STAT6183

Introduction to Probability

Session 1, Online-scheduled-In person assessment, Exam centre within Australia 2022

School of Mathematical and Physical Sciences

Contents

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General Information

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Credit points
10

Prerequisites
Admission to MAppStat or GradCertAppStat or GradDipAppStat or MSc or MDataSc

Corequisites
STAT6170 or STAT670

Co-badged status
STAT2173

Unit description
This unit consolidates and expands upon the material on probability introduced in STAT670.
The emphasis is on the understanding of probability concepts and their application. Examples
are taken from areas as diverse as biology, medicine, finance, sport, and the social and
physical sciences. Topics include: the foundations of probability; probability models and their
properties; some commonly used statistical distributions; relationships and association
between variables; distribution of functions of random variables and sample statistics;
approximations including the central limit theorem; and an introduction to the behaviour of
random processes. Simulation is used to demonstrate many of these concepts.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are
available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.

ULO2: Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.

ULO3: Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean

ULO4: Analyse a bivariate probability distribution to find and interpret corresponding covariances, correlations, marginal and conditional probability distributions.

ULO5: Apply Markov Chain (MC) theory to practical problems and tasks.

General Assessment Information

The tests and the exam must be undertaken at the time indicated in the unit guide or on iLearn. Should these activities be missed due to illness or misadventure, students may apply for special consideration.

ASSIGNMENT SUBMISSION: Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.
- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. The assisgnment must be submitted by 5:00 pm on its due date. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

LATE SUBMISSION OF WORK: All assessment tasks must be submitted by the official due date and time. Should these assessments be missed due to illness or misadventure, students should apply for special consideration. In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, a consistent penalty will be applied for the late submission as follows. A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark; 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time (including weekends and/or public holidays), a mark of zero (0) will be given. Timed assessment tasks (e.g. test, examination) do not fall under these rules.

FINAL EXAM POLICY: It is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via ask.mq.edu.au.

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during this supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application.

Assessment Tasks

Name	Weighting	Hurdle	Due
Test 1	15%	No	Week 4
Test 2	15%	No	Week 8
Assignment	20%	No	Week 12
Final Exam	50%	No	University Examination Period

Test 1

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 4**
Weighting: **15%**

50-minute test

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.

Test 2

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 8**
Weighting: **15%**

50-minute test

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.
- Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean

Assignment

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 10 hours
Due: **Week 12**
Weighting: **20%**

Students will be given two weeks to complete the assignment.

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous

random variables including their expected values and variances.

- Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean
- Analyse a bivariate probability distribution to find and interpret corresponding covariances, correlations, marginal and conditional probability distributions.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 2 hours
Due: **University Examination Period**
Weighting: **50%**

Formal invigilated examination testing the learning outcomes of the unit.

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.
- Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean
- Analyse a bivariate probability distribution to find and interpret corresponding covariances, correlations, marginal and conditional probability distributions.
- Apply Markov Chain (MC) theory to practical problems and tasks.

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Technology Used and Required

The unit is delivered by lectures (2 hours per week, starting in Week 1) and SGTAs (1 hour per week, starting in Week 2). All teaching material will be available on iLearn.

SGTA exercises will be available from iLearn prior to the SGTA. Students are expected to have attempted these prior to the SGTA. Solutions will be explained, with emphasis on any area students had trouble with. At the end of the week, these solutions will then be placed on iLearn.

Excel, R and Wolfram Alpha will be used in the unit.

Required and Recommended Texts and/or Materials

There is no required textbook for this unit. Students may benefit from having access to the following background reference for additional reading and problems:

- Wackerly, D. D., Mendenhall, W., Scheaffer, R. L. Mathematical Statistics with Applications (4th,5th, 6th or 7th Editions)

The following books may also be useful background references:

- Ross, S. A First Course in Probability, Pearson (5th, 6th, 7th, 9th or 9th Editions)
- Ward, M. D. and Gundlach, E. (2016) Introduction to Probability, W. H. Freeman and Company
- Kinney, J.J. (1997) Probability - An Introduction with Statistical Applications, John Wiley and Sons
- Scheaffer R.L. (1994) Introduction to Probability and Its Applications, (2nd Edition) Duxbury Press
- Sincich,T., Levine, D.M., Stephan, D. (1999) Practical Statistics by Example using Microsoft Excel

Unit Schedule

Topic	Material Covered
1	Experiments, sample spaces, Probability Rules, Permutations and Combinations.
2	Conditional Probability. Independence, Bayes' Theorem.
3	Random Variables. Probability Functions, Discrete Probability Distributions, Cumulative Distribution functions, Expected value and Variance. Moments.
4	Important Discrete Distributions: Bernoulli, Binomial, Geometric and Poisson.
5	Moment generating functions. Discrete Distributions: Negative Binomial and Hypergeometric.

Topic	Material Covered
6	Introduction to Continuous random variables. Cumulative distribution function.
7	Continuous Distributions: Uniform, Exponential.
8	Normal distribution.
9	Continuous Distributions: Gamma and Beta Distributions. Chebyshev's Theorem.
10	Sampling Distributions.
11	Joint Distributions: Discrete and Continuous cases.
12	Introduction to stochastic processes. Markov Chains.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be

made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing an d maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/ offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.