User)$

Question 2

Find every hashtag that has been mentioned in at least two post captions on every day of 2018. You may assume that there is at least one post on each day of a year.

– Get the posts and the hashtags

$PostHashtag(pid, when, tag) :=$

$\Pi_{Post.pid,Post.when,Hashtag.tag}(Post \bowtie Hashtag)$

– Get the answer (the hashtags that have been mentioned at least 2 times on any day of 2018)

$Answer(tag) :=$

$\pi_{H1.tag}(\sigma_{H1.pid<H1.pid \wedge H1.tag=H2.tag \wedge H1.when=H2.when=\text{"2018"}}(\rho_{H1}(PostHashtag) \times \rho_{H2}(PostHashtag))$

Question 3

Let's say that a pair of users are "reciprocal followers" if they follow each other. For each pair of reciprocal followers, and all of their "uncommon followers": users who follow one of them but not the other. Report one row for each of the pair's uncommon follower. In it, include the identifiers of the reciprocal followers, and the identifier, name and email of the uncommon follower.

– Find Reciprocal user pairs (user 1 and user 2)

$Reciprocal(uid1, uid2) :=$

$\Pi_{F1.followed,F2.followed}(\sigma_{F1.followed=F2.follower \wedge F2.followed=F1.follower \wedge F1.follower<F1.follower}$
$(\rho_{F1}(Follows) \times \rho_{F2}(Follows)))$

– Find users who followed user 1 of the reciprocal user pair

$Follow1(uid1, uid2, follower1) :=$

$\Pi_{R.uid1,R.uid2,F.follower}(\sigma_{R.uid1=F.followed}$
$(\rho_R(Reciprocal) \times \rho_F(Follows)))$

– Find users who followed user 2 of the reciprocal user pair

$Follow2(uid1, uid2, follower2) :=$

$\Pi_{R.uid2,R.uid1,F.follower}(\sigma_{R.uid2=F.followed}$
$(\rho_R(Reciprocal) \times \rho_F(Follows)))$

– Find users who followed user 2 of the reciprocal user pair

$Followboth(uid1, uid2, followerboth) :=$

$\Pi_{F1.uid1,F1.uid2,F1.Follower1}(\sigma_{F1.uid1=F2.uid1 \wedge F1.uid2=F2.uid2 \wedge F1.follower1=F2.follower2}$
$(\rho_R(Reciprocal) \times \rho_{F1}(Follow1) \times \rho_{F2}(Follow2)))$

– Reciprocal pairs and uncommom user id

$PairUncommon(reciprocal1, reciprocal2, uncommonid) :=$

$Follow1 \cup Follow2 - Followboth$

– Answer
$Answer(reciprocal1, reciprocal2, uncommonid, name, email) :=$
$\Pi_{PairUncommon.reciprocal1,PairUncommon.reciprocal2,PairUncommon.uncommonid,User.name,User.email}$
$(PairUncommon \bowtie PairUncommon.uncommonid = User.uid \bowtie User)$

Question 4
Find the user who has liked the least posts. Report the user's id, name and email, and the id of the posts they have liked. If there is a tie, report them all.
Cannot be expressed

Question 5
Let's say a pair of users are "backscratchers" if they follow each other and like all of each others' posts. Report the user id of all users who follow some pair of backscratcher users.

– Find Reciprocal user pairs (user 1 and user 2)
$Reciprocal(uid1, uid2) :=$
$\Pi_{F1.followed,F2.followed}(\sigma_{F1.followed=F2.follower \wedge F2.followed=F1.follower \wedge F1.follower<F1.follower}$
$(\rho_{F1}(Follows) \times \rho_{F2}(Follows)))$

– All Posts of User 1
$User1AllPost(uid1, uid2, pid) := \pi_{Reciprocal.uid1,Reciprocal.uid2,Post.pid}$
$(\sigma_{Reciprocal.uid1=Post.uid}(Reciprocal \times Post))$

– All user1's Posts that had been liked by User2
$P1likedbyU2(uid1, uid2, pid) := \pi_{Reciprocal.uid1,Reciprocal.uid2,P.pid}$
$(\sigma_{P.pid=L.pid \wedge P.uid2=L.liker}(\rho_P(User1AllPost) \times \rho_L(Likes))$

– All user1's Posts that had not been liked by User2
$P1notlikedbyU2(uid1, uid2, pid) :=$
$User1AllPost - P1likedbyU2$

– All Posts of User 2
$User2AllPost(uid1, uid2, pid) := \pi_{Reciprocal.uid1,Reciprocal.uid2,Post.pid}$
$(\sigma_{Reciprocal.uid2=Post.uid}(Reciprocal \times Post))$

– All user2's Posts that had been liked by User1
$P2likedbyU1(uid1, uid2, pid) := \pi_{Reciprocal.uid1,Reciprocal.uid2,P.pid}$
$(\sigma_{P.pid=L.pid \wedge P.uid1=L.liker}(\rho_P(User2AllPost) \times \rho_L(Likes))$

– All user2's Posts that had not been liked by User1
$P2notlikedbyU1(uid1, uid2, pid) :=$
$User2AllPost - P2likedbyU1$

– Find backscratcher(user A, user B)

$Backscratcher : (userA, userB) =$
$Reciprocal - (\sigma_{uid1,uid2}(P1notlikedbyU2)) \cup (\sigma_{uid1,uid2}(P2notlikedbyU1))$

–Find users who followed user A

$UserfollowA(uid) := \pi_{Follows.follower}(\sigma_{Follows.followed=Backscratcher.userA}(Follows \times Backscratcher)$

– Find users who followed User B

$UserfollowB(uid) := \pi_{Follows.follower}(\sigma_{Follows.followed=Backscratcher.userB}(Follows \times Backscratcher)$

– Answer

$Answer := UserfollowA \cap UserfollowB$

Question 6

The recent activity" of a user is his or her latest story or post. The recently active user" is the user whose most recent activity occurred most recently. Report the name of every user, and for the most recently active user they follow, report their name and email, and the date of their most-recent activity. If there is a tie for the most recently active user that a user follows, report a row for each of them.

– Find all users whose most recent activity is a post without considering story

$MostRecentIsPost(uid, pid, when) :=$
$\Pi_{uid,pid,when}\ \sigma_{Saw.viewerid=Comment.commentor=Likes.liker=Follows.follower}$
$\wedge post.when>Saw.when \wedge post.when>Comment.when \wedge post.when>Likes.when \wedge post.when>Follows.when$
$(Saw \times Comment \times Likes \times Post \times Follows))$

– Find all users whose most recent activity is a story without considering post

$MostRecentIsStory(uid, sid, when) :=$
$\Pi_{uid,sid,when}\ \sigma_{Saw.viewerid=Story.uid=Comment.commentor=Likes.liker=Post.uid=Follows.follower}$
$\wedge story.when>Saw.when \wedge post.when>Comment.when \wedge post.when>Likes.when \wedge post.when>Follows.when$
$(Saw \times Story \times Comment \times Likes \times Follows))$

– Find most recent active users and recent activities

$MostRecentActiveUsers(uid, when) :=$
$\pi_{A.uid,A.when}(\sigma_{A.when>B.when}(\rho_A(MostRecentIsPost) \times \rho_B(MostRecentIsStory)))$

– Find most recent active users' followers

$GoodFollowers(user, followed, when) :=$
$\Pi_{Follows.follower,Follows.followed,M1.when}\ \sigma_{Follows.followed=M1.uid \wedge Follows.followed=M1.uid}$
$(\rho_{M1}MostRecentActiveUsers \times Follows))$

– Find good followers, the most recently active user they followed, and the date of their activities

$GoodFollowerdate(user, followed, date) :=$
$\Pi_{A.user,A.followed,A.when.date}\ (\sigma_{A.user=B.user \wedge A.when>B.when}(\rho_A(GoodFollowers) \times \rho_B(GoodFollowers)))$

– Answer: Find good followers, the name and email of most recently active user they followed, and the date of their activities
$Answer(user, MostActiveUsersName, MostActiveUsersEmail, date) :=$
$\pi_{GoodFollowerdate.user,User.name,User.email,GoodFollowerdate.date}(\sigma_{GoodFollowerdate.followed=User.uid}(GoodFollowerdate \times User))$

Question 7
Report the name and email of the user who has gained the minimum number of new followers in 2018. If there is a tie, report them all.

Cannot be expressed

Question 8
For each user who has ever put any comments, report their id and the id of the first and of the last post they commented on.

– Find the pid that is not the latest comment of the commenter
$NotLatestPost(commenter, pid) :=$
$\pi_{C1.commenter,C1.pid}(\sigma_{C1.commenter=C2.commenter \wedge C1.when<C2.when}((\rho_{C1}(Comment) \times \rho_{C2}(Comment))))$

– Find the pid that is not the first comment of the commenter
$Notfirst Post(commenter, pid) :=$
$\pi_{C1.commenter,C1.pid}(\sigma_{C1.commenter=C2.commenter \wedge C1.when>C2.when}((\rho_{C1}(Comment) \times \rho_{C2}(Comment))))$

– All post that is comments and the commenter
$AllPost(commenter, pid) :=$
$\pi_{(}commenter, pid)Comment$

– Find the latest pid that user commented on
$Latest(commenter, pidlatest) :=$
$AllPost - NotLatestPost$

– Find the frist pid that user commented on
$Frist(commenter, pidfirst) :=$
$AllPost - Notfirst Post$

– Answer
$Answer(commenter, pidfirst, pidlatest) :=$
$Latest \bowtie Frist$

Part 2: Additional Integrity Constraints

1. A view on a story must occur after the date-time of the story itself.

$$\sigma_{(R_1.when > R_2.when)}\left(\rho_{R_1} Story \times \rho_{R_2} Saw\right) = \emptyset$$

2. Each user can have at most one current story.

$$\sigma_{S1.current=S2.current=TRUE \wedge S1.sid<S2.sid \wedge S1.uid=S2.uid}(\rho_{S1}(Story) \times \rho_{S2}(Story)) = \emptyset$$