

## Databasesystems 2

Forum: <https://forum-db.informatik.uni-tuebingen.de/c/ss18-db2>

## Assignment 6 (05.06.2018)

Submission: Tuesday, 12.06.2018, 10:00 AM

Please note that students currently have the opportunity to **evaluate lectures**. Please help us to improve **your** courses by providing precious feedback. Check your Mailbox now and participate **today**.

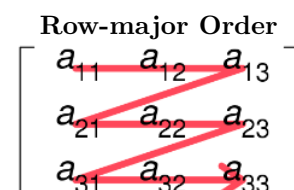
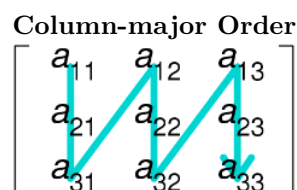
1. [15 Points] **Loop Swapping Optimization**

Processing a wide table stored as C array, the order of processing can have significant impact on performance. Consider the following table `tbl` of random integers stored *column-wise* in an C array:

```
unsigned int *tbl;

/* initialize table column-wise with random values */
for (c = 0; c < cols; c++)
    for (r = 0; r < rows; r++)
        tbl[c * rows + r] = (unsigned int) random();
```

If we want to add up all elements of the table, we can process the elements following two different traversal strategies:



The choice of loop order has significant impact on performance:

- (a) Extend the program in `loop-swapping.c` to compute and print the overall sum of all cells in table `tbl` in two different ways: Using two nested loops processing array `tbl`
  - i. in *row-major* order and
  - ii. in *column-major* order.
- (b) Further extend your program to measure and print the execution time of both variants.
- (c) Compile the program with flag `-O2` and run a test with 1,000,000 rows and 100 columns. Describe the results and explain the difference in performance of both variants.

2. [15 Points] **Logical Conjunction**

In the lecture we discussed how a MAL program would apply logical disjunction found in SQL queries (see slide 9 of slideset 8). Your task is to write the following SQL query using **logical conjunction** as a MAL program:

```
SELECT t.a, t.b
FROM   ternary AS t
WHERE  t.a % 2 = 0 AND t.c < 1;
```

The table used in this query is defined as `ternary` (`a` `int NOT NULL`, `b` `text NOT NULL`, `c` `float`).

We provided you with an incomplete MAL file `conjunction.mal` which you should complete for this task.