

Lecture 0: Introduction

Yi, Yung (이용)

EE210: Probability and Introductory Random Processes
KAIST EE

August 26, 2021

- Course logistics
- Why this course?

- Yi, Yung (이융)
- Office: N1, 810
- Homepage: <https://yung-web.github.io/home/>
- E-mail: yiyung@kaist.edu
- Computer Division
- In KAIST EE since 2008

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- All lecture videos have already been pre-recorded. Now available in [YouTube](#).
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 - You can adjust the speed of studying the materials according to your schedule, as long as you submit the homeworks until the announced deadlines and you show up at the right time for the exams.

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- Sometimes, we will open **real-time zoom** classes (maybe biweekly)
 - To answer students' questions
 - To give important announcements
 - etc

- Method 1:

<https://yung-web.github.io/home/courses/probability.html>

Watching Lecture Videos



- Method 1:
<https://yung-web.github.io/home/courses/probability.html>
- Method 2: (a) Type **Yung Yi** in the google, (b) visit his [GitHub homepage](#), (c) find the links on [Course](#).

Google search results for "yung yi":

- 검색 결과 약 20,600,000개 (0.62초)
- 도움말: 한국어 검색결과만 검색합니다. 환경설정에서 검색 언어를 지정할 수 있습니다.
- <https://scholar.google.com/citations> - Yung Yi - Google Scholar
- Yung Yi, Professor of Electrical Engineering, KAIST. Verified email at kaist.edu - Homepage · Applied machine learning/computer networking/performance ...
- <https://ee.kaist.ac.kr/node/> - YI, Yung - KAIST ELECTRICAL ENGINEERING
- YI, Yung - KAIST ELECTRICAL ENGINEERING
- <https://yung-web.github.io/> - Yung Yi, KAIST - GitHub Pages
- 2021. 6. 10. - Short Bio: Yung Yi received his B.S. and the M.S. in the School of Computer Science and Engineering from Seoul National University, ... 이 페이지를 여러 번 방문했습니다. 최근 방문 날짜: 21. 8. 23.
- https://openreview.net/profile?id=Yung_YII - Yung Yi | OpenReview
- Korea Advanced Institute of Science and Technology · Names · Emails · Personal Links · Education & Career History · Advisors, Relations & Conflicts · Expertise.
- <https://dl.acm.org/> profile
- Yung Yi - Home - ACM Digital Library

Mobile networks Wireless access networks Machine learning Network protocols Sequential decision making Design and analysis of algorithms Local area networks ...



Short Bio: Yung Yi received his B.S. and the M.S. in the School of Computer Science and Engineering from Seoul National University in 1997 and 1999, respectively, and his Ph.D. in the Department of Electrical and Computer Engineering at the University of Texas at Austin in 2006. From 2006 to 2008, he was a post-doctoral research associate in the Department of Electrical Engineering at Princeton University. In 2008, he joined KAIST as an Associate Professor in the Department of Electrical Engineering at KAIST, South Korea. His current research interests include applied machine learning, design and analysis of wired/wireless networking systems. He was the recipient of two best paper awards at SECON 2013 and ACM MobiHoc 2013. He was the co-recipient of IEEE William R. Bennett Award, 2016.

LANADA (Laboratory of Network Architecture, Design, and Analysis)

LANADA is a research group which I currently lead. Currently, we do not hire new graduate students.

Students advised (PhD)

1. Jinsung Lee, 2012, Postdoc at U. of Colorado
2. Jaesung Jeong, 2014, Sony Ericsson, Sweden
3. Joohyun Lee, 2014, Hangyang Univ.
4. Hyojin Park, 2015, National Security Research Inst.
5. Dongju Yun, 2016, Naver
6. Soohwan Lee, 2016, ETRI
7. Hyjeong Lee, 2016, SK Telecom
8. Hyeyoung Jang, 2016, Dongguk Univ.
9. Jungseul Ok, 2017, POSTECH
10. Hyejong Lee, 2017, Samsung

Education

- Ph.D.: Dept. of Electrical and Computer Engineering, University of Texas at Austin, 2006
- M.S.: Dept. of Computer Science and Engineering, Seoul National University, 1999
- B.S.: Dept. of Computer Science and Engineering, Seoul National University, 1997

Position

- KAIST Chair Professor (KAIST 지평역학교수): Dept. of Electrical Engineering, KAIST, 2021 - Current
- Full Professor: Dept. of Electrical Engineering, KAIST, 2012.2 - Current
- Associate Professor: Dept. of Electrical Engineering, KAIST, 2011.8 - 2012.2
- Assistant Professor: Dept. of Electrical Engineering, KAIST, 2008.8 - 2011.8
- Postdoctoral Research Associate: Dept. of Electrical Engineering Princeton University, 2006.8 - 2008.8

Courses

- [Probability and Introductory Random Process](#) Video included, Undergraduate
- [Data Structures for Electrical Engineers](#), Undergraduate
- [Mathematics for Machine Learning](#), Undergraduate
- [Computer Network](#), Undergraduate
- [Complex Network Analysis: Ecodynamics and Rumours](#) Video included, Graduate

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N1 Building,
Daegu, South Korea
Phone: +82 42
Fax: +82 42
Email: ieste@kaist.ac.kr
Office Hours

Memorabilia



2020 Spring

- Questions on the course contents
 - Upload them in the [Q&A board in KLMS](#).
 - Your question will also be very helpful to other classmates
 - Answers to your questions will be given [at the board](#) (if simple), or via separate [lecture videos](#) or [a real-time zoom session](#).

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- Real-time Zoom Session
 - Open when necessary and it will be recorded so as to be accessible throughout this semester.
 - The zoom link information will be given in advance at the corresponding week.

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- Real-time Zoom Session
 - Open when necessary and it will be recorded so as to be accessible throughout this semester.
 - The zoom link information will be given in advance at the corresponding week.
- Personal Office Hours
 - Will arrange by an [individual request](#).
 - Send an email to yiyung@kaist.edu for appointment.
 - Questions on the course and other any types of advices that may help you

- Lecture videos and slides:

<https://yung-web.github.io/home/courses/probability.html>

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- All other contents: KLMS, <http://klms.kaist.ac.kr/>

- To ask questions about everything

- To check your score on each homework/exam

- To see all the announcements about the class

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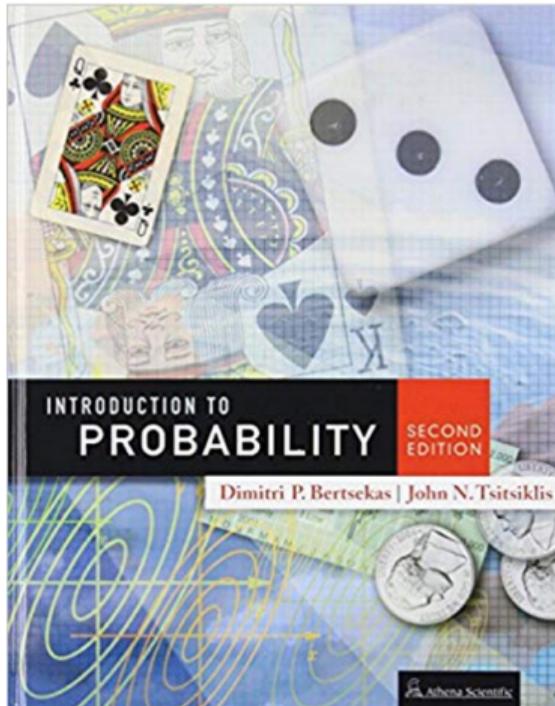
- **Important: Please regularly check!**

- Emails

- SMS

- KLMS announcements

- Introduction to Probability
(2nd edition)
 - MIT course textbook
 - Dimitri P. Bertsekas and John N. Tsitsiklis
- You can order it from Yes24, Aladin, Kyobo
 - Yes24: <http://www.yes24.com/Product/Goods/3995311>
 - Aladin: <https://www.aladin.co.kr/shop/wproduct.aspx?ItemId=12945615>
 - Kyobo: <http://www.kyobobook.co.kr/product/detailViewEng.laf?ejkGb=ENG&mallGb=ENG&barcode=9781886529380&orderClick=LAG&Kc=>



1. Probabilistic model (1/2 week) (08/31)
2. Conditioning and Independence (1/2 week) (09/02)
3. Random Variable, Part I (Discrete Random Variable) (1.5 week) (09/07, 09/09, 09/14)
Exam 1 (09/23)

4. Random Variable, Part II (Continuous Random Variable) (1.5 week) (09/16, 09/28, 09/30)
5. Random Variable, Part III (Advanced Topic on Random Variable) (1.5 week) (10/05, 10/07, 10/12)
Exam 2 (10/14)

6. Limit of Scaled Sum of Random Variables: Central Limit Theorem and Weak Law of Large Numbers (1.5 week) (10/19, 10/21, 10/26)
7. Random Process: Bernoulli and Poisson Processes (2 week) (10/28, 11/2, 11/4, 11/9)
Exam 3 (11/11)

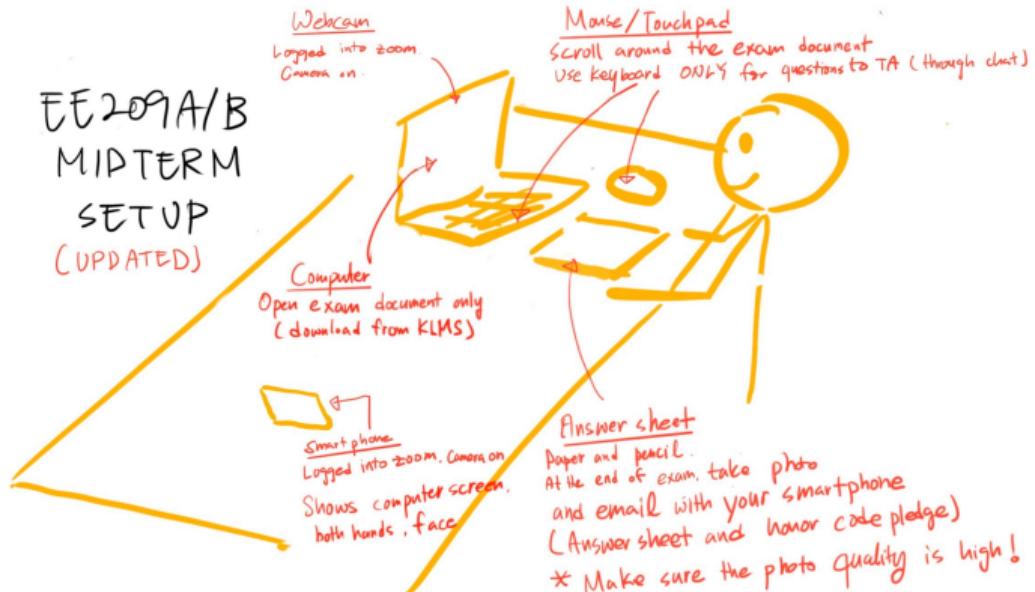
8. Random Process: Markov Chain (2 week) (11/16, 11/18, 11/23, 11/25)
9. Introduction to Statistic Inference (2 week) (11/30, 12/2, 12/7, 12/9)
Exam 4 (12/14)

- On-line lectures at MIT and EdX
 - MIT: <http://bit.ly/2PkvYdr>
 - EdX: <http://bit.ly/3pHmZRd>
 - You can find the urls (2006, 2010, 2013) for the MIT lectures based on the same textbook, where there are many useful resources (recitation problems, homework problems, old exam problems, etc)
 - Some of my lecture slides are based on theirs, but my slides are largely modified/reorganized/edited in many places for our purpose.

- 4 Exams
- Schedule Again
 - Exam 1: **09/23**, 7:00PM - 10:00PM
 - Exam 2: **10/14**, 7:00PM - 10:00PM
 - Exam 3: **11/11**, 7:00PM - 10:00PM
 - Exam 4: **12/14**, 7:00PM - 10:00PM
 - Check your calendar and empty your schedule at these times.
- 9 Homeworks for each of 9 chapters.
 - Will take just about **2-3 hours** if you understand the course contents very well.
 - Try to finish as soon as possible soon after you watch the lecture videos.

- Homeworks: total 37%, 4 points for each of the first 8 homeworks and 5 points for the last homework
- Exams: total 63%, $63/3 = 21$ points for each exam
 - You can exclude one exam that you don't want to be graded
- Letter or Pass/Fail
 - You can decide until the date of Exam 2, no extension
 - Minimum requirement for Pass: C- or higher
 - Minimum requirement for C- or higher
 - ▶ Take all the exams, and the homework score ≥ 18
- Cheating
 - Zero tolerance (very serious)
 - Honor code from EE department

- Will announce more details when you take exams
- Earlier experience from the EE209 class

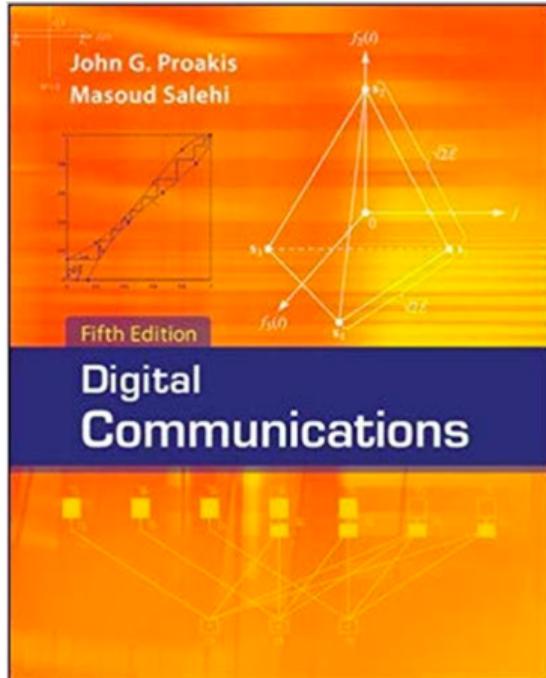


Questions?

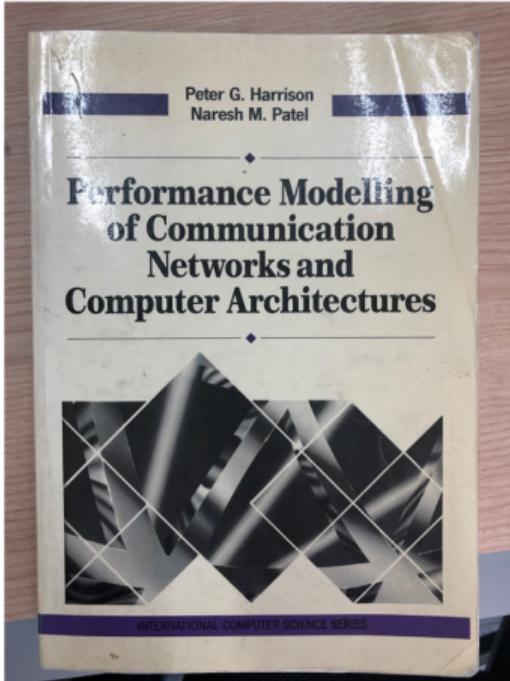
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- Assume that you are a designer of the following engineering systems. Good design?
 - a web server
 - a communication device like mobile phones
 - an AI-based image classifier

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- Assume that you are a designer of the following engineering systems. Good design?
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- From an engineering point of view,
 - System input
 - Algorithms in systems
 - Analysis of systems



Communications	13
1-5 Overview of the Book	16
1-6 Bibliographical Notes and References	16
2 Probability and Stochastic Processes	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

Chapter 1 Essentials of Probability Theory

- 1.1 Sample space, events and probability
- 1.2 Conditional probability
- 1.3 Independence

Exercises

Chapter 2 Random Variables and Distributions

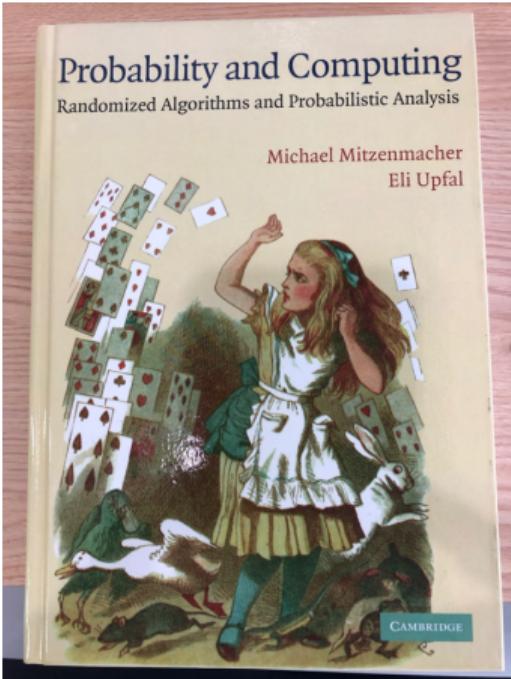
- 2.1 Probability distribution functions
- 2.2 Discrete random variables
- 2.3 Continuous random variables
- 2.4 Joint random variables
- 2.5 Conditional distributions
- 2.6 Independence and sums

Exercises

Chapter 3 Expected Values and Moments

- 3.1 Expectation
- 3.2 Generating functions and transforms
- 3.3 Asymptotic properties

Exercises



Preface

1 Events and Probability

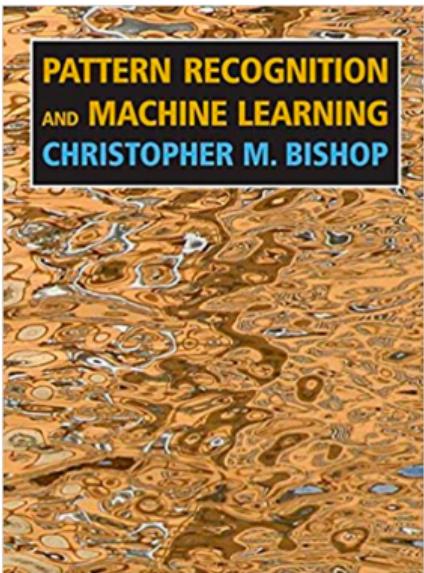
- 1.1 Application: Verifying Polynomial Identities
- 1.2 Axioms of Probability
- 1.3 Application: Verifying Matrix Multiplication
- 1.4 Application: A Randomized Min-Cut Algorithm
- 1.5 Exercises

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



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CONTENTS

2 Probability Distributions	67
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
3 Linear Models for Regression	137
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!

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- We will take this exciting journey from the next lecture!

Questions?

