ADC Assignment 2: Relational Algebra Solutions

ADC Assignment

September 2024

1 Formulating queries in Relational Algebra and RA SQ

4.

$$\pi_{\text{cname, sid, salary}}\,(\pi_{\text{w1.cname, w1.sid, w1.salary}}\,(W_1 \bowtie_{\text{w1.sid}=k.\text{sid1}} K \bowtie_{\text{sS.sid}=k.\text{sid2}}\,(\sigma_{sS.\text{skill}=\text{'OperatingSystems'}}(sS))) - (\pi_{\text{w1.cname, w1.sid, w1.salary}}\,(W_1 \bowtie_{\text{w1.sid}\neq w2.\text{sid AND } w1.\text{cname}=w2.\text{cname AND } w1.salary\leq w2.salary} W2)))$$

5.

$$\pi_{\text{sname, salary, city}}\Big(\pi_{\text{s1.sname, w.salary, s1.city}}\Big(S_1 \bowtie_{\text{s1.city}=\text{s2.city}} S_2 \bowtie_{\text{w.sid}=\text{s1.sid}} W_1\Big) - \pi_{\text{s1.sname, w.salary, s1.city}}\Big(S_1 \bowtie_{\text{w.sid}=\text{s1.sid}} W_1 \bowtie_{\text{s1.sid}=\text{ps.sid}\wedge\text{ps.skill}=\text{"Networks"}} pS\Big) - \pi_{\text{s1.sname, w1.salary, s1.city}}\Big(S_1 \bowtie_{\text{w1.sid}=\text{s1.sid}} W_1 \bowtie_{\text{w1.sid}\neq\text{w2.sid}\wedge\text{w1.cname}=\text{w2.cname}\wedge\text{w1.salary}<\text{w2.salary}} W_2\Big)\Big)$$

6.

$$\pi_{\text{c1.cname, c2.cname}}\Big(\pi_{\text{c1.cname, c2.cname}}\Big(C_1 \bowtie_{\text{c1.cname}\neq\text{c2.cname}} C_2\Big) - \pi_{\text{c1.cname, c2.cname}}\Big(C_1 \bowtie_{\text{c1.cname}\neq\text{c2.cname}} C_2 \bowtie_{\text{s1.city}=\text{"Chicago"}} S_1 \bowtie_{\text{s1.sid}=\text{w1.sid}\wedge\text{w1.cname}=\text{c1.cname}} W_1\Big) - \pi_{\text{c2.cname, c1.cname}}\Big(C_1 \bowtie_{\text{c1.cname}\neq\text{c2.cname}} C_2 \bowtie_{\text{s1.city}=\text{"Chicago"}} S_1 \bowtie_{\text{s1.sid}=\text{w1.sid}\wedge\text{w1.cname}=\text{c1.cname}} W_1\Big)\Big)$$

2 Formulating constraints using Relational Algebra

7. $\pi_{\text{mid}}(M) \subseteq \pi_{\text{mid}}(\sigma_{M.eid=K.sid2}(M \bowtie_{M.mid=K.sid1} K))$

8. $\pi_{w1.sid}(\sigma_{w1.cname=\text{"}Amazon\text{"}}(W_1)) - \pi_{w1.sid}(\sigma_{w1.cname=\text{"}Amazon\text{"}}(W_1 \bowtie_{w1.sid=k1.sid} K1 \bowtie_{w1.sid=k2.sid} K2 \bowtie_{w1.sid=k3.sid} K3)) = \emptyset$

9. StudentWithNoSkill$(A) = \pi_{s.sid}(S) - \pi_{ss.sid}(SS)$

   StudentWithNoSkill_Salary$(B) = \pi_{w.salary}(W \bowtie_{w.sid=a.sid} A)$

   $\pi_{w.sid}(W \bowtie (w.salary < b.salary)B \bowtie (w.cname = c.cname)\sigma_{c.headquarter=\text{"}Cupertino\text{"}}(C)) \neq \emptyset$