STAT 321 - Stochastic Signals and Systems

Canvas page – Piazza

Department of Statistics & Department of Electrical and Computer Engineering

Semester: Winter Term 1 - 2020 | Credits: 4

Learning Goals

By the end of the course students are expected to be able to:

- Recognize the existence of randomness and explain its impact;
- Define and calculate probability;
- Define random variables and their basic characterization (e.g., cdf, pdf, pmf, expectation, median, and variance);
- Identify use cases for common probability distributions;
- Define joint probability distribution, conditional distribution, and marginal distribution;
- Recognize the main properties of multivariate Gaussian;
- Define and contrast convergence in probability vs almost sure convergence;
- Distingruish different optimality criteria in Bayesian inference;
- Derive MAP estimator and the corresponding probability of error;
- Derive MMSE estimator and the corresponding error;
- Define hypothesis testing and type I and tyep II error;
- Recognize basic properties of Bernoulli process, Gaussian process, Poisson process, and Markov process.

Teaching Team

Instructors

- Rodolfo Lourenzutti, Assistant Professor of Teaching - Department of Statistics
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  - Office hours: Thursdays @ 2:00pm on Zoom
- Lele Wang, Assistant Professor - Department of Electrical and Computer Engineering
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  - Office hours: Thursdays 10:00 - 11:00 am on Zoom

Teaching Assistants

- Ziao Wang
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Deliverables

Deliverable	Weight	Deadline
lab 1	2%	2020-09-22 @ 23:59
lab 2	2%	2020-09-29 @ 23:59
lab 3	2%	2020-10-06 @ 23:59
lab 4	2%	2020-10-13 @ 23:59
lab 5	2%	2020-10-20 @ 23:59
lab 6	2%	2020-10-27 @ 23:59
Midterm	28%	2020-10-21
lab 7	2%	2020-11-03 @ 23:59
lab 8	2%	2020-11-10 @ 23:59
lab 9	2%	2020-11-17 @ 23:59
lab 10	2%	2020-11-24 @ 23:59
lab 11	2%	2020-12-01 @ 23:59
Final exam	50%	TBD

Class Meetings

Topics covered by week

- Week 1: Basic of probability
- Week 2: Random variables
- Week 3: Random vectors
- Week 4: Multivariate Gaussian
- Week 5: Functions of Random Variables, useful Probability inequalities, probability integral transform theorem
- Week 6: Types of convergence: in probability, almost sure, in distribution
- Week 7: Bayesian inference, maximum a posterior probability (MAP) estimation
- Week 8: Minimum mean square error (MMSE) estimation
- Week 9: Hypothesis testing, classical statistics
- Week 10: Random processes: Bernoulli process, Gaussian process
- Week 11: Random processes: Poisson process
- Week 12: Random processes: Markov process

Resources

In this session, we are going to provide some additional resources in case you want. However, keep in mind that these resources do not map perfectly to the classes' topics. They might not cover some of the material and/or cover additional material.

Open source

- Introduction to probability
  - In fact, you might want to checkout the course website. It can be a useful resource: https://projects.iq.harvard.edu/stat110
- Probability Cheatsheet and another one
- JBstatistics (also on YouTube)
- MIT Open Courseware - Introduction to probability

Academic Integrity

All students are expected to follow UBC's Academic Honesty and Standards policy. We encourage students to work together on assignments and labs, however all of your work must be written in your own words. Students must correctly cite references if you quote or use outside sources in your work. Breach of the academic integrity policy may, at a minimum, result in a grade of 0 on the relevant assessment or may result in more serious consequences.

Please see UBC's Academic Calendar for detailed policies on Academic Misconduct: http://calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,0.

Reach Out for Success

University students often encounter setbacks from time to time that can impact academic performance. Discuss your situation with your instructor or an academic advisor. Learn about how you can plan for success at www.students.ubc.ca. For help addressing mental or physical health concerns, including seeing a UBC counsellor or doctor, visit https://students.ubc.ca/health/wellness-centre.

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here.

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