Advanced statistical and numerical methods for bioinformatics (847G1 and 848G1): Course Document

Aims

The aim of the course is to equip students with a sound grasp of the latest statistical and numerical techniques in bio-informatics.

Objectives

By the end of the course a student will have
1. A thorough knowledge of a range of statistical techniques.
2. An appreciation of the limitations and assumptions of each test.
3. An ability to identify which technique to use for a particular problem.
4. The ability to analyse bioinformatic data using a modern statistical computer package.
5. An appreciation of the difference between statistical and biological significance.
6. An understanding of how new tests can be developed.

Books

The main book for the course is:
Statistical Methods in Bioinformatics: An Introduction. (2001) Ewens,W.J. and Grant,G.R. Springer. ISBN 0-387-95229-2.
Other useful books are
Introductory Statistics with R. (2003) Dalgaard, P. Springer ISBN 0-387-95475-9
Introduction to Mathematical Methods in Bioinformatics. (2004) Isaev,A. Springer ISBN 3-540-21973-0.
Biological Sequence Analysis. (1998) Durbin,R., Eddy,S., Krogh,A. and Mitchison, G. Cambridge University Press. ISBN 0 521 62971 3.
An Introduction to R. (1990) Venables, W.N., Smith,D.M. and the R Development Core Team. Network Theory Ltd. ISBN 0-9541617-4-2

Lectures, workshops and lab classes

The course will be taught using a mixture of lectures, laboratory classes and workshops. There will be three contact hours per week, two of which will be lectures and the third will be either a workshop or a laboratory class.

Syllabus and Course schedule

The course will be taught for 10 weeks in the Spring term. A breakdown of the course content is given below.
Weeks 1-5 Stochastic models in biology and their applications: Poisson processes, birth-death processes, Markov chains, Monte-Carlo Markov chains, including Metropolis-Hastings algorithm and Gibbs sampling,
Weeks 6-10 Advanced and specialist statistical and numerical methods: statistical methods and evolutionary models in phylogeny construction, genetic models, dynamic programming, genetic algorithms.

Assessment

The course will be assessed by a combination of an unseen test at the end of the Spring Term which will count for 60% of the total mark, and two assessed laboratory practicals in weeks 5 and 9 of the Spring Term, each of which will count 20% to the final mark.

Course Lecturer

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Lectures and laboratory classes for the Spring Term 2008

Lectures are on Thursdays (11:00 – 12:00) and Fridays (10:00 – 11:00) in CHI3 – 3R241. Laboratory classes are planned for Fridays (17:00 – 18:00) but we are in the process of moving these to the earlier time of 12:00 – 13:00 on the same day and in the same laboratory JMS – 3B11.