

OVERVIEW

Quantitative modelling of complex systems, which account for the dynamics and variability inherent in any system, is integral to statistics. Major applications in the micro world are via genomics and bioinformatics. Specifically SNP and microarray research, molecular drug discovery and also in the study of plant microstructure, plant science, cell, brain and health systems research. Major applications in the macro world pertain to statistical modelling of global climate, quality of life and education, social and population studies in health, wealth, and health care delivery.

Statistics is continuing to underpin much of financial mathematics, econometrics, internet communications theory, nanotechnology and engineering applications. Detection and monitoring of drugs, the environment and quality of goods rely heavily on statistical inference to give precise, unbiased estimates of efficacy, quality and safety.

Statistics courses taught through our Bachelor of Science and Bachelor of Mathematics degrees have been nationally accredited through the Statistical Society of Australia, Inc. - an honour bestowed on only two other universities in the country.

OBJECTIVES

The statistics research group works in the following areas:

- Study of Distributions
- Process Improvement
- Categorical Data Analysis: correspondence analysis and ordinal data
- Performance Measurement
- Climate change modelling
- Drug discovery
- Mixture and Multilevel methods
- Environmetrics
- Psychometrics
- Statistical Education
- Meta analysis: health and climate studies
- Bayesian Modelling
- Bioinformatics & genomics
- Analytics for industry - pulp and paper, health and plant sciences, air and rail industry
- Biostatistics
- Time Series analysis

RESEARCH SUPPORT

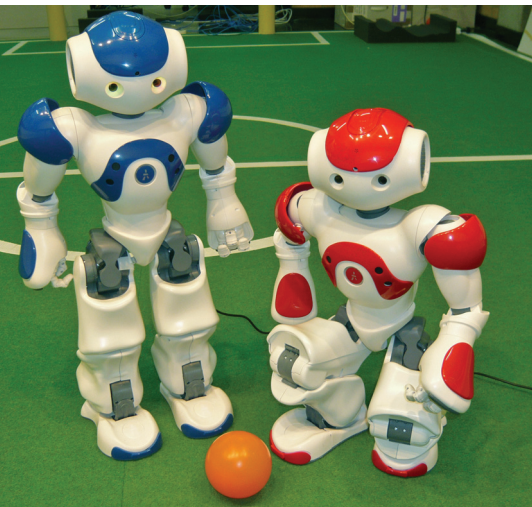
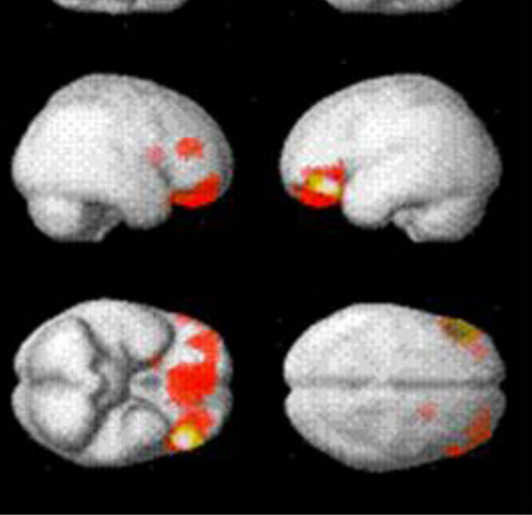
Students in statistics have the opportunity to use the ARCS grid for computationally intensive research.

Students have opportunities to present their work at internal and external conferences.

The archive of the R help mailing list is maintained at Newcastle, giving access to support for R.

EXTERNAL COLLABORATORS

- Biomathematics & Statistics (BIOSS), Edinburgh, Scotland
- Bureau of Meteorology (BoM, Melbourne)
- Connell Wagner
- Departamento de Botanica Plant Phenology and Seed Dispersal Group Universidade Estadual Paulista Claro, Brazil
- Ghent University, Belgium
- Harvard University
- QUT School of Mathematics
- Second University of Naples, Italy
- Stanford University
- Taipei Medical University, Taiwan
- Toulouse University, France
- University of Adelaide
- University of California (Davis), USA
- Univeristy of Cambridge
- University of Canterbury, Christchurch, NZ - Mechanical Engineering and Electrical Engineering
- University of Melbourne
- University of Naples "Federico II", Italy
- University of Sannio, Italy
- Zentrum fur Biomaterial entwicklung, Institut fur Polymerforschung, GKSS, Berlin, Germany



EXAMPLES OF CURRENT PROJECTS

Randomised control trials with non-compliance: Survival Models for Causal Inference - Estimating causal effects in clinical trials complicated by non-compliance to treatment and by missing outcomes. Project aims to develop Bayesian estimators of treatment efficacy in clinical trials for survival data.

Phenological indicators and statistical methods to detect climate change: Mapping multiple climate proxies.

Occupational Health and Safety: modelling high dimensional time series: Develop methods to cluster railway drivers' (RD) transition probabilities to sleep. This research aims to extend our work to benefit end-users by the creation of new work-related fatigue models, and has clear work, health and safety implications.

Methods for drug discovery - application to cataract treatment: High throughput docking of small molecule ligands into high resolution protein structures is standard in computational approaches to drug discovery. Project aims to create new indicators of molecular ligand binding for drug discovery.

Bivariate relationship modelling
New methods that can be used for the modelling of relationships of interdependency between biophysical parameters.

RESEARCH TOPICS

- Smooth Tests of Goodness of Fit
- Modelling using the generalised lambda distribution
- Correspondance analysis
- Integrated Image Detection Algorithms for Robust Object recognition
- Measures of Association
- Tests for equality of variances and covariance matrices from multiple populations
- Bioinformatics
- Development and validation of spectral indices and models to improve estimation of forest foliage cover from Landsat spectral imagery
- Biostatistics
- Integrated Image Detection Algorithms for Robust Object recognition
- Climate change statistics
- Sleep research - modelling sleep/wake/duty profiles in railway drivers and airline pilots
- Statistics in drug discovery
- Wavelet statistics in brain research and agitation-sedation modelling in ICU
- Wood informatics
- Multilevel modelling of quality of life and education
- Multivariate mixture methods to model sleep

RESEARCH OUTCOMES

During 2009-2010, members of the statistics discipline collectively published two books, 14 book chapters, 49 journal articles and 44 papers that appear in national and international conferences.

GROUP MEMBERS

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