Cardinality Estimation Using Neural Networks

CASCON '15

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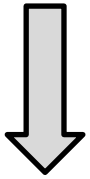
Join-Orders Matter

```
SELECT * FROM a, b WHERE 5 < a.x < 9 AND 20 < b.y < 2000 AND a.z = b.z
```



nested-loop join

```
for outer_record in outer_table:
        for inner_record in inner_table:
                print(outer_record + inner record)
```

Option 1: a as outer table, b as inner table

Option 2: b as outer table, a as inner table

Background

Terminologies in paper title:

Cardinality Estimation Using Neural Networks

Cardinality = # of total records * selectivity

name	age
J	3
A	5
P	3
X	4
C	5
I	4

Eg:

Select name from tb1 where age>3

# of total records: 6

Selectivity:0.67
(4/6)

Cardinality:4

Background

- Cardinality = # of total records * selectivity

How to estimate selectivity?

–a naïve approach: assume uniform distribution

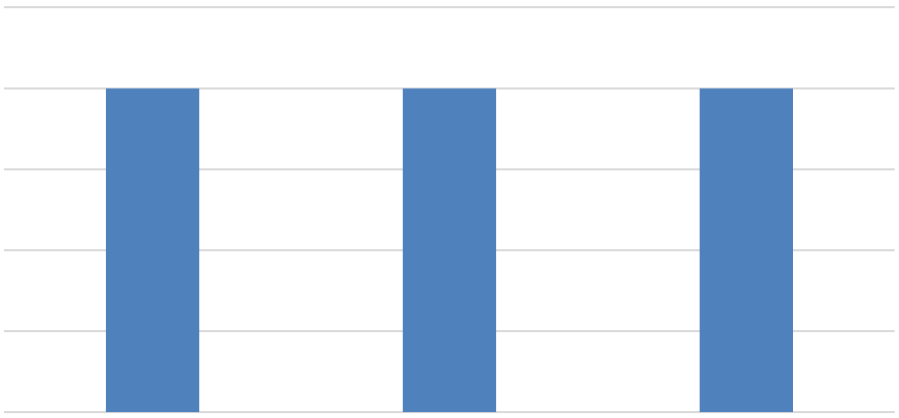
–a better approach: histogram

Background

Cardinality = # of total records * selectivity

- assume uniform distribution

age
3
5
3
4
5
4

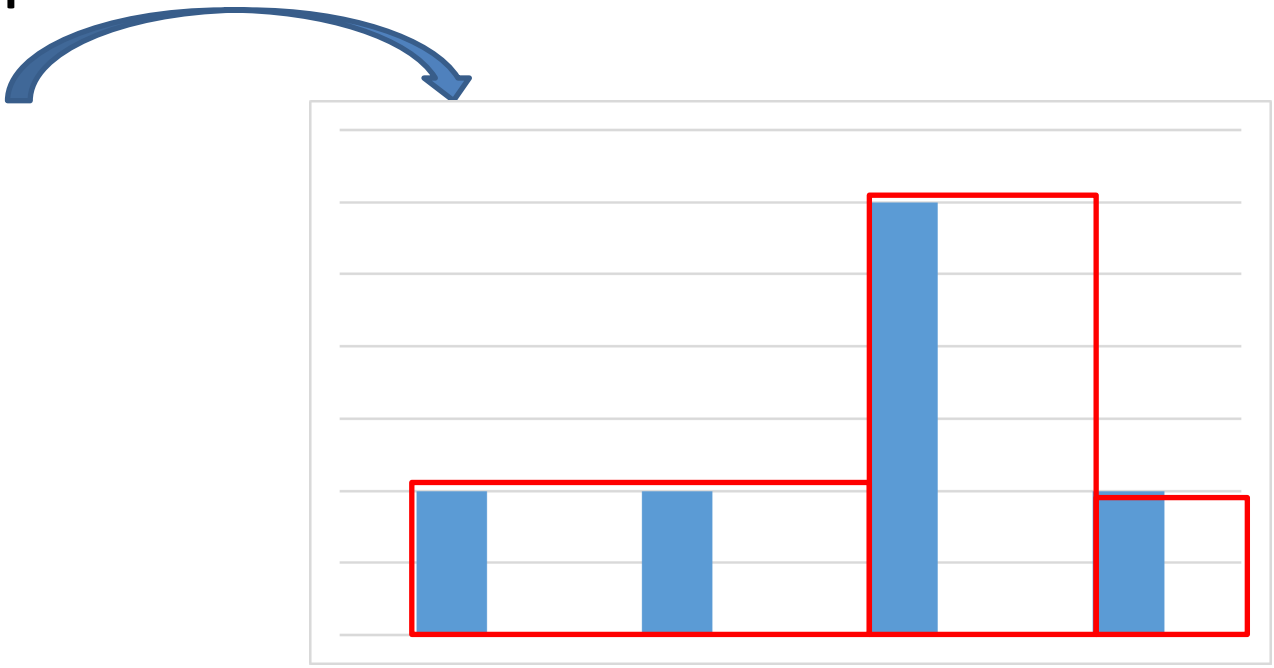


Background

Cardinality = # of total records * selectivity

- histogram

age
3
4
14
15
14
14



Multi-Column Selectivity Estimation

- Assume columns are independent
  - estimate the selectivity of each column and obtains the product of them
- Correlation between columns

```
SELECT * FROM population WHERE age < 45 AND salary < 45000
```

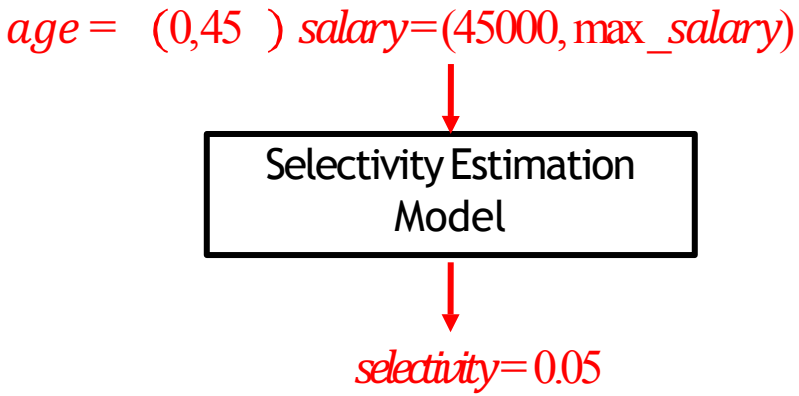
Multi-Column Selectivity Estimation

- Assume
  - half of the population is order than 45
  - half of the population has salary more than 45K
- Under the independent-column assumption
  - $sel = 0.5 * 0.5 = 0.25$
  - however, the actual selectivity may be farless than that

```
SELECT * FROM population WHERE age < 45 AND salary > 45000
```

Problem Formulation

- Input
  - *k* fields, *2k* boundaries
- Output
  - selectivity




```
SELECT * FROM population
WHERE 0 < age < 45 AND 45000 < salary < max_salary
```

Questions

- If columns are independent, can we do more better estimation of selectivity?
- If columns are dependent, can we improve the estimation of selectivity more?