CS 791I - Online Algorithms - (Spring 2002)

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1 Preview

This course is intended for a graduate audience in the CSEE, Industrial Engineering, Mathematics and Statistics Departments. It will serve as a thorough introduction to the fundamentals of design and analysis in the online realm, i.e. when all problem parameters are not known in advance. We shall study a number of real-world applications including Paging, Scheduling and Portfolio Optimization.

2 Pre-requisites

A course on Analysis of Algorithms; some exposure to the basic concepts of Randomized Algorithms and Approximation Algorithms is preferred, but not required.

3 Syllabus sketch

1. Introduction - Competetive Analysis and its Applications
2. Self-Organizing Data Structures - Unsorted Linear Lists and Binary Search Trees
3. Competetive Analysis of Paging - Deterministic and Randomized Algorithms, Variations on Competetive Analysis, Variations on the Paging Problem
4. Metrical Task Systems and the $k-$Server Problem
5. Distributed Paging - File Migration and File Allocation
6. Competitive Analysis of Distributed Algorithms
7. Online Load Balancing - Permanent tasks, Temporary tasks with unknown duration
8. Online Scheduling - Scheduling jobs one by one, Unknown running times, Jobs arriving over time
9. Online Network Optimization Problems
10. Online Financial Problems - Two way trading and Portfolio Selection.

4 Material

All the material for this course will be based on selected Chapters of [FW98] and [BEY98].

5 Important Dates

1. Quiz I - Posted February 19; Collected February 25
2. Midterm - Posted March 7; Collected March 14
3. Quiz II - Posted April 11; Collected April 18
4. Final - Posted May 2; Collected May 9

All assignments including the final will be posted on the class Website and are take home.

6 Grading

1. Lecture Notes (20%)
2. Quizzes (20%)
3. Midterm (30%)
4. Final (30%)

A maximum of 10 points is reserved for class performance, which includes regular attendance, participating in class discussions and presenting a research paper.

7 Grade Boundaries

1. **A** - ≥ 80
2. **B** - $65 - 79$
3. **C** - $50 - 64$

References

[BEY98] Allan Borodin and Ran El-Yaniv. *Online Computation and Competitive Analysis.* Cambridge University Press, Cambridge, 1998.

[FW98] Amos Fiat and Gerhard Woeginger. *Online algorithms: the state of the art*, volume 1442 of *Lecture Notes in Computer Science.* Springer-Verlag Inc., New York, NY, USA, 1998.