

FunSQL

A library for compositional construction
of SQL queries

<https://github.com/MechanicalRabbit/FunSQL.jl>

Clark C. Evans,
Kyrylo Simonov

JuliaCon 2021

Find all patients born in or after 1970.



```
SELECT p.person_id  
FROM person p  
WHERE p.year_of_birth >= 1970
```



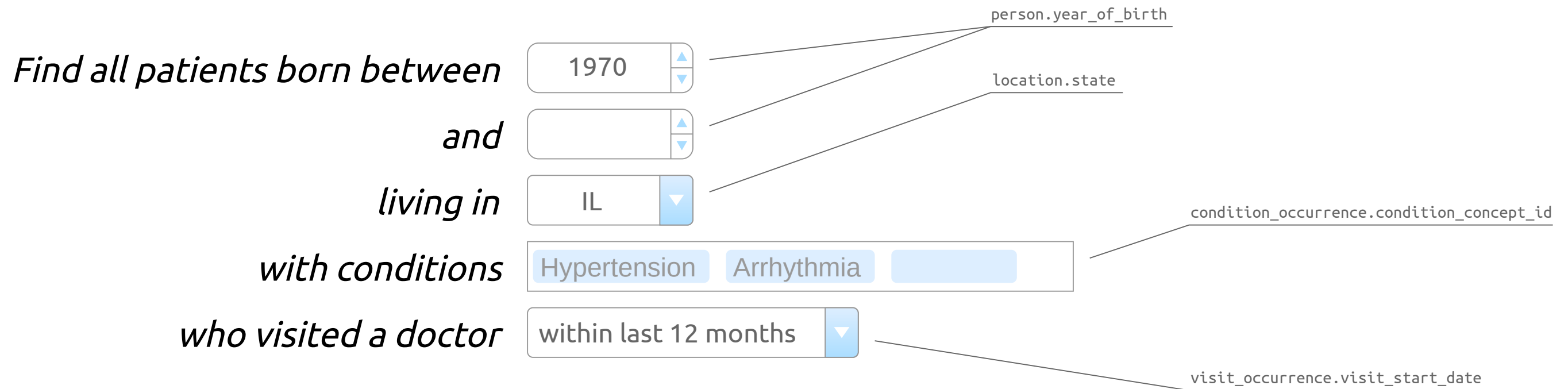
```
function find_patients(conn)  
  sql = ""  
  SELECT p.person_id  
  FROM person p  
  WHERE p.year_of_birth >= 1970  
  ""  
  DBInterface.execute(conn, sql)  
end
```

Find all patients born between

1970

and

```
function find_patients(conn; start_year = nothing, end_year = nothing)
  sql = ""
  SELECT p.person_id
  FROM person p
  ""
  predicates = String[]
  if start_year != nothing
    push!(predicates, "p.year_of_birth >= $start_year")
  end
  if end_year != nothing
    push!(predicates, "p.year_of_birth <= $end_year")
  end
  if !isempty(predicates)
    sql *= "\nWHERE " * join(predicates, " AND ")
  end
  DBInterface.execute(conn, sql)
end
```



```
function find_patients(conn; start_year = nothing,  
                        end_year = nothing,  
                        state = nothing,  
                        conditions = [],  
                        latest_visit = nothing)
```

```
    sql = ???
```

```
    DBInterface.execute(conn, sql)
```

```
end
```



A fragment of OMOP CDM
<https://github.com/OHDSI/CommonDataModel>

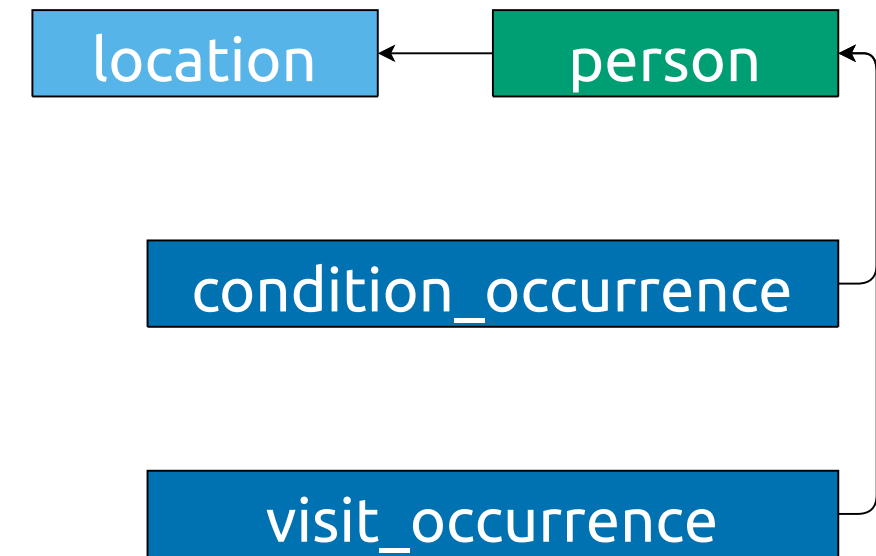
```
using FunSQL: SQLTable
```

```
const person =  
  SQLTable(name = :person,  
    columns = [:person_id, :year_of_birth, :location_id])
```

```
const location =  
  SQLTable(name = :location,  
    columns = [:location_id, :city, :state, :zip])
```

```
const condition_occurrence =  
  SQLTable(name = :condition_occurrence,  
    columns = [:condition_occurrence_id, :person_id, :condition_concept_id,  
      :condition_start_date, :condition_end_date])
```

```
const visit_occurrence =  
  SQLTable(name = :visit_occurrence,  
    columns = [:visit_occurrence_id, :person_id, :visit_concept_id,  
      :visit_start_date, :visit_end_date])
```



Find all patients born in or after 1970.

FROM person p



FROM person p
WHERE p.year_of_birth >= 1970



SELECT p.person_id
FROM person p
WHERE p.year_of_birth >= 1970

using FunSQL: From, Get, Select, Where, render

q = From(person)



q = From(person) |>
 Where(Get.year_of_birth .>= 1970)



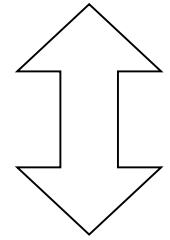
q = From(person) |>
 Where(Get.year_of_birth .>= 1970) |>
 Select(Get.person_id)

sql = render(q, dialect = :postgresql)

```

q1 = From(person)
q2 = q1 |> Where(q1.year_of_birth .>= 1970)
q3 = q2 |> Select(q2.person_id)

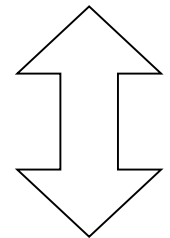
```



```

q = From(person) |>
  Where(Get.year_of_birth .>= 1970) |>
  Select(Get.person_id)

```



```

BornInOrAfter(Y) = Get.year_of_birth .>= Y

```

```

q = From(person) |>
  Where(BornInOrAfter(1970)) |>
  Select(Get.person_id)

```

bound references

unbound references

| person | |
|--------|---------------|
| PK | person_id |
| | year_of_birth |
| FK | location_id |


```
SELECT p.person_id  
FROM person p  
WHERE p.year_of_birth >= 1970
```

```
WHERE p.year_of_birth >= 1970 AND  
      p.year_of_birth <= 2000
```

```
WHERE p.year_of_birth  
      BETWEEN 1970 AND 2000
```

using FunSQL: Fun

"Fun" notation

Fun.">="(Get.year_of_birth, 1970)

or

Get.year_of_birth .>= 1970

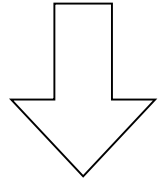
broadcasting

Fun.and(Get.year_of_birth .>= 1970,
 Get.year_of_birth .<= 2000)

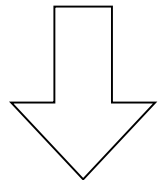
Fun.between(Get.year_of_birth, 1970, 2000)

Show patients with their state of residence.

FROM person p



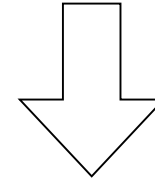
FROM person p
JOIN location l
 ON (p.location_id = l.location_id)



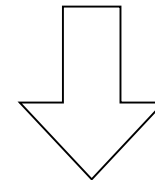
SELECT p.person_id, l.state
FROM person p
JOIN location l
 ON (p.location_id = l.location_id)

using FunSQL: Join

q = From(person)



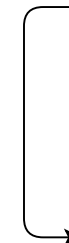
q = From(person) |>
 Join(:location => location,
 Get.location_id .==
 Get.location.location_id)



q = From(person) |>
 Join(:location => location,
 Get.location_id .==
 Get.location.location_id) |>
 Select(Get.person_id, Get.location.state)

| person | |
|--------|---------------|
| PK | person_id |
| | year_of_birth |
| FK | location_id |

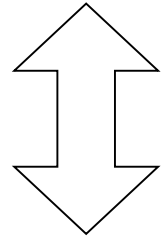
| location | |
|----------|-------------|
| PK | location_id |
| | city |
| | state |



```

q1 = From(person)
q2 = From(location)
q3 = q1 |> Join(q2, q1.location_id .== q2.location_id)

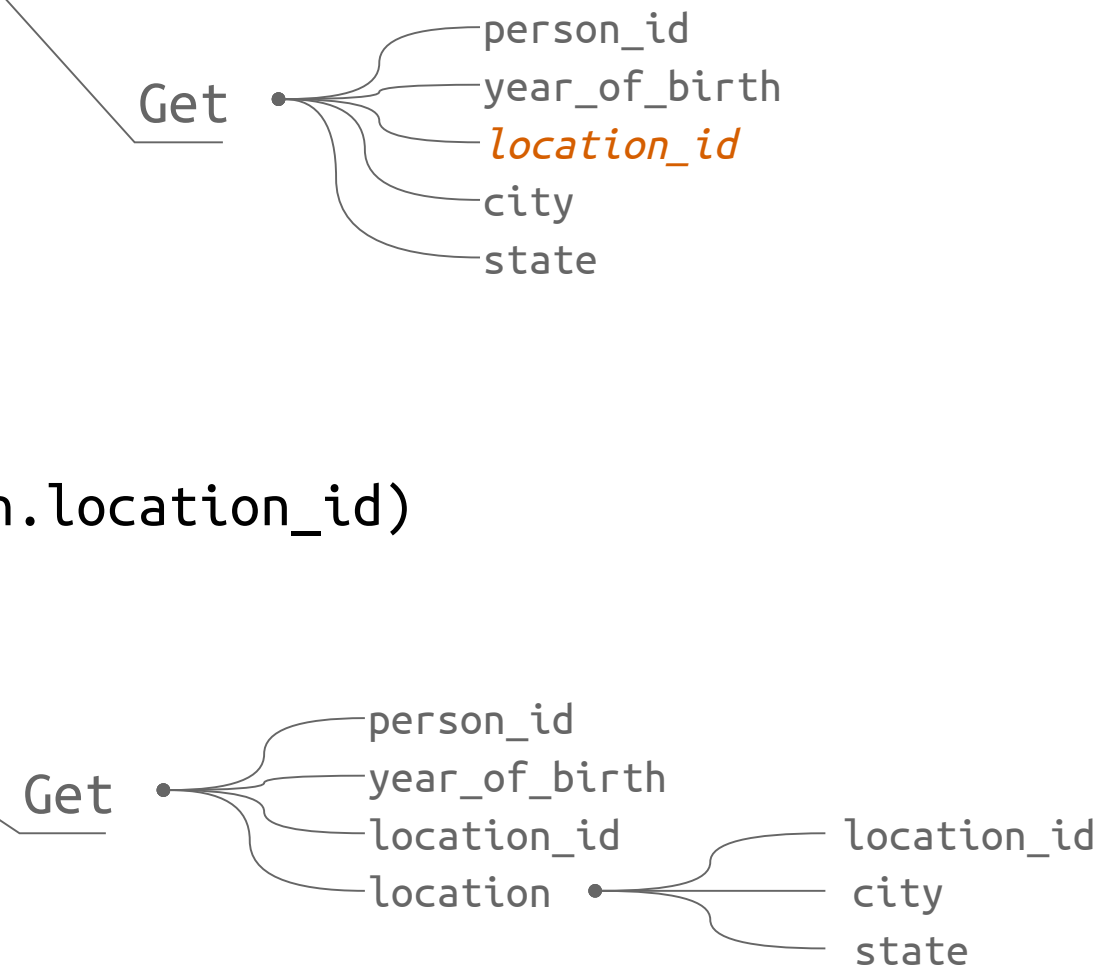
```



```

q = From(person) |>
  Join(:location => From(location),
    Get.location_id .== Get.location.location_id)

```



| person | |
|--------|---------------|
| PK | person_id |
| | year_of_birth |
| FK | location_id |

| location | |
|----------|-------------|
| PK | location_id |
| | city |
| | state |