

# Lecture 0: Introduction

Yi, Yung (이웅)

EE210: Probability and Introductory Random Processes  
KAIST EE

MONTH DAY, 2021

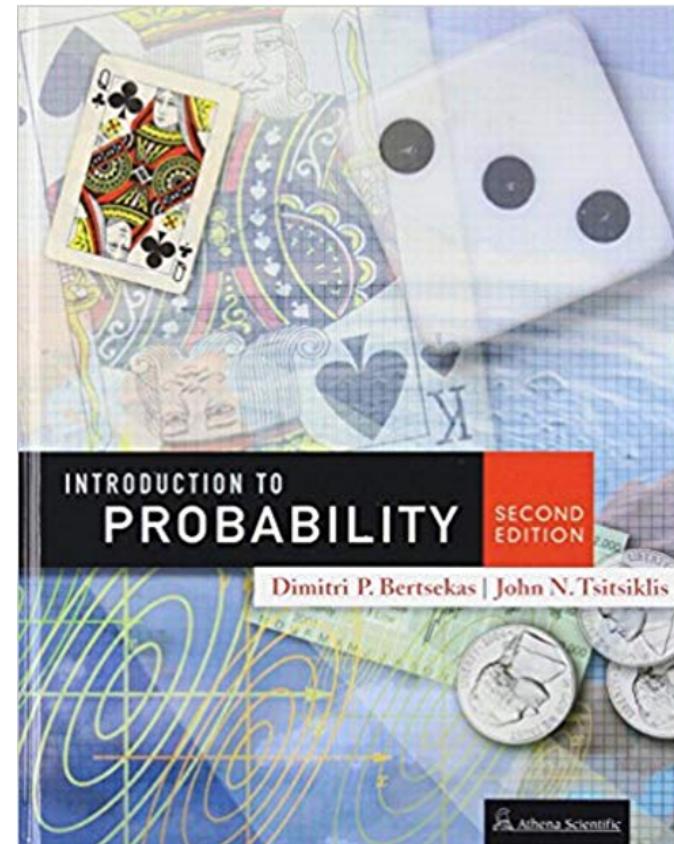
- Course logistics
- Why necessary to take the course of probability and random process?

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- Computer Division
- A professor in KAIST EE since 2008
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- A
- B
- C
  
- Mailing list: ee210@lanada.kaist.ac.kr
  - Please use KLMS for the questions about the lecture contents
  - This mailing list can be used for individual issues

- <http://klms.kaist.ac.kr/>
- To download course materials
- To ask questions about everything
- To check your score on each homework/exam
- To see all the announcements about the class

- Introduction to Probability  
(2nd edition)
  - MIT course textbook
  - Dimitri P. Bertsekas and John N. Tsitsiklis



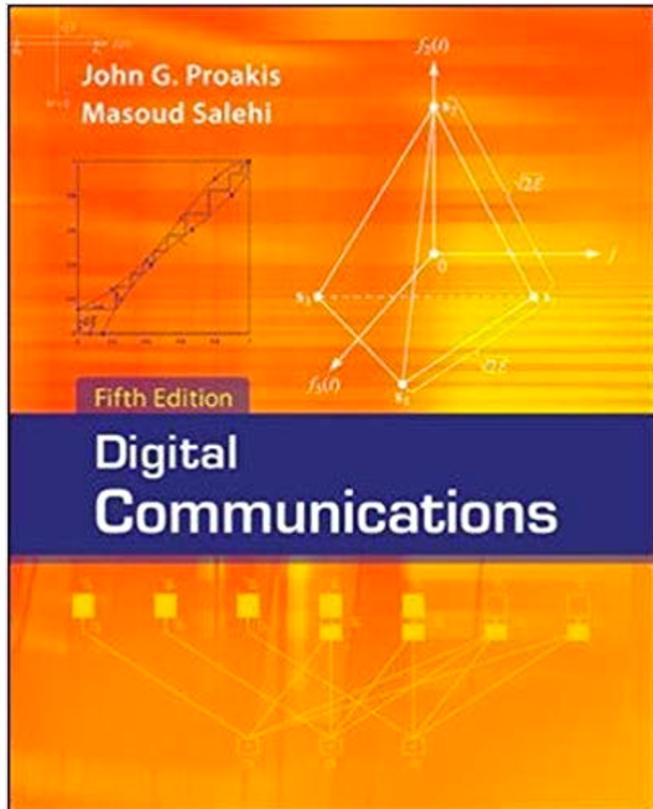
- Three Parts
  - Part I: Fundamentals of Probability
  - Part II: Inference and Limit Theorems
  - Part III: Random Processes
- On-line lectures at MIT and EdX
  - MIT: <http://bit.ly/2PkvYdr>
  - EdX: <http://bit.ly/3pHmZRd>
  - You can find older urls (2006, 2010, 2013) for this lecture, where there are many useful resources (recitation problems, homework problems, old exam problems, etc)
  - My lecture slides: based on theirs, but largely modified/reorganized/edited in many places for KAIST students

- In-class quiz (sometimes)
- Basically, weekly homework, but often bi-weekly
- 3 Exams (2 mid-terms and 1 final)
- Class participation
- Grading portions: A (X%), B (Y%), C(Z%), D(W%), F . . .
- Online lectures due to COVID-19 may change how to grade.

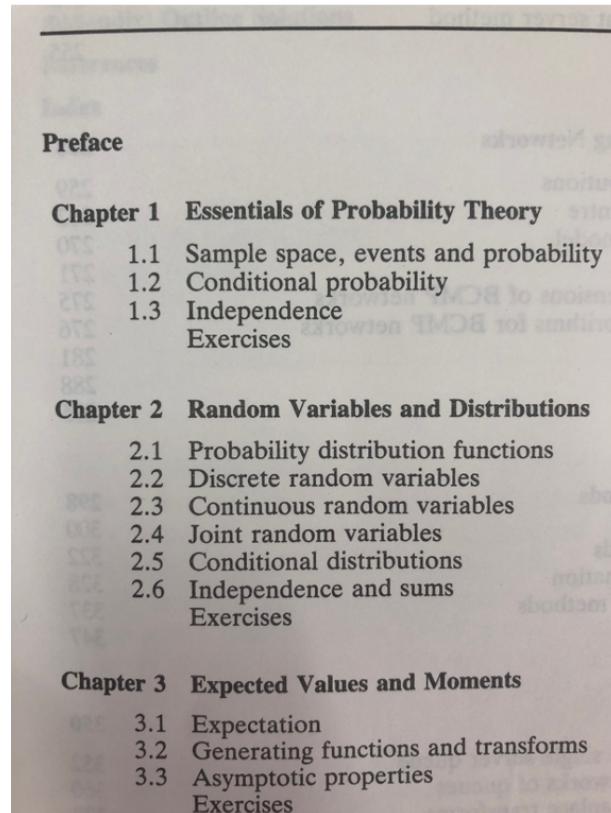
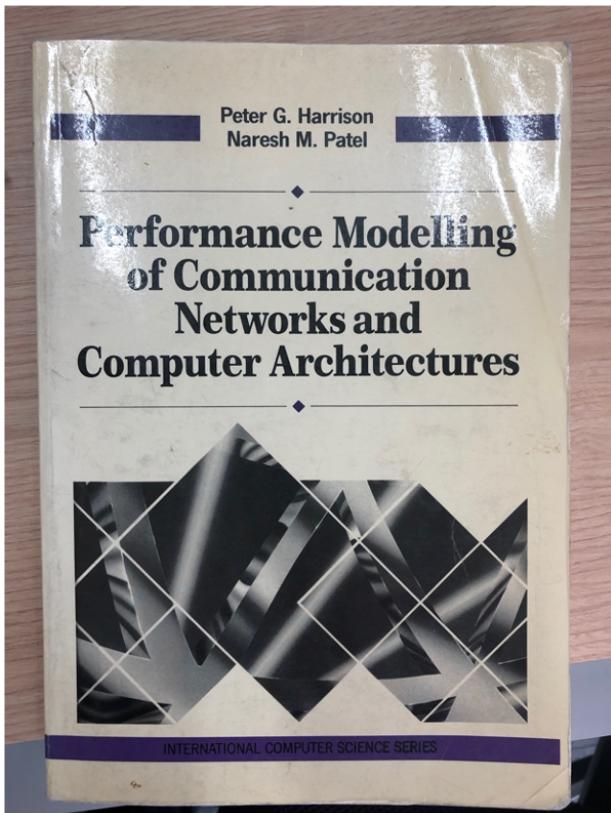
- Most should be via KLMS
  - Technical questions about lectures, homework, and etc
- Please DO NOT individually send emails to Prof. Yung Yi and TAs (or making calls or sending KakaoTalk msgs) about the technical questions (course contents, homework, etc)
  - All the questions need to be shared among the students.
  - TAs and Prof. Yung Yi will handle your questions as soon as possible.
  - But, you can send an email to Prof. Yung Yi for the things that need to be individually discussed.

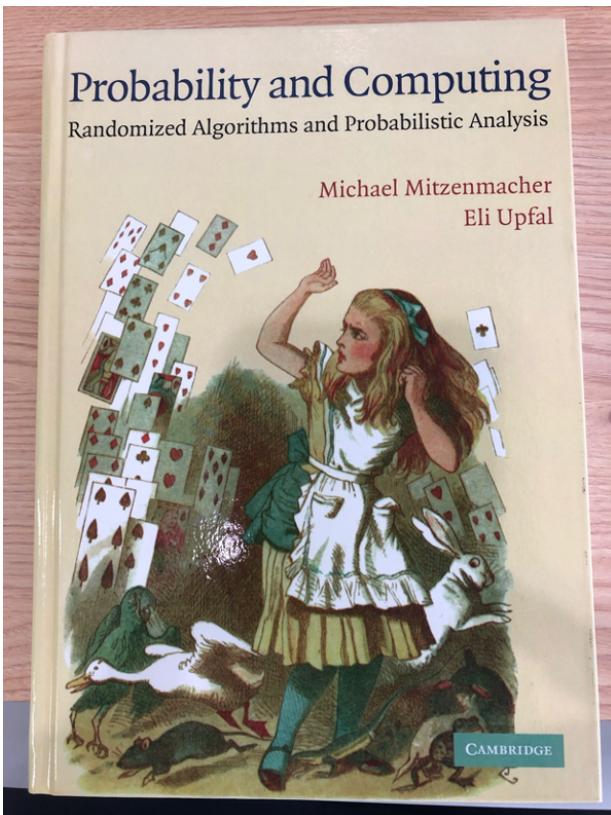
Questions?

- Many things are "probabilistic"
- Assume that you are a designer of the following engineering systems. Good design?
  - a web server
  - a communication device like mobile phones
  - an AI-based image classifier
- From an engineering point of view,
  - System input
  - Algorithms in systems
  - Analysis of systems



<b>Communications</b>	13
1-5 Overview of the Book	16
1-6 Bibliographical Notes and References	16
 <b>2 Probability and Stochastic Processes</b>	 17
2-1 Probability	17
2-1-1 Random Variables, Probability Distributions, and Probability Densities	22
2-1-2 Functions of Random Variables	28
2-1-3 Statistical Averages of Random Variables	33
2-1-4 Some Useful Probability Distributions	37
2-1-5 Upper bounds on the Tail Probability	53
2-1-6 Sums of Random Variables and the Central Limit Theorem	58
2-2 Stochastic Processes	62
2-2-1 Statistical Averages	64
2-2-2 Power Density Spectrum	67
2-2-3 Response of a Linear Time-Invariant System to a Random Input Signal	68
2-2-4 Sampling Theorem for Band-Limited Stochastic Processes	72
2-2-5 Discrete-Time Stochastic Signals and Systems	74
2-2-6 Cyclostationary Processes	75
2-3 Bibliographical Notes and References	77
Problems	77





*Preface*

**1 Events and Probability**

- 1.1 Application: Verifying Polynomial Identities
- 1.2 Axioms of Probability
- 1.3 Application: Verifying Matrix Multiplication
- 1.4 Application: A Randomized Min-Cut Algorithm
- 1.5 Exercises

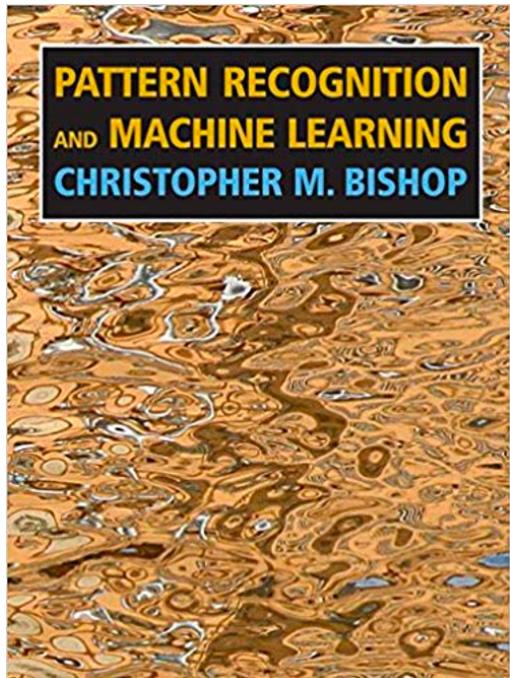
**2 Discrete Random Variables and Expectation**

- 2.1 Random Variables and Expectation
  - 2.1.1 Linearity of Expectations
  - 2.1.2 Jensen's Inequality
- 2.2 The Bernoulli and Binomial Random Variables
- 2.3 Conditional Expectation
- 2.4 The Geometric Distribution
  - 2.4.1 Example: Coupon Collector's Problem
- 2.5 Application: The Expected Run-Time of Quicksort
- 2.6 Exercises

**3 Moments and Deviations**

- 3.1 Markov's Inequality
- 3.2 Variance and Moments of a Random Variable
  - 3.2.1 Example: Variance of a Binomial Random Variable
- 3.3 Chebyshev's Inequality
  - 3.3.1 Example: Coupon Collector's Problem
- 3.4 Application: A Randomized Algorithm for Computing the
  - 3.4.1 The Algorithm
  - 3.4.2 Analysis of the Algorithm
- 3.5 Exercises

# Textbook: Machine Learning



xiv CONTENTS		Copyrighted Material
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<b>2 Probability Distributions</b>		<b>67</b>
2.1 Binary Variables . . . . .		68
2.1.1 The beta distribution . . . . .		71
2.2 Multinomial Variables . . . . .		74
2.2.1 The Dirichlet distribution . . . . .		76
2.3 The Gaussian Distribution . . . . .		78
2.3.1 Conditional Gaussian distributions . . . . .		85
2.3.2 Marginal Gaussian distributions . . . . .		88
2.3.3 Bayes' theorem for Gaussian variables . . . . .		90
2.3.4 Maximum likelihood for the Gaussian . . . . .		93
2.3.5 Sequential estimation . . . . .		94
2.3.6 Bayesian inference for the Gaussian . . . . .		97
2.3.7 Student's t-distribution . . . . .		102
2.3.8 Periodic variables . . . . .		105
2.3.9 Mixtures of Gaussians . . . . .		110
2.4 The Exponential Family . . . . .		113
2.4.1 Maximum likelihood and sufficient statistics . . . . .		116
2.4.2 Conjugate priors . . . . .		117
2.4.3 Noninformative priors . . . . .		117
2.5 Nonparametric Methods . . . . .		120
2.5.1 Kernel density estimators . . . . .		122
2.5.2 Nearest-neighbour methods . . . . .		124
Exercises . . . . .		127
<b>3 Linear Models for Regression</b>		<b>137</b>
3.1 Linear Basis Function Models . . . . .		138
3.1.1 Maximum likelihood and least squares . . . . .		140
3.1.2 Geometry of least squares . . . . .		143
3.1.3 Sequential learning . . . . .		143
3.1.4 Regularized least squares . . . . .		144

These days, every area in CS and EE is directly or indirectly related to machine learning!

- Designer's perspective?
- In the year of 2021, suppose that unfortunately there is no theory of mathematically studying the *uncertainty* of some phenomena, events, etc.
- You have to design such a theory called "probability". How are you going to do it?  
Where are you going to start?
- You just have other basic mathematical theories such as set theory.
- You need to get used to the *English terms* on probability (e.g., sample space = 표본공간, probability density function = 확률밀도함수).
- We will take this exciting journey from the next lecture!

Questions?

