CSC343 Assignment 1

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February 4, 2019

1 Problem 1

1. – all uids and the stories they viewed that are posted by people who they follow
$SawFollowing(viewid, sid) :=$
   $\Pi_{viewid,sid}$
      $\sigma_{follower=viewid \wedge followed=uid}(Follows \bowtie \Pi_{viewerid,sid}(Saw) \bowtie \Pi_{sid,uid}(Story))$

   – all uids and the posts they liked that are posted by people who they follow
   $LikedFollowing(liker, pid) :=$
   $\Pi_{liker,pid}$
      $\sigma_{follower=liker \wedge followed=uid}(Follows \bowtie \Pi_{liker,pid}(Likes) \bowtie \Pi_{pid,uid}(Post))$

   – all uids of people who viewed stories posted by people they're not following
   $SawNotFollowing(uid) := \Pi_{viewid}(\Pi_{viewid,sid}(Saw) - SawFollowing)$

   – all uids of people who liked posts posted by people they're not following
   $LikedNotFolloing(uid) := \Pi_{liker}(\Pi_{liker,pid}(Likes) - LikedFollowing)$

   – all uids of people who never liked a post or viewed a story posted by people they're not following
   $NeverLikedNorViewedNotFollowing(uid) :=$
      $\Pi_{uid}(User) - (SawNotFollowing \cup LikedNotFollowing)$

   – assuming the "username" refers to uid as of the description of the question
   $Answer(username, description) := \Pi_{uid,about}(User \bowtie NeverLikedNorViewedNotFollowing)$

2. $PostsIn2018(pid, tag, when) := \Pi_{pid,tag,when}\sigma_{when.year=2018}(Hashtag \bowtie Post)$

   – here I am assuming that the date-time attribute "when" has a date component representing year, month and day
   $Answer(hashtag) :=$
   $\Pi_{P1.tag}\sigma_{P1.pid \neq P2.pid \wedge P1.when.date=P2.when.date \wedge P1.tag=P2.tag}(\rho_{P1}PostsIn2018 \times \rho_{P2}PostsIn2018)$

3. $ReciprocalFollowers(uid1, uid2) :=$
      $\Pi_{F1.follower,F1.followed}$
         $\sigma_{F1.follower=F2.followed \wedge F1.followed=F2.follower \wedge F1.follower<F2.follower}$
            $(\rho_{F1}Follows \times \rho_{F2}Follows)$

   $FollowReciprocal1(uid, uid1, uid2) :=$

$$\Pi_{follower,followed,uid2}\sigma_{follower\neq uid2}[(\rho_{R1(followed,uid2)}ReciprocalFollowers) \bowtie Follows]$$

$FollowReciprocal2(uid, uid1, uid2) :=$
$$\Pi_{follower,uid1,followed}\sigma_{follower\neq uid1}[(\rho_{R2(uid1,followed)}ReciprocalFollowers) \bowtie Follows]$$

$UncommonFollowers(uid, uid1, uid2) :=$
$$(FollowReciprocal1 \cup FollowReciprocal2) - (FollowReciprocal1 \cap FollowReciprocal2)$$

$Answer(reciprocal1, reciprocal2, uncommon, name, email) :=$
$$\Pi_{uid1,uid2,uid,name,email}(UncommonFollowers \bowtie User)$$

4. Cannot be expressed.

5. – the reciprocal followers, duplicate in reverse order in the following rows
$ReciprocalFollower(follower, follower2) :=$
$$\Pi_{F1.follower,F1.followed}$$
$$\sigma_{F1.follower=F2.followed\wedge F1.followed=F2.follower}(\rho_{F1}Follower \times \rho_{F2}Follower)$$

– change the liker of Likes to follower
$Like(follower, pid, when) := Likes$

– the reciprocal followers and all the posts the first have liked
$FollowerLike(follower, follower2, pid) := \Pi_{follower,follower2,pid}(ReciprocalFollower \bowtie Like)$

– the reciprocal followers and all the posts written by the second one
$FollowerShouldLike(follower, follower2, pid) :=$
$$\Pi_{follower1,uid,pid}(\rho_{F(follower1,uid)}ReciprocalFollower \bowtie Post)$$

– the reciprocal followers whose first follower has not liked all the posts of the second one
$FollowerHasNotLiked(follower, follower2) :=$
$$\Pi_{follower,follower2}(FollowerShouldLike - FollowerLike)$$

– all the reciprocal followers where one of the two or maybe both did not like all the posts of the other one
$HaveNotLikedEachOther(follower, follower2) :=$
$$\Pi_{F1.follower,F1.follower2}$$
$$\sigma_{(F1.follower=F2.follower\wedge F1.follower2=F2.follower2)\vee(F1.follower=F2.follower2\wedge F1.follower2=F2.follower)}$$
$$(\rho_{F1}ReciprocalFollower \times \rho_{F2}FollowerHasNotLiked)$$

– all the backscratchers, duplicate in reverse order in the following rows
$Backscratchers(follower, follower2) := ReciprocalFollower - HaveNotLikedEachOther$

$Answer(uid) := \Pi_{F1.follower}\sigma_{F1.followed=F2.follower}(\rho_{F1}Follows \times \rho_{F2}Backscratchers)$

6. – times of all posts and stories of all users
$AllTimes(uid, when) := \Pi_{uid,when}(Post \bowtie User) \cup \Pi_{uid,when}(Story \bowtie User)$

– all posts and stories that are NOT the most recent
$RelativelyEarlierTimes(uid, when) :=$

$$\Pi_{T1.uid,T2.when}\sigma_{T1.uid=T2.uid\wedge T1.when>T2.when}(\rho_{T1}AllTimes \times \rho_{T2}AllTimes)$$

– each user's most recent activity time
$$LastestActivityTime(uid, when) := AllTimes - RelativelyEarlierTimes$$

– the most recent activity time of all users that each user follows
$$AllFollowsLatestActivity(follower, followed, when) :=$$
$$\Pi_{follower,followed,when}\sigma_{uid=followed}(Follows \bowtie LatestActivityTime)$$

– the users that are NOT the most recently active in each user's following list
$$RelativelyEarlierFollowActivities(follower, followed, when) :=$$
$$\Pi_{F1.follower,F2.followed,F2.when}$$
$$\sigma_{F1.follower=F2.follower\wedge F1.followed1\neq F1.followed2\wedge F1.when>F2.when}$$
$$(\rho_{F1}AllFollowsLatestActivity \times \rho_{F2}AllFollowsLatestActivity)$$

– the most recently active user that each user follows
$$MostRecentlyActiveFollow(follower, followed, when) :=$$
$$AllFollowsLatestActivity - RelativeEarlierFollowActivities$$

– add follower name info
$$MostRecentlyActiveFollowInfo(follower, username, followed, when) :=$$
$$\Pi_{follower,name,followed,when}\sigma_{uid=follower}(User \bowtie MostRecentlyActiveFollow)$$

– add followed user name, email info and select the final info needed
$$Answer(name, followed, email, when) :=$$
$$\Pi_{username,name,email,when}\sigma_{uid=followed}(User \bowtie MostRecentlyActiveFollowInfo)$$

7. Cannot be expressed.

8. $NotLast(pid, commenter) :=$
$$\Pi_{C1.pid,C1.commenter}$$
$$\sigma_{C1.commenter=C2.commenter\wedge C1.when<C2.when}(\rho_{C1}Comment \times \rho_{C2}Comment)$$

$NotFirst(pid, commenter) :=$
$$\Pi_{C1.pid,C1.commenter}$$
$$\sigma_{C1.commenter=C2.commenter\wedge C1.when>C2.when}(\rho_{C1}Comment \times \rho_{C2}Comment)$$

$$Last(pid_{last}, uid) := (\Pi_{pid,commenter}Comment) - NotLast$$

$$First(pid_{first}, uid) := (\Pi_{pid,commenter}Comment) - NotFirst$$

$$Answer(pid_{first}, uid, pid_{last}) := \Pi_{pid_{first},uid,pid_{last}}(Last \bowtie First)$$

2 Problem 2

1. $\sigma_{publish\geq time}(\rho_{Saw(viewerid,sid,time)}Saw \bowtie \rho_{Story(sid,uid,publish,current)}Story) = \emptyset$

2. $\sigma_{S1.sid\neq S2.sid\wedge S1.uid=S2.uid\wedge S1.current="yes"\wedge S2.current="yes"}(\rho_{S1}Story \bowtie \rho_{S2}Story) = \emptyset$