6.842 Randomness and Computation	February 8, 2012

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Course Information

Lecturer: Ronitt Rubinfeld

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Lectures: MW 1:00-2:30, Room 36-155.

Instructor: Ronitt Rubinfeld, `ronitt@csail.mit.edu`, G32-698, 253-0884.

Teaching Assistant: ??

Course Staff: Joanne T. Hanley, `joanne@csail.mit.edu`, G32-672A, 253-6054.

Course Website: `http://people.csail.mit.edu/ronitt/COURSE/S12/index.html`

Course topics   The course will consist of a subset of the topics mentioned below. The list is subject to change due to my personal whims, class interest and timing issues. The topics will not be covered in the order given below.

- Some uses of randomness: algorithms (parallel algorithms, small space algorithms for graph connectivity, uniform generation and approximate counting, property testing), probabilistic proofs and constructions of combinatorial objects (e.g., expander graphs, Lovasz Local Lemma, efficient codes).

- Randomness vs. predictability:

    - Computational learning theory (predictability): learning vs. predictability, learning constant depth circuits, learning decision trees, learning noisy parity functions, weak learning, boosting.

    - Pseudorandomness (unpredictability): pseudorandomness vs. unpredictability, pseudorandom generators (prg's) based on hard problems, derandomization, randomness from weak random sources, randomness extractors, extractors vs. prg's, techniques for recycling randomness, derandomizing space bounded computation, sample spaces with limited independence, deterministic connectivity in logspace.

- Tools: Influence of a variable on a function, random walks on graphs, expander graphs, list decoding, limited independence, Fourier representation of a function.

Course Requirements   Approximately 4-5 homework sets (70%). Scribe notes(25%). Class participation (5%). If no TA is identified, as part of class participation, students may be asked to help with grading of assignments and the preparation of solution sets.

Prerequisites   6.046, 6.045 or 6.840 (or permission of instructor).

Office hours   By appointment.