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Selection Overview

- Varieties of Selection
- Implementing Select Efficiently

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❖ Varieties of Selection

Selection: `select * from R where C`

- filters a subset of tuples from one relation `R`
- based on a condition `C` on the attribute values

We consider three distinct styles of selection:

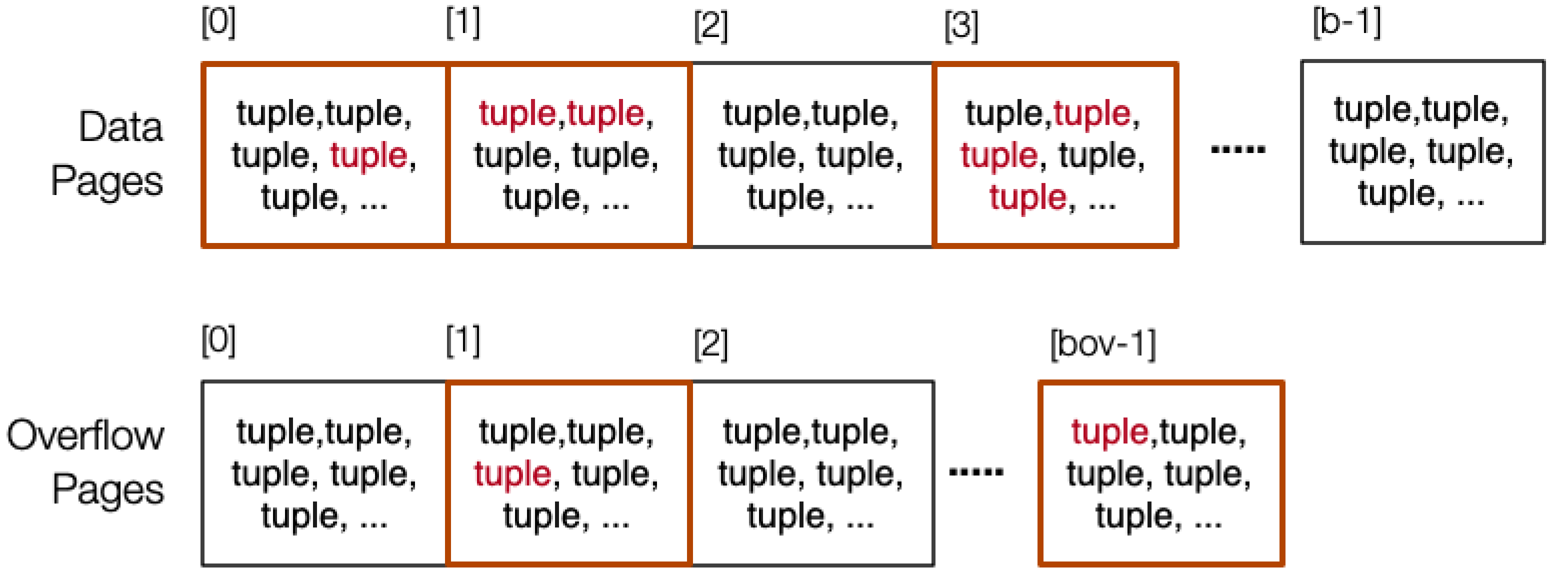
- 1-d (one dimensional) (condition uses only *1* attribute)
- *n*-d (multi-dimensional) (condition uses *>1* attribute)
- similarity (approximate matching, with ranking)

Each style has several possible file-structures/techniques.

❖ Varieties of Selection (cont)

Selection returns a subset of tuples from a table

- r_q = number of tuples that match query *q*
- b_q = number of pages containing tuples that match query *q*



[0]
[1]
[2]
[3]
[b-1]
Data Pages
tuple,tuple, tuple, tuple, tuple, ...
tuple,tuple, tuple, tuple, tuple, ...
tuple,tuple, tuple, tuple, tuple, ...
tuple,tuple, tuple, tuple, tuple, ...
.....
tuple,tuple, tuple, tuple, tuple, ...
[0]
[1]
[2]
[bov-1]
Overflow Pages
tuple,tuple, tuple, tuple, tuple, ...
tuple,tuple, tuple, tuple, tuple, ...
tuple,tuple, tuple, tuple, tuple, ...
.....
tuple,tuple, tuple, tuple, tuple, ...

In the diagram, r_q = 8, b_q = 5

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❖ Varieties of Selection (cont)

Different categories of selection queries:

one ... queries with at most 1 result ... $0 \leqslant r_q \leqslant 1$, $0 \leqslant b_q \leqslant 1$

- typically, equality test on primary key attribute, e.g.
- `select * from R where id = 1234`

pmr ... partial match retrieval ... $0 \leqslant r_q \leqslant r$, $0 \leqslant b_q \leqslant b+b_{ov}$

- conjunction of equality tests on multiple attributes, e.g.
- `select * from R where age=65` (1-d)
- `select * from R where age=65 and gender='m'` (n-d)

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❖ Varieties of Selection (cont)

More categories of selection queries:

rng ... range queries ... $0 \leqslant r_q \leqslant r$, $0 \leqslant b_q \leqslant b+b_{ov}$

- conjunction of inequalities, on one or more attributes, e.g.
- `select * from R where age≥18 and age≤21` (1-d)
- `select * from R where 18≤age≤21 and 160≤height≤190` (n-d)

pat ... pattern-based queries ... $0 \leqslant r_q \leqslant r$, $0 \leqslant b_q \leqslant b+b_{ov}$

- string-based matching using `like` or regular expressions
- `select * from R where name like '%oo%'`
- `select * from R where name ~ '^Smi'`

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❖ Varieties of Selection (cont)

More categories of selection queries:

sim ... similarity matching ... in theory, $r_q = r$ ... everything matches to some degree

- uses "similarity" measure ($0 \leqslant sim \leqslant 1$, 0=different, 1=identical)
- **`select * from`** *Images* **`where`** ***`similar to`*** *SampleImage*
- results are ranked by *sim* value, from most to least similar
- can become a filter via
  - threshold ... only items where $sim \geqslant$ min similarity
  - top-k ... *k* items with highest similarities

We focus on one, pmr and rng queries, but will discuss others

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❖ Implementing Select Efficiently

Two basic approaches:

- physical arrangement of tuples
  - sorting (search strategy)
  - hashing (static, dynamic, *n*-dimensional)
- additional indexing information
  - index files (primary, secondary, trees)
  - signatures (superimposed, disjoint)

Our analysis assumes 1 input buffer available for each relation.

If more buffers are available, most methods benefit.

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