

## Exercise Sheet 3

Submit until Tuesday, November 12 at 4:00pm

### Exercise 1 (10 points)

Copy your code for the class *InvertedIndex* from *exercise-sheet-02* to a new subfolder *exercise-sheet-03*. Then extend the class by a method for intersecting two postings lists using the galloping (first exponential, then binary) search explained in the lecture. As usual, write a unit test for this new method for at least one non-trivial input. You can use the same input as for the linear-time intersection method you have already implemented.

### Exercise 2 (10 points)

Write a program *IntersectPerformanceMain* that compares the running time of your two intersection methods on the tree pairs of posting lists from the following three queries: *university german* (61,288 and 34,677 postings), *university berlin* (61,288 and 4,717 postings) and *university freiburg* (61,288 and 310 postings). Check that the number of postings for these lists in your index is indeed as indicated in the parentheses (deviations of up to 10% due to minor differences in your parses are fine).

For each running time, call the respective method 10 ten times and take the average. Make sure that your time measurement has at least *microsecond* precision. Make an effort to implement both methods as efficiently as you can. Enter your results in the table linked on the Wiki, following the instructions given there. Briefly discuss the results in your *experiences.txt*.

### Exercise 3 (optional, for the mathematically inclined)

Show that there are indeed  $\binom{n+k}{k}$  ways to place the elements of a list of size  $k$  within the elements of a list of size  $n \geq k$ . Hint: the number in question is the number of tuples  $(j_1, \dots, j_k)$  with  $0 \leq j_1 \leq \dots \leq j_k \leq n$ .

Add your code to a new sub-directory *exercise-sheet-03* of your folder in the course SVN, and commit it. Make sure that *compile*, *test*, and *checkstyle* run through without errors on Jenkins. As usual, also commit a text file *experiences.txt* where you briefly describe your experiences with this exercise sheet and the corresponding lecture. As a minimum, say how much time you invested and if you had major problems, and if yes, where. Don't forget to include the short discussion asked for in Exercise 2.