EECS 651
Source Coding Theory
Winter 2001

Synopsis

Source coding (i.e. data compression) is the process of creating binary representations of the data from sources such as speech, images, audio, video or English text. This course gives a broad introduction to the theory and practice of lossy coding (i.e. quantization), where perfect reproductions are not possible or require too many bits (e.g. speech, images, audio, video) and also of lossless coding, where perfect reproductions are required (e.g. text). The lossy codes include scalar, vector, transform (e.g. JPEG, MPEG), subband (e.g. wavelet), predictive and adaptive quantizers (e.g. CELP); and the theory is mainly high resolution quantization theory. The lossless techniques include Huffman, run-length, Lempel-Ziv, and arithmetic codes; and the theory is entropy theory. Particular attention is paid to coding speech and images. Students will gain experience in source coding through a term project. The course is oriented toward first and second year graduate students. It is a kernel course for both communications and signal processing. No previous introduction to source coding is presumed.

Syllabus (attached)

Course Details

Time: MWF 1:30-2:30 (may be changed)

Room: 3150 Dow (may be changed)

Credit hours: 3

Likely next offering: Winter '03

Instructor: Prof. David L. Neuhoff, 4215 EECS, 764-6586, neuhoff@eecs.umich.edu

Office hours: To be determined. However, either now or later you can always contact me to make an appointment at a mutually convenient time.

Prerequisite: EECS 501, Probability and Random Processes

Text: None required.
Lecture notes will be distributed and posted on the class website, as they are needed. Notes from the last offering of EECS 651 are already available on the class website, so you can look ahead. Note, however, that we will be covering the material in a different order than last time.

References: See attached list.

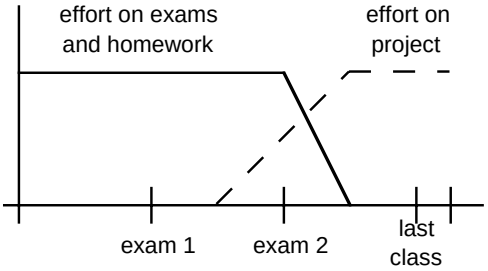
Books on reserve in the media union: See attached list

Homework assignments: Roughly weekly.

Exams: Two midterm exams. No final exam.

Term Project: Begins roughly halfway through the course; written report due the last day of finals; oral presentations to the class made at the end of the term, probably in the period of April 14 through 17. Group projects are permitted and encouraged.

Work load:



Course Grade: 15% Homework, 25% Exam 1, 25% Exam 2, 35% Term Project.

Homework is important and counts enough so that you should take it seriously, but not so much that you cannot afford mistakes.

Class email list:

Many important announcements (e.g. homework hints, corrections, exam schedules, changes to office hours etc.) will be emailed to the class. **YOU MUST enroll in the class email list by sending email to** eecs651-request@eecs.umich.edu with the word "subscribe" in the subject line. You should receive a confirming email. I will send one or more test emails, which will be announced in class. Let me know if you do not receive them.

Class web page:

www.eecs.umich.edu/courses/eecs651

It will contain homework assignments, solutions, course notes, etc.

Right now you will find the Winter 99 version. This will soon be updated.

Lecture attendance policy:

Lecture begins at 40 minutes after the hour. Please be seated and ready by then. To do otherwise is disruptive to the class.

Late homework policy:

Homework is due in class before the lecture begins on the assigned date. Please do not interrupt the lecture by attempting to hand in homework after the lecture begins. Homework received after the lecture and before the next lecture begins will incur a 25% deduction. (This is the only time that late arrival in class is penalized.) Homework received after that, but within one week of the due date, will incur a 50% deduction. No credit for homework that is more than one week late, except in extenuating circumstances.

Collaboration policy:

All homework assignments are to be completed on your own. You are allowed to consult with other students during the conceptualization of a solution, but all written work,whether in scrap or final form, is to be generated by you working alone. You are also not allowed to use, or in anyway derive advantage from, the existence of solutions prepared in prior years. Violation of this policy is an honor code violation. If you have any questions about this policy, please contact me.