Relational-algebra exercises on Pizza dataset

Solutions

Setup

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

- Eats contains information about what type of pizza each person (customer) eats (likes)
- Name is always the customer's name
- Frequents record information about pizzerias that each customer frequents (visits)
- Serves contains information about all possible pizza types for each pizzeria

Person (name, age, gender)
Frequents (name, pizzeria)
Eats (name, pizza)
Serves (pizzeria, pizza, price)

9. Find the names of all females who eat either mushroom or pepperoni pizza (or both).

$\pi_{name}($
$\sigma_{gender='female' \text{ AND } (pizza='mushroom' \text{ OR } pizza='pepperoni')}(Person \bowtie Eats)$
$)$

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

10. Find the names of all females who eat both mushroom and pepperoni pizza.

$\pi_{name}(\sigma_{gender='female'\ AND\ pizza='mushroom'}(Person \bowtie Eats))$

$\cap$

$\pi_{name}(\sigma_{gender='female'\ AND\ pizza='pepperoni'}(Person \bowtie Eats))$

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

11. Find all pizzerias that serve at least one pizza that Amy eats for less than $10.00.

$\pi_{pizzeria}(\sigma_{name='Amy'}(Eats) \bowtie \sigma_{price<10}(Serves))$

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

12. Find all pizzerias frequented by at least one person under the age of 18.

$$\pi_{pizzeria}(\sigma_{age<18}(Person) \bowtie Frequents)$$

Person (<u>name</u>, age, gender)

Frequents (<u>name</u>, <u>pizzeria</u>)

Eats (<u>name</u>, <u>pizza</u>)

Serves (<u>pizzeria</u>, <u>pizza</u>, price)

13. Find all pizza types which are not eaten by anyone

$\pi_{pizza}(Serves) - \pi_{pizza}(Eats)$

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

14. Find all pizzerias that are frequented by only females or only males.

$\pi_{pizzeria}(\sigma_{gender='female'}(Person)\bowtie Frequents) - \pi_{pizzeria}(\sigma_{gender='male'}(Person)\bowtie Frequents)$

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$\pi_{pizzeria}(\sigma_{gender='male'}(Person)\bowtie Frequents) - \pi_{pizzeria}(\sigma_{gender='female'}(Person)\bowtie Frequents)$

Person (<u>name</u>, age, gender)

Frequents (<u>name</u>, <u>pizzeria</u>)

Eats (<u>name</u>, <u>pizza</u>)

Serves (<u>pizzeria</u>, <u>pizza</u>, price)

15. Find all pizzerias where Dan could buy pizzas that he eats, and where he has never bought a pizza yet

$\pi_{pizzeria}[(\sigma_{name='Dan'}(Eats))\bowtie (Serves)]$

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$\pi_{pizzeria} (\sigma_{name='Dan'}(Frequents))$

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

16. For each person, find all pizzas the person eats that are not served by any pizzeria the person frequents. Return all such person (name, pizza) pairs.

Eats$-\pi_{name,pizza}$(Frequents$\bowtie$Serves)

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

17. Find the names of all people who frequent only pizzerias serving at least one pizza they eat.

π_{name}(Person)

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π_{name}(Frequents $-$ $\pi_{name,pizzeria}$(Eats$\bowtie$Serves))

17. Find the names of all people who frequent only pizzerias serving at least one pizza they eat.

➢ 1. List of all pizzerias which serve at least one of pizzas which particular person can eat:

$\pi_{name,pizzeria}(Eats \bowtie Serves)$

➢ 2. List of all pizzerias which are frequented by this person but do not serve any pizza he can it

Frequents - $\pi_{name,pizzeria}(Eats \bowtie Serves)$

➢ 3. Answer to the query

$\pi_{name}(Person)$

–

$\pi_{name}(Frequents - \pi_{name,pizzeria}(Eats \bowtie Serves))$

Person (name, age, gender)

Frequents (name, pizzeria)

Eats (name, pizza)

Serves (pizzeria, pizza, price)

18. Find the names of all people who frequent every pizzeria serving at least one pizza they eat.

π_{name}(Person)

$-$

$\pi_{name}(\pi_{name,pizzeria}(Eats \bowtie Serves) - Frequents)$

18. Find the names of all people who frequent every pizzeria serving at least one pizza they eat.

➢ 1. List of all pizzerias per person which serve at least one pizza this person can eat:

$\pi_{name,pizzeria}(Eats \bowtie Serves)$

➢ 2. List of pizzerias which serve the desirable pizza but which person did not visit yet

$\pi_{name,pizzeria}(Eats \bowtie Serves) - Frequents$

➢ 3. All the people excluding those in p.2

$\pi_{name}(Person)$

$-$

$\pi_{name}(\pi_{name,pizzeria}(Eats \bowtie Serves) - Frequents)$

Person (name, age, gender)
Frequents (name, pizzeria)
Eats (name, pizza)
Serves (pizzeria, pizza, price)

19. Find the pizzeria serving the cheapest pepperoni pizza. In the case of ties, return all of the cheapest-pepperoni pizzerias.

$$\pi_{pizzeria}(\sigma_{pizza='pepperoni'}Serves)$$

$$-$$

$$\pi_{pizzeria}\;[\sigma_{price>price2}($$

$$\pi_{pizzeria,price}(\sigma_{pizza='pepperoni'}Serves)$$

$$\times$$

$$\rho_{pizzeria2,price2}\pi_{pizzeria,price}(\sigma_{pizza='pepperoni'}Serves))]$$

Explanation on the next page

19. Find the pizzeria serving the cheapest pepperoni pizza. In the case of ties, return all of the cheapest-pepperoni pizzerias.

➢ 1. Finds all pizzerias where price for pepperoni pizza is greater than in some other pizzeria

$\sigma_{price>price2}($
$\qquad \pi_{pizzeria,price}(\sigma_{pizza='pepperoni'}Serves)$
×
$\qquad \rho_{pizzeria2,price2}[\pi_{pizzeria,price}(\sigma_{pizza='pepperoni'}Serves)]$
$)$

➢ 2. Subtracts it from all other pizzerias serving pepperoni pizzas

$\pi_{pizzeria}(\sigma_{pizza='pepperoni'}Serves)$
−
$\pi_{pizzeria} \ [\sigma_{price>price2}($
$\qquad \pi_{pizzeria,price}(\sigma_{pizza='pepperoni'}Serves)$
×
$\qquad \rho_{pizzeria2,price2}\pi_{pizzeria,price}(\sigma_{pizza='pepperoni'}Serves))]$