

Information Theory (ECE 6063)
NYU Tandon School of Engineering, Spring 2022
Elza Erkip

January 24, 2022

Information Theory, ECE 6063

Outline

Instructor: Dr. Elza Erkip

E-mail: elza@nyu.edu

Office: 370 Jay Street, 9th floor, 953.

Office Hours: Monday 12:30 pm–1:30 pm or by appointment. Office hours will be conducted in person and also simultaneously over Zoom. Zoom link is provided in NYU Brightspace. The password is **shannon**.

Course Assistant: Kubilay Ulger

E-mail: ou2007@nyu.edu

Office Hours: TBA.

Class Time and Place: Monday 2:00 pm–4:30 pm, RH 201.

Online Course Materials: Check NYU Brightspace ECE 6063 site for course materials. Recorded lectures from last year will be available through NYU Brightspace.

Prerequisites: ECE 6303, or a graduate course in probability. A good understanding of probability is essential for this course.

Homework: There will be weekly homework. Please make sure you solve them on your own and do not copy from somewhere/someone else; the more questions you solve, the better you will understand the concepts.

Grading: Midterm 25 %, final 35 %, project 30 %, homework and participation 10%.

The project involves reading a research paper and re-working parts of the paper (including one or more proofs) on your own. You will prepare (i) a brief presentation in the form of a lightning talk, (ii) a poster, and (iii) a short IEEE conference style report. Relevant papers will be provided later. Please let me know if you have a particular topic in mind.

Please note that this is an *in person* class and all exams and presentations will be in person unless NYU rules and recommendations suggest otherwise.

Make-up Policy: Make-up exams will only be given under exceptional circumstances, such as illness or other critical emergency. Proper documentation through Tandon Student Advocacy (see below) is required. Make-ups will be in oral exam format.

Tandon Student Advocacy: Please note that if you are experiencing an illness (including Covid) or any other situation that might affect your academic performance in a class (including missing exam or assignments), please email Tandon Student Advocacy (eng.studentadvocate@nyu.edu). They will reach out to me and your other instructors on your behalf when warranted.

Moses Center Statement of Disability: If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd.

Required Text: T. M. Cover and J. Thomas, *Elements of Information Theory*, Second Edition, Wiley, 2006.

Course Outline:

- Information measures: entropy, relative entropy and mutual information.
- Asymptotic equipartition property.
- Entropy rates of stochastic processes.
- Data compression.
- Channel capacity.
- Differential entropy and the Gaussian channel.
- Rate distortion theory (brief).
- Network information theory (brief).

Inclusion Statement: The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me. For Diversity and Inclusion resources as NYU Tandon, see

<https://engineering.nyu.edu/about/diversity-inclusion>

NYU School of Engineering Policies and Procedures on Academic Misconduct:

1. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.
2. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:
 - (a) Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
 - (b) Fabrication: including but not limited to, falsifying experimental data and/or citations.
 - (c) Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
 - (d) Unauthorized collaboration: working together on work that was meant to be done individually.
 - (e) Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
 - (f) Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.