Colorado State University, Ft. Collins **Fall 2023**

ECE 516: Information Theory

3 credits, Tuesday & Thursday 9:30am ~ 10:45am, Engr. B4

Instructor: J. Rockey Luo **Office:** B118, Engineering Building
Phone: (970) 491-7411 **E-mail:** rockey@colostate.edu
Office Hours: Tuesday & Thursday 1:00 ~ 2:30 pm, or by appointment.

Prerequisites: ECE303/STAT303, ECE421

Textbook: Thomas M. Cover and Joy A Thomas, "Elements of Information Theory", 2nd Edition, John Wiley & Sons, New Jersey, 2005. (ISBN 0-471-24195-4)

Course Goals:

An analytical framework for modeling and evaluating point-to-point communication systems is developed. The key concepts of information content of a signal source and information capacity of a transmission medium are precisely defined, and their relationship to data compression algorithms and error control codes is examined in detail. The course aims to instill an appreciation for the fundamental capabilities and limitations of information transmission schemes; and to provide the mathematical tools for applying these ideas to a broad class of communication systems.

Course Outline:

1. Entropy, relative entropy and mutual information (Chapter 2)
2. The asymptotic equipartition property (Chapter 3)
3. Entropy rate of stochastic processes (Chapter 4)
4. Data compression (Chapter 5)
5. Channel capacity (Chapter 7)
6. Differential entropy (Chapter 8)
7. The Gaussian channel (Chapter 9)
8. Network information theory (Chapter 15)
9. Rate distortion theory (Chapter 10)

Grading: Homeworks (20%), assigned every Tuesday, due on Thursday next week.

Midterm Exam (30%), Tuesday, 9:30~10:45am, 10/17

Final Exam (50%), Monday, 9:40~11:40am, 12/11

Exams will be open book open notes.

All homework submissions will be done online on Canvas. If you prefer working on paper copies, you can take photos of the papers and then upload the PDF file on Canvas.