ORIE 7590 - Selected Topics in Applied Probability
Spring 2021

Martingales in discrete and continuous time

Instructor: Gennady Samorodnitsky

Instruction:
in person, Tuesday and Thursday, 11:25 am - 12:40 pm, Olin 255
Online: anytime

Martingales are everywhere. If you are ineterested in establishing regret bounds for multiarmed bandits or for other learning problems, you use martingale concentration inequalities. If your interest is in finance, and you want to describe the price process of an instrument, you use stochastic integrals with respect to a martingale. If you are trying to get an idea how an epidemic develops, you use branching processes whose dynamics is described by the martingale theory.

In this course we will cover martinagles both in discrete and continuous time. We will cover martingales, submartingales and supermartingales, stopping times, maximal inequalities and upcrossing inequalities, convergence and regularity of martingales and of stopping times, optional stopping theorems, local martinagales and their quadratic variation, the Doob-Meyer decomposition, stochastic integrals and Ito's formula.

The students are assumed to have had a course in measure-theoretical probability and have a good understanding of conditional expectation.