

# APPLIED MATHEMATICS COLLOQUIUM

## ONLINE LEARNING ALGORITHMS FOR SEARCHING AND RANKING

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### ABSTRACT:

We will discuss some algorithm design problems that stem from the challenge of employing users' implicit feedback to optimize the ranking of documents or advertisements presented in response to a query. We will first consider the problem of inserting a new document into its proper position in an already sorted list, using the feedback from users' clicks. This can be modeled as a noisy binary search problem, for which we present an algorithm whose query complexity is information-theoretically optimal, up to a constant factor. The second part of the talk considers the problem of learning an optimal query response, or a ranked list of query responses, in the framework of regret minimization and multi-armed bandit problems. We present natural formulations of the problem which admit polynomial-time learning algorithms despite the potentially exponential number of strategies available to the decision-maker.

The first part of the talk is joint work with Richard Karp. The second part is based on joint works with Thorsten Joachims and Filip Radlinski, and with Alex Slivkins and Eli Upfal.

**MONDAY, DECEMBER 10, 2007**

**4:30 PM**

**Building 4, Room 270**

*Reception at 4:00 PM in Building 4, Room 174  
(Math Majors Lounge)*

Applied Math Colloquium: <http://www-math.mit.edu/amc/fall07>

Math Department: <http://www-math.mit.edu>



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