Signal Compression (ECE 242)   **January 8, 2008**
Gibson   **Handout #1**

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Syllabus

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Course Objectives: To introduce the student to scalar and vector quantization methods and their theoretical analyses, to present and analyze lossless source coding methods, and to prepare the student for further study in speech, audio, still image, and video compression.

Lectures: Tuesday and Thursday, 2 to 3:50 am, Psych 1802

Instructor: J. D. Gibson, 2215 Elings Hall, gibson@ece.ucsb.edu

Office Hours: Monday and Friday 2-3 pm or by appointment

Text: Gersho and Gray, *Vector Quantization and Signal Compression*, Kluwer, 1992

Grading:

Midterm Exam	30%
Final	30%
Course Project	20%
Homework	20%

Topical and Text Coverage:

Date	Topic	Text Coverage
01/08	Course Description, Homework, Exams, Projects. What is Compression? Why Compress? The Data Compression Problem, Applications of Data Compression	Preface, Chap. 1
01/10	Scalar Quantization: Structure, Notation, Performance, Uniform Quantizer Design	pp. 133-138, 142-146, 150-152
01/15	High Resolution Uniform Quantization	pp. 153-156
01/17	Nonuniform Scalar Quantizer Design	pp. 156-161
01/22	High Resolution Nonuniform Quantization	pp. 161-165, 185-187
01/24	High Resolution Quantization with an entropy constraint	pp. 295-302
01/29	Conditions for Optimality **Project Proposals Due**	pp. 173-185

01/31	Lloyd Algorithms	pp. 187-198
02/05	Linear Prediction	pp. 203-214
02/07	Filter Banks and Transforms	pp. 235-252
02/12	Bit Allocation and Performance Bounds	pp. 225-235, 241-252
02/14	**Midterm Exam**	
02/19	Intro to Lossless Coding and Huffman Codes	pp. 259-277, 286-288
02/21	Lossless Coding: LZ and Arithmetic Codes	pp. 277-284, 288-295
02/26	Applications of lossless coding	
02/28	Introduction to Vector Quantization	pp. 309-327
03/04	Training Mode VQ	pp. 327-335, 349-369
03/06	Lattice VQ	pp. 335-338
03/11	**Project Presentations**	
03/13	Course Review	
03/19	**Final Exam**	**4-7 pm**

Other References:

1. Gibson, Berger, Lookabaugh, Lindbergh, and Baker, *Digital Compression for Multimedia*, Morgan-Kaufmann, 1998. (Good coverage of scalar quantization, predictive coding, and LZ lossless compression, with introductions to speech, audio, still image, and video coding standards as of mid 1997)

2. K. Sayood, *Introduction to Data Compression*, 2nd edition, Morgan-Kaufmann, 2000. (Excellent discussions of lossless compression methods, good introductory treatments of transforms, subbands, and wavelets)

3. N. S. Jayant and P. Noll, *Digital Coding of Waveforms*, Prentice-Hall, 1984. (Good treatments of scalar quantization, predictive coding, and discrete transforms as of 1984)

4. R. M. Gray and D. L. Neuhoff, "Quantization," *IEEE Trans. Information Theory*, vol. 44, No. 6, Oct. 1998, pp. 2325-2383.

5. T. Berger and J. D. Gibson, "Lossy Source Coding," *IEEE Trans. Information Theory*, vol. 44, No. 6, Oct. 1998, pp. 2693-2723.