

## On-Line Algorithms – F17 – Lecture 12

### Lecture, March 28

We covered section 6 and section 3 in “The relative worst order ratio applied to paging”.

### Lecture, March 31

We will cover the definitions for relatedness and weakly comparable in section 2, Theorems 7 and 8 of section 5, and section 7 in “The relative worst order ratio applied to paging”. We may begin on chapter 10 in the textbook.

### Lecture, April 5

We will cover sections 10.1 and 10.4 of chapter 10 in the textbook. We may begin on chapter 12.

### Problems for April 7

1. Using relative worst order analysis, compare First-Fit and Worst-Fit for the classical bin packing problem (trying to minimize the number of bins used). Worst-Fit is the algorithm which places an item in the most empty open (already used) bin, if it fits in any open bin. Otherwise it opens a new bin.
2. Lemma 4 in the article The relative worst order ratio applied to paging does not hold if the conservative algorithm is allowed look-ahead. How do you know this? Where does the proof fail?
3. Find another sequence which would separate LRUs and FWFs behavior under the relative worst order ratio. (It’s not necessary to get as large a ratio as the one in the article. Try for  $3/2$ .)

4. Try defining an algorithm which is based on FIFO and uses look-ahead. What is its relative worst order ratio compared to FIFO? To LRU?
5. Consider the algorithm for dual bin packing (fixed number of bins, maximizing the number of accepted items) behaves exactly as First-Fit would unless the item  $x$  is larger than  $1/2$  and would be placed in the last bin, bin  $n$ . The algorithm FF $n$  rejects such an item and is thus not fair. Show that FF $n$  is better than First-Fit, according to the relative worst order ratio.