Information Theory - Spring 2018

Professor: David Karpuk (email: da.karpuk@uniandes.edu.co, office: H006)
Course number: MATE-3134 / MATE-4134
Lectures, all in Z203: Tuesday and Thursday, 9:00 - 10:50
Office hours: by appointment, but preferably on Tuesday and Thursdays
Language of instruction: English

Course Summary: This is a first course in Information Theory. This course builds on material developed in a basic probability course, but the most important requirement is mathematical maturity. The course has two explicit goals, namely to answer the following two (related) questions:

1. How efficiently can data be compressed?

2. How efficiently can data be transmitted in the presence of noise?

At the end of the course, students will have the mathematical tools to answer the above questions, as well as have a general understanding of the mathematics underpinning modern communications systems. More specifically, the main ideas we hope to cover during the course are entropy and mutual information of random variables, data compression, coding theory, and channel capacity.

Textbook: Cover and Thomas, *Elements of Information Theory*. There are two editions of this book, and it doesn't really matter which one you have. The most important material will be presented in class during lecture, and the most important thing is to follow along with the lectures and take good notes.

Evaluation: Your final grade will be based on four (long) homework assignments (each 20%), and one final project (worth 20%). **There are no exams.** Homework will be assigned approximately every three weeks, will consist of a mixture of problems from the textbook and my own problems, and will be posted on the course's SicuaPlus page.

The final project will consist of reading a modern and important research paper in the area of Information Theory, giving a presentation to the class about the main results, and writing a written report (≤ 5 pages of Latex) paraphrasing the main ideas of the paper. More details about the project will be given towards the end of the course.

Prerequisites: Formally, there are not many prerequisites for this course as the material is largely self-contained. The most important prerequisite is familiarity the basics of probability theory. **However**, it will be demanding and a certain amount of mathematical maturity is expected.