

Basic Probability and Deep Learning

Course Description: This is a crashed course for basic Probability and deep learning . We will mainly use as a textbook Sheldon's *A First Course in Probability*. The course will be planed for 12 weeks, 2 hours lecture per week.

In this course axiomic probability theory will be introduced. We maybe touch the measure theoretical aspect, but it depends on the background of the audience. Then we will discuss about the mathematical aspects of deep learning.

The instructor believes that the following groups of students will benefit from this course:

1. People who will be interested in statistics learning and data science.
2. High school students who are preparing for AP/IB as well as College Entrance Exam (GaoKao).
3. People who will be persuing career in Financial math/Engineering;
4. College students in science in american universities;

The course will be given by Zoom: a two-hour lecture per week. Main concepts, theorems will be taught in English. A couple of exercises and reading material will be given each week and the instructor will also provide detailed solutions. *Note that this course is developed for a small group of people, self-motivated learning and discussion is very much encouraged!* In particular, the instructor expects that this course will establish a solid probability background for the audience.

Instructor: Dr. Ben Li*. He obtained PhD in Mathematics from Case Western Reserve University in 2018. Then he came to Tel Aviv University as a post doc researcher and in the fall of 2020 he will be a visiting postdoc researcher in Berkeley Simons Institute for the Theory of Computing.

Textbook: *A First Course in Probability*, by Sheldon Ross, and other reading material distributed by the instructor.

Schedule: Lecture Hours: Sundays, 7-9pm EDT;
Dates: September 13th - December 13th.

Registration: Please register with the link: <https://forms.gle/LBZHitbXXfqzsJRK6> or by email hshen@ginsengedu.com.

The tuition for the entire course, including all course materials: \$350. *Early bird offer (sign up by Sept. 1th):* \$300. Group discount: \$300 (for two students or more).

Please send payment via PayPal hshen@ginsengedu.com or Alipay caiwu@50edu.cn.

Plan(tentative):

Week 1: Combinatorics and axioms of probability (Ch 1-2)

Week 2: Conditional probability and Bayes Formula (Ch 3)

Week 3: Discrete random variables(Ch 4)

Week 4: Examples of discrete distributions (Ch 4)

Week 5: Poisson process (Ch 9)

Week 6: Continuous random variables (Ch 5)

Week 7: Examples of continuous distributions (Ch 5)

Week 8: Central limit theorem (Ch 8)

Week 9: Coding theory (Ch 9)

Week 10: Introduction to the universality of depth nets

Week 11: Depth separation

Week 12: Deep nets and PAC learning