

EECE 527 -- Information Theory

Instructor: Scott Craver

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Engineering Building Q8, hours: T/Th, 3-5:00.

Course Description: An introduction to information theory for signal processing and communication theory. Entropy, mutual information, divergence, channel capacity, multi-user communications, hypothesis testing and types.

Textbook: Cover and Thomas, *Elements of Information Theory*. Either edition is fine for the class.

Grading

- 33.3% homework
- 33.3% midterm exam
- 33.3% final exam

Schedule

This schedule is very tentative.

We will spend more or less time on different subjects as time permits.

Week Topic

1	Entropy, Conditional Entropy
2	Mutual Information and Divergence
3	Random processes and the AEP
4	Data Compression
5	Data Compression
6	Channel Capacity (exam 1)
7	Differential Entropy
8	Gaussian Channels
9	Types and Hypothesis Testing
	Mar 27-Apr 5 -- Spring Recess
10	Network Information Theory
11	Network Information Theory
12	Kolmogorov Complexity
13	Rate Distortion Theory
14	Other topics

Objectives

By the end of this course, I will expect students to be able to

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- Prove important inequalities in probability;
- Compute Shannon entropy, mutual information and divergence;
- Connect entropy and mutual information to compression and coding;
- Prove important facts about $H(x)$, $I(X;Y)$ and $D(p||q)$ (examples: the Information Inequality and the entropy chain rule);
- Compute differential entropy of continuous random variables;
- Determine the capacity of a theoretical error-prone channel.

A note on influenza

In order to prevent the spread of the H1N1 Flu Virus, please do not attend lecture or lab if you have a fever, body aches, cough, and/or sore throat- even if you don't think it's the flu. The university recommends that you remain at home or in your room and follow instructions from the University's Health Services (<http://www2.binghamton.edu/health/>). Please notify your instructor of your absence as soon as reasonably possible. Every effort will be made to accommodate make-up work. Excluding scheduled exams, you will not be asked to validate your illness with a note from a medical professional. It is considered a violation of the academic honesty code if you abuse this policy for non-medical reasons.

Binghamton University maintains an updated H1N1 webpage at <http://www2.binghamton.edu/news/updates/index.html>

For recommendations on what to do if you get sick, see the CDC site at

<http://www.cdc.gov/h1n1flu/sick.htm>

Academic Honesty

All students must adhere to the Student Academic Honesty Code of the University and the Watson School (links below). The Department of Electrical and Computer Engineering has adopted a standard policy to enforce these codes for violations involving course work. Category I violations result in a grade of 0 for the graded work plus a one letter course grade reduction. A *Report of Category I Academic Dishonesty* form is filed with the Provost's Office; if a prior report is already on file, the offense is automatically elevated to Category II. Category II violations result in at least a failing grade for the course plus any additional penalties determined by the Watson Academic Integrity Committee.

University Academic Honesty Code:

http://bulletin.binghamton.edu/program.asp?program_id=826

Watson School Academic Honesty Code:

http://www.binghamton.edu/watson/Watson_Academic_Honesty_Policy.pdf

ECE Department Academic Honesty Code Enforcement Policy

http://www.ece.binghamton.edu/documents/Academic_Honesty_Policy.pdf

This course is also offered under the articulation agreement between Binghamton University and SUNYIT. It is available to qualified students at Binghamton University via the distance learning system Enginet.