MATH170A: PROBABILITY THEORY

Winter 2019

GENERAL INFORMATION

Instructor: Hanbaek Lyu
(Email: hlyu@math.ucla.edu, Office: MS 6156)

Lectures: MWF 2:00PM - 2:50PM at MS 5137

Office hours: (tentative) MW 12:55PM - 1:55PM and F 3:00 - 4:00PM

Textbook: Introduction to Probability by D. P. Bertsekas and John N. Tsitsiklis, 2nd edition

Prerequisites: Math 33A

TA: Fan Yang
(Email: yangf.cuhk@gmail.com, Office: MS 3949)

COURSE DESCRIPTION

In this course we study foundations of probability theory. The key concept is random variable, which is a mathematical device that is designed to describe outcomes of uncertain observations. We learn various essential random variables, their properties, and how to quantify and manipulate them.

GRADING

• Final score will be the maximum of the following two schemes:
  
  **Scheme 1**: Homework (15%) + Midterm 1 (20%) + Midterm 2 (20%) + Final (45%)
  
  **Scheme 2**: Homework (15%) + Better of the midterms (30%) + Final (55%)

• All grades will be posted via MyUCLA gradebook.

HOMEWORK

• Homeworks will be assigned weekly on every Wednesdays, and are due at the beginning of the class on following Wednesday.
• No late homeworks will be accepted.
• Two lowest homework scores will be dropped.
• A random sample of problems will be graded by the TA.
• Solutions on some selected problems will be posted in the course website.
• Discussing homework problems with the instructor, TA, or classmates are encouraged. But you need to write your own solution with your own understanding.

EXAMS

• There are two midterms and one final exam.
  
  **Midterm 1**: Wednesday, Jan.30 in class.
  
  **Midterm 2**: Friday, Mar.1 in class.
  
  **Final**: Monday, Mar. 19, 3:00PM - 6:00PM (location TBD)

• There is no make-up exam. You should attend the final exam to pass the course.
• Please bring your UCLA ID card to all exams.
Below is a tentative course schedule based on the departmental guideline. There could be a slight change depending on our progress.

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<thead>
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<th>Week</th>
<th>Date</th>
<th>Section</th>
<th>Topics</th>
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<td>1</td>
<td>M 1/7</td>
<td>1.1</td>
<td>Sets</td>
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<tr>
<td></td>
<td>W 1/9</td>
<td>1.2</td>
<td>Probabilistic models</td>
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<td>F 1/11</td>
<td>1.2</td>
<td>Probabilistic models</td>
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<td></td>
<td>M 1/14</td>
<td>1.3</td>
<td>Conditional probability</td>
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<td>W 1/16</td>
<td>1.3</td>
<td>Conditional probability</td>
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<td>F 1/18</td>
<td>1.4</td>
<td>Total Probability Theorem and Bayes Rule</td>
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<td>M 1/21</td>
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<td>No Class</td>
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<td></td>
<td>W 1/23</td>
<td>1.5</td>
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<td></td>
<td>F 1/25</td>
<td>2.1, 2.2, 2.4</td>
<td>Discrete random variables, expectation, and variance</td>
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<tr>
<td></td>
<td>M 1/28</td>
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<td>Binomial, Geometric, and Poisson RVs</td>
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<td>W 1/30</td>
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<td>F 2/1</td>
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<td></td>
<td>M 2/4</td>
<td>2.6</td>
<td>Conditioning discrete RVs</td>
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<td>W 2/6</td>
<td>2.6</td>
<td>Conditional expectation of discrete RVs</td>
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<td>F 2/8</td>
<td>2.7</td>
<td>Independence between discrete RVs and events</td>
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<td></td>
<td>M 2/11</td>
<td>2.7</td>
<td>Independence between discrete RVs</td>
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<td>W 2/13</td>
<td>3.1</td>
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<td>F 2/15</td>
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<td>Uniform, Exponential, and Normal RVs</td>
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<td>M 2/18</td>
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<td>No class</td>
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<td>W 2/20</td>
<td>3.4</td>
<td>Joint PDFs of multiple RVs</td>
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<td>F 2/22</td>
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<td>M 2/25</td>
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<td>Conditional expectation of continuous RVs</td>
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<td></td>
<td>W 2/27</td>
<td>3.6</td>
<td>The continuous Bayes rule</td>
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<td>F 3/1</td>
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<td><strong>Midterm 2</strong></td>
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<td>M 3/4</td>
<td>1.6</td>
<td>Counting and Stirling's Formula</td>
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<td></td>
<td>W 3/6</td>
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<td>de Moivre-Laplace CLT</td>
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<td>F 3/8</td>
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<td>Normal approximation of binomial RVs</td>
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<td>M 3/11</td>
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<td>Markov's &amp; Chebyshef's inequalities</td>
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<td>W 3/13</td>
<td>5.1</td>
<td>The Weak Law of Large Numbers</td>
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<td>F 3/15</td>
<td>5.2</td>
<td>Review</td>
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<td><strong>Final</strong></td>
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