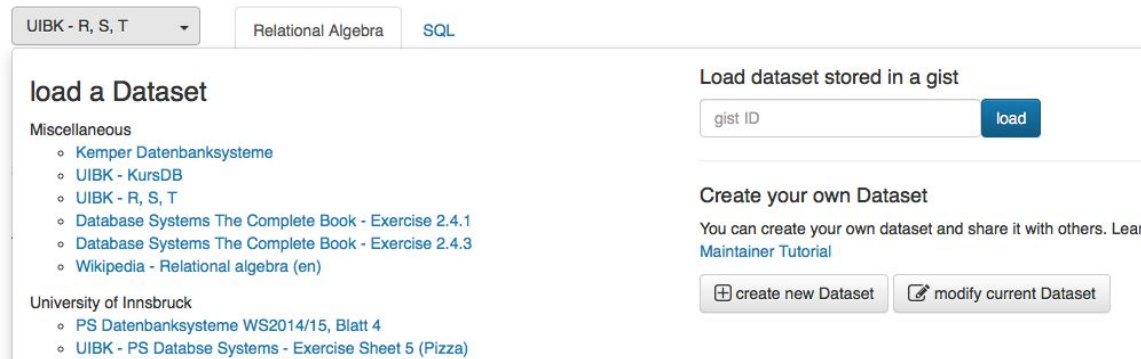


Instructions

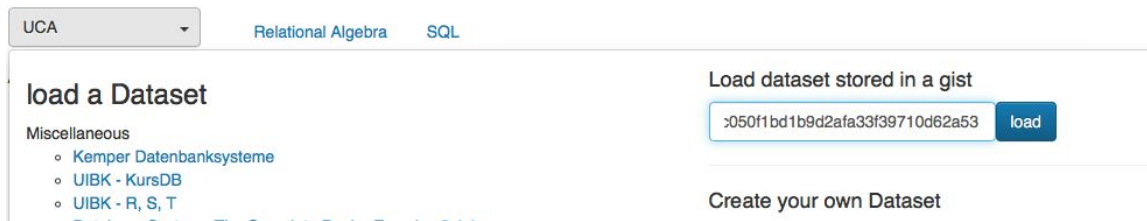
In this assignment, you are going to use an online relational algebra calculator (<http://138.232.66.66/ra/calc.htm>) that allows you to enter a relational algebra query expression or a SQL query and see the result. We have preloaded sample data. All you need to do is to type your relational algebra expressions and check the results. Here's how to use the site.

1. Open a Web browser and visit <http://138.232.66.66/ra/calc.htm>.



The screenshot shows the web interface of the relational algebra calculator. At the top, there is a dropdown menu currently set to 'UIBK - R, S, T' and two tabs: 'Relational Algebra' and 'SQL'. Below this, the page is divided into two main sections. On the left, under the heading 'load a Dataset', there is a list of datasets categorized into 'Miscellaneous' and 'University of Innsbruck'. The 'Miscellaneous' category includes links for 'Kemper Datenbanksysteme', 'UIBK - KursDB', 'UIBK - R, S, T', 'Database Systems The Complete Book - Exercise 2.4.1', 'Database Systems The Complete Book - Exercise 2.4.3', and 'Wikipedia - Relational algebra (en)'. The 'University of Innsbruck' category includes 'PS Datenbanksysteme WS2014/15, Blatt 4' and 'UIBK - PS Database Systems - Exercise Sheet 5 (Pizza)'. On the right side, there is a section titled 'Load dataset stored in a gist' which contains a text input field labeled 'gist ID' and a blue 'load' button. Below this is another section titled 'Create your own Dataset' with a brief description and two buttons: 'create new Dataset' and 'modify current Dataset'.

2. Click the “UIBK - R,S,T” button. In the “gist ID” box, type **50c050f1bd1b9d2afa33f39710d62a53** and click the “Load” button. All the data are loaded on the browser side, which means you will have to reload every time you refresh or reopen this page.



This screenshot shows the same interface as the previous one, but after the dataset has been loaded. The dropdown menu at the top left now shows 'UCA'. The 'gist ID' input field in the 'Load dataset stored in a gist' section now contains the text '50c050f1bd1b9d2afa33f39710d62a53', and the 'load' button next to it is highlighted with a blue border. The 'load a Dataset' section on the left is partially visible, showing the same list of datasets as before.

3. You should see the “Success” message. Now the UCA relations have loaded into your browser. You can execute a relational algebra expression by typing one in the right pane.

Success: gist loaded successfully

UCA

Airplane

- registration_number string
- model_number string
- purchased_year number

Relational Algebra SQL

π σ ρ \leftarrow τ γ \wedge \vee \neg $=$ \neq \geq

1 your query goes here ...

keyboard shortcuts:
execute statement:
execute selection:

4. In the following example, we use the projection (π) operator, the "IATA_code" field, and the relation "Airport". After typing this relational algebra expression, click "> Execute query" and you will see the result along with a tree representation of the query.

UCA ▾

Airplane
 registration_number string
 model_number string
 purchased_year number
 manufactured_year number
 capacity number

Airport
 IATA_code string
 name string
 airport_city string
 airport_state string

Credit_Card
 cid number
 card_number string
 expr_date string

Customer
 cid number
 ssn string
 gender string
 email string
 address_street string
 address_city string
 address_state string
 address_zipcode string

Customer_Reserves_Flight
 cid number
 flight_number string

Relational Algebra SQL

π σ ρ ← τ γ ^ v ↵

```
1 π IATA_code (Airpo
```

▶ execute query

π IATA_code

Airport

π IATA_code (Airport)

Airport.IATA_code
JFK
LAX
SAT
SNA

5. Click the 'SQL' tab to change to SQL query mode.

Relational Algebra SQL

select from where group having order limit

1 your query goes here ...

keyboard shortcuts:

execute statement: [CTRL]+[RETURN]

execute selection: [CTRL]+[SHIFT]+[RETURN]

autocomplete: [CTRL]+[SPACE]

6. For more details on syntax, click the “Help” button or visit <http://138.232.66.66/ra/help.htm>.

Homework 3 requires you to write queries on the relations using relational algebra. Show the results of each query. We recommend that you write your relational algebra expressions first before trying to execute them on the site. Please note that you will not get any points for showing the result if the relational algebra expression is not correct (!). Since you have a “live” algebra interpreter at your disposal, however, this should not be an issue – you can test all of your queries this way.

Dataset

Airplane

registration_number	model_number	purchased_year	manufactured_year	capacity
N12345	B747	2007	2005	467
N17523	A380	2010	2009	555
N23456	B787	2009	2008	290

Airport

IATA_code	name	airport_city	airport_state
JFK	John F. Kennedy International Airport	New York	NY

LAX	Los Angeles International Airport	Los Angeles	CA
SAT	San Antonio International Airport	San Antonio	TX
SNA	John Wayne Airport	Santa Ana	CA

Credit Card

cid	card_number	expr_date
14	67098976139150083	201812
8	67094895931396906	202004
2	67061288802817912	201808
2	63044293896926521	202103
12	63046794584776563	201910
1	67069688967650218	202107
11	67099549008585132	201801
6	67067815612478404	201805
5	67067652662421939	202102
3	67710912584731679	202010
8	63041217473725819	202107
1	67092434793176230	202109
1	67099511369731325	202104
9	67717501971398912	202008
4	67061322459422559	201909
15	67060631839968862	201903
7	67716138484326683	202002
13	63040243326223001	202101
10	67099732670013670	202109
16	67718812245978283	201803

DishOrder_Contains_Dish

oid	lid	name	quantity
1	112	tacos	3
2	212	swordfish	10

3	212	salmon	3
3	212	swordfish	5
4	409	fresh lemonade	2
4	409	sandwich	2
4	409	the thai wrap	2
5	314	galbitang	4
5	314	samgyetang	3
6	113	oven baked salmon	5
7	213	wafu steak	1
8	315	hummus	10
8	315	the burger combo	5
8	315	the karma burger	3
12	212	salmon	20
12	212	skewered shrimp	20
12	212	swordfish	20
13	213	surf and turf	50
15	314	yukgejang	10
16	315	hummus	3
19	112	japchae mari	5
20	113	grilled free range chicken	20

Customer

cid	ssn	gender	email	address_street	address_city	address_state	address_zipcode
1	988843736	M	153m@4bjsvkd6f.com	9091 Spectrum Pointe Drive	Lake Forest	CA	92630

2	582902 877	F	gimodc@qq5a543.com	9091 Watermarke Place	Irvine	CA	92612
3	455171 051	F	l91bi@rds0z4ct9n2d.com	9091290 North Hancock Street	Anahei m	CA	92807
4	117911 362	F	r1d0800121@8w-4lb.com	90914780 Pipeline Avenue	Chino Hills	CA	91709
5	813694 086	M	eu3@4l4ligbm2d4.com	90914851 Jeffrey Road	Irvine	CA	92618
6	830930 154	F	2ldx.6l9@pk11l2s.com	90915241 Laguna Canyon Road	Irvine	CA	92618
7	481161 938	F	ijv5hx@e0z8o6w.com	9091536 East Warner Avenue	Santa Ana	CA	92705
8	340130 873	M	iz4tvg5j0e.@otiw34ymv68 z.com	9091536 West Warner Avenue	Santa Ana	CA	92705
9	140686 813	M	xhrh8pptf0bm2@ki4jwmsi ek.com	90915661 Red Hill Avenue	Tustin	CA	92780
10	670322 800	M	93nwu_g3pow65d@0zeko pshz.com	90916470 Bake Parkway	Irvine	CA	92618
11	145282 363	M	gmzs@hdm9q8rpd.com	90924367 Von Karman Avenue	Irvine	CA	92606
12	459777 569	F	s4yk8@v006nomucpd.co m	90917772 17th Street	Tustin	CA	92780
13	891455 675	F	42-8b8@l0m1bttskf3.com	909195 North Euclid Avenue	Upland	CA	91786
14	958708 596	M	3ewd@s8xum24csra.com	90937654 Savi Ranch Pkwy	Yorba Linda	CA	92887
15	662905 075	M	9zsiot3@8aab4f3tj.com	90923046 Avenida De La Carlota	Laguna Hills	CA	92653
16	390453 600	F	4ikmvae@xsvx5etrv2.com	90923726 Birtcher Drive	Lake Forest	CA	92630
17	908856 821	M	s3et50zvq-9b1@dlayle.co m	9092603 Main Street	Irvine	CA	92614
18	989812 336	M	2-z6sf@oh-sz1whst6.com	90927261 Las Ramblas	Mission Viejo	CA	92691
19	221526 01	F	5-@rblrxw-ql9c.com	90931 Creek Road	Irvine	CA	92604

20	261504 907	M	iuxh@al8wsoem.com	90932565 Golden Lantern St.	Dana Point	CA	92629
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Customer_Reserves_Flight

Customer_Reserves_Flight.cid	Customer_Reserves_Flight.flight_number	Customer_Reserves_Flight.projected_departure_datetime	Customer_Reserves_Flight.purchased_datetime	Customer_Reserves_Flight.purchased_price	Customer_Reserves_Flight.quantity
1	N124	2015-08-09 08:21:00	2015-08-06 07:21:00	1135	2
1	N124	2015-09-07 08:21:00	2015-08-01 18:11:00	531	2
13	U987	2015-06-07 10:23:00	2015-04-27 13:22:00	2821	4
14	N124	2015-09-07 08:21:00	2015-08-06 21:21:00	473	1

Dish

lid	name	price
112	alioi spanish	19
112	japchae mari	6.5
112	kalbi burger	7.95
112	tacos	7.5
113	grilled free range chicken	10.5
113	grilled steak	10.5
113	oven baked salmon	12.5
113	tempura	31.5
212	grilled steak	49
212	salmon	13
212	skewered shrimp	10.99
212	swordfish	11.5
212	wafu steak	45.99

213	bacon relish	35.5
213	seafood salad	12
213	surf and turf	23.99
213	wafu steak	14
314	burger	11.99
314	galbitang	16
314	samgyetang	29.99
314	yukgejang	12.99
315	hummus	13.99
315	king prawn	97.1
315	seafood salad	17.99
315	the burger combo	32.99
315	the karma burger	18
409	fresh lemonade	12.99
409	sandwich	16.99
409	sesame chicken	11
409	the thai wrap	13

DishOrder

oid	cid	lid	order_datetime	total_amount
1	1	112	2015-01-01 12:34:34	22.5
2	2	212	2015-01-02 11:11:11	115
3	3	212	2015-01-03 12:22:22	96.5
4	1	409	2015-01-04 13:33:33	85.96
5	2	314	2015-01-05 16:33:33	153.97
6	3	113	2015-01-06 17:17:17	62.5
7	12	213	2015-01-07 15:34:34	22.5
8	14	315	2015-01-08 18:34:34	358.85
12	1	212	2015-01-12 09:22:22	709.8
13	1	213	2015-01-13 11:45:45	1199.5
15	1	314	2015-01-15 14:22:22	129.9
16	1	315	2015-01-16 15:31:31	41.97
19	3	112	2015-01-19 21:12:12	32.5
20	1	113	2015-01-20 20:54:54	210

Flight

flight_number	projected_departure_date_time	projected_arrival_datetime	airplane_registration_number	departure_airport_IATA_code	actual_departure_datetime	arrival_airport_IATA_code	actual_arrival_datetime
N124	2015-08-09 08:21:00	2015-08-09 08:41:00	N23456	LAX	null	SNA	null
N124	2015-09-07 08:21:00	2015-09-07 08:41:00	N23456	LAX	null	SNA	null
U987	2015-06-07 10:23:00	2015-06-07 21:23:00	N17523	SNA	null	JFK	null

Flight Attendant

faid	phone_number	birthdate	ssn	job_title	address_street	address_city	address_state	address_zipcode	service_year
990013	314-471-6335	1991-10-21	388667456	Purser	234 Valley View Drive	Holly Springs	FL	33010	1
990014	623-217-2561	1992-01-05	546373819	Chief Purser	349 Devon Court	Lutherville Timonium	NC	27540	7

Lounge

lid	location	airport_IATA_code
112	section D32	SNA
113	section E21	SNA
212	section C12	SAT
213	section C24	SAT
314	section A12	JFK
315	section D12	JFK
409	section B15	LAX

Maintenance Engineer

meid	phone_number	birthdate	ssn	job_title	address_street	address_city	address_state	address_zipcode	skill
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990001	804-543-7860	1989-12-23	187826814	Senior Engineer	984 Wood Street	Bolingbrook	IL	60440	Engines
990002	219-775-7988	1987-03-21	281653141	junior engineer	847 Route 44	Orange	NJ	7050	Airframes
990003	817-712-3731	1989-12-25	968920642	senior engineer	216 Washington Avenue	Worcester	MA	1604	Electrical Systems
990004	850-338-7148	1983-12-22	461306391	Specialist	262 Aspen Court	Far Rockaway	NY	11691	Physics
990005	724-938-6285	1989-08-09	811035535	Principal Engineer	232 Locust Street	Palm Bay	FL	32907	Mechanical

Operation Staff

osid	phone_number	birthdate	ssn	job_title	address_street	address_city	address_state	address_zipcode	department
990006	954-465-7930	1989-06-28	282462223	Senior Staff	557 Warren Avenue	Shepherdsville	KY	40165	Custom Service
990007	847-647-4341	1989-05-29	929040801	Junior Staff	223 Mulberry Lane	Asbury Park	GA	30075	Quality Assurance
990008	508-983-8873	1984-07-30	650572255	Office r	19 Riverside Drive	Gettysburg	NJ	7712	Administration
990009	712-834-4242	1989-12-31	793285475	Classified	525 Route 6	Moncks Corner	PA	17325	Secret Service

Pilot

pid	phone_number	birthdate	ssn	job_title	address_street	address_city	address_state	address_zipcode	since
990010	941-655-5246	1974-01-01	854666700	Chief Pilot	155 Locust Street	Howard Beach	SC	29461	NULL

99001 1	510-896- 8715	1990-0 1-02	913281 306	captain	231 York Road	Sun City	NY	11414	NULL
99001 2	765-548- 8979	1995-0 2-05	979417 494	Naviga tor	427 Delawar e Avenue	Hialeah	AZ	85351	NULL