STAT7830

Statistical Methods in Bioinformatics

Session 1, Special circumstances 2021

Archive (Pre-2022) - Department of Mathematics and Statistics

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Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff
Unit Convenor/Lecturer
Nino Kordzakhia
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see iLearn

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Credit points
10

Prerequisites
Admission to MRes

Corequisites

Co-badged status

Unit description
This unit introduces the statistical and probabilistic concepts that are the basis for the study of bioinformatics. Topics include an introduction to probability and conditional probability, probability distributions, sampling distributions and an introduction to Markov processes. Particular attention is paid to how they relate to specific applications in the field of bioinformatics. A basic understanding of calculus will be an advantage.

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: Communicate the knowledge of fundamentals of Probability and Statistics using specific terminology.

ULO2: Use relevant terminology and describe the distribution functions and characteristics of some discrete and continuous random variables.

ULO3: Evaluate probabilities of events, expected values andvariances of random

variables.

ULO4: Apply statistical and probabilistic modelling approach to genetic data.

ULO5: Apply fundamental principles of statistical data analysis.

General Assessment Information

ASSIGNMENT SUBMISSION: Assignment submission will be online through the iLearn page. Submit assignments online via the appropriate assignment link on the iLearn page.

LATE SUBMISSION OF ASSIGNMENT: All assessment tasks must be submitted by the official due date and time. In the case of late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) including weekends and/or public holidays.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	10%	No	Week 4
Test	30%	No	Week 8
Assignment 2	10%	No	Week 10
Practical Test	50%	No	Week 12 Online

Assignment 1

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 28.5 hours
Due: **Week 4**
Weighting: **10%**

Reinforce and apply skills learned in computer labs through data analysis. The tasks given during computer lab sessions are to be completed within the allocated time and submitted via iLearn.

On successful completion you will be able to:

- Apply fundamental principles of statistical data analysis.

Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 8**
Weighting: **30%**

This is a paper based mid-semester test. Further information will be provided in the iLearn site of

the unit.

On successful completion you will be able to:

- Use relevant terminology and describe the distribution functions and characteristics of some discrete and continuous random variables.
- Evaluate probabilities of events, expected values andvariances of random variables.
- Apply statistical and probabilistic modelling approach to genetic data.

Assignment 2

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 28.5 hours
Due: **Week 10**
Weighting: **10%**

Reinforce and apply skills learned in computer labs through data analysis. The tasks given during computer lab sessions are to be completed within the allocated time and submitted via iLearn.

On successful completion you will be able to:

- Apply fundamental principles of statistical data analysis.

Practical Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **Week 12 Online**
Weighting: **50%**

The practical test is designed to examine data analysis and R output interpretation skills taught in the unit.

On successful completion you will be able to:

- Communicate the knowledge of fundamentals of Probability and Statistics using specific terminology.
- Apply fundamental principles of statistical data analysis.

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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

The Lectures begin in Week 1 online.

The online SGTAs (1-hour per week) begin in Week 2.

The lecture slides will be made available on iLearn before the lecture.

SGTA exercises will be set weekly and will be available on iLearn before each class.

iLearn

https://ilearn.mq.edu.au/login/

Software

The statistical software R will be used. This is a free software environment for statistical computing and graphics and can be downloaded from the website

http://www.r-project.org/

Texts and materials:

There is no required textbook for this unit.

Recommended reference sources:

1. W. P. Krijnen Applied Statistics for Bioinformatics using R, 2009: http://cran.r-project.org/doc/contrib/Krijnen-IntroBioInfStatistics.pdf
2. S. Draghici Statistics and Data Analysis for Microarrays Using R and Bioconductor. Chapman & Hall/CRC Mathematical and Computational Biology, 2nd Edition, 2012
3. P. N. Suravajhala. Your passport to a career in bioinformatics. New Delhi: Springer, 2013
4. W. J. Ewens and G. R. Grant. Statistical Methods in Bioinformatics, an Introduction. Springer, 2000
5. K. Lange. Mathematical and Statistical Methods for Genetic Analysis, Statistics for Biology and Health. Springer, 2002

Unit Schedule

Study Weeks	Lecture Topics	Due
W1	Introduction	

W2	Discrete random variables and their characteristics	
W3 - W5	Hardy-Weinberg Equilibrium (HWE); Departures from HWE; Statistical testing of HWE.	**Week 4** **Assignment 1**
W6	HWE for X-linked loci.	
MID-SESSION BREAK		
W7 - W8	Continuous random variables and their characteristics	**Week 8** **Test**
W10 - W11	Hypothesis testing and its applications	**Week 10** **Assignment 2**
W12	Markov Chains and their applications	**Practical Test**

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
- Grade Appeal Policy
- Complaint Management 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

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.