MATH 5016 - Topics in Probability: Discretization of continuous processes

Syllabus Spring 2020

This course will be a practical introduction to the classical topic of approximation of continuous stochastic processes (diffusions) by discrete processes (random walks on graphs). We will begin with the standard one-dimensional Wiener process and discuss its standard approximations by simple random walks, martingales, and Markov chains. In the second part of the course we will discuss similar problems on other spaces (Lie groups, manifolds, and fractals). No prior knowledge of stochastic process will be required. Please contact the instructor for further information, or if you have any questions.

- **Instructor:** Alexander (Sasha) Teplyaev
  http://teplyaev.math.uconn.edu/
  office: MONT429, email: teplyaev@uconn.edu
- **Office hours:**
  Monday, Wednesday, Friday: 11:15—12:05pm
  Tuesday and Thursday: 2:00—3:00pm
  and by appointment. Please send me an email beforehand if the meeting is important.
- **Lecture times and locations:** MoWeFr 10:00am-11:10am MONT 113
- **Textbook:** No textbook is required. The essential material for the course will be available.
- **Prerequisites:** Working knowledge of undergraduate probability and PDE.
- **Grading:** students are to choose one or more of the following options, with agreement of the instructor:
  - ⋆ 20 minute presentation in the end of the course on a topic related to the course;
  - ⋆ 3 to 5 page lecture notes (about 1 week of lectures);
  - ⋆ 3 to 5 page paper(s) summary or a literature review;
  - ⋆ numerical simulation related to the topics that we discuss;
  - ⋆ original pure or applied mathematics research related to the topics that we discuss.

  Team work is encouraged.

A paper to consider: Giné, Evarist, and Koltchinskii, Vladimir. "Empirical graph Laplacian approximation of Laplace-Beltrami operators: Large sample results." High dimensional probability (pp 238-259) Institute of Mathematical Statistics, 2006.