Mathematics and Statistics: Part C Projects

1. Please read the notes below and then complete the Project Preferences Form attached.

2. Please return your preferences (on paper or via email) to Jan Boylan, Academic Administrator, Department of Statistics (boylan@stats.ox.ac.uk) **by the deadline of Friday week 10 of Trinity Term (8 July 2011).**

Notes

A dissertation on statistics project is compulsory in Part C, so all intending Part C students must submit a completed Project Preferences Form by Friday week 10 of Trinity Term so that we can allocate projects.

(This applies to all students – unless you have already had confirmation that the personalised project proposal you submitted has been approved.)

When allocating projects, we will do best to match the projects available to the preferences submitted. However, it is extremely unlikely that all students will get their first choice project, so:

- **you must submit your preferences by the deadline**

- **you must rank all of the available projects**
  (unless there are any projects for which you will not have the necessary prerequisites, in which case you must state which prerequisites you will not have).

Mathematics and Statistics: Part C Project Preference Form

Details of the projects can be found at
http://www.stats.ox.ac.uk/current_students/bammath/projects

Name (block capitals)……………………………………………………………………..

Email address…………………………………………………………………………...

College (block capitals) ……………………………………………………………….

Please rank ALL projects from the list, for which you have the course prerequisites. (1=highest,2,3,4,5,…)

Otherwise please state any prerequisites you lack. Failure to do so may reduce your chances of being allocated one of your preferred projects, for fairness reasons – there may well be competition for some projects.

Signature of College Tutor:……………………………………………………………………...
(can be filed subsequently, if necessary)

Signature of the candidate: :……………………………………………………………..……...

RETURN the form to:

The Academic Administrator, Department of Statistics, 1 South Parks Road to arrive no later than **Friday of 10th week of Trinity Term.**

Rank

Projects Available 2011/2012

☐ 1. **Pseudo-Marginal Markov Chain Monte Carlo** — Dr Nicholls
Prerequisite courses: BS3a Applied Probability or Part A Simulation
Type of project: Theoretical/Simulation study
Computing required? Yes.

☐ 2. **Parallel Markov Chain Monte Carlo** — Dr Nicholls
Prerequisite courses: BS3a Applied Probability or Part A Simulation
Type of project: Theoretical/Simulation study
Computing required? Yes.

☐ 3. **The random assignment problem** — Dr Goldschmidt
Prerequisite courses/knowledge: Part A Probability, BS3a Applied Probability
Level of computing required? None required; good level desirable if simulation to be undertaken.

☐ 4. **Approximating Markov chains by differential equations** — Dr Goldschmidt
Prerequisite courses/knowledge: Part A *Probability*, BS3a *Applied Probability*. Part B *Martingales Through Measure Theory* and Part C *Probabilistic Combinatorics* would tie in well with this project but are not essential; a willingness to learn about martingales, however, is essential.

☐ 5**. Particle Markov chain Monte Carlo methods for Stochastic Volatility Models** — Prof Doucet

☐ 6. **Hamiltonian Markov chain Monte Carlo methods for posterior sampling** — Prof Doucet
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☐ 7. **Multi-information and conditional independence** — Dr Massa
Prerequisite courses/knowledge: MS1a *Graphical Models and Inference*

☐ 8. **Prior specification for Bayesian Gaussian graphical models** — Dr Massa
Prerequisite courses/knowledge: MS1a *Graphical Models and Inference. Some background in Bayesian statistics*
Level of computing required? Good knowledge of programming in R, if necessary.

☐ 9. **Isotonic regression for survival data** — Dr Steinsaltz
Prerequisites: Lifetime models, simulation and/or statistical programming would help.
Computing: substantial, not advanced

10. **Mutation-selection models** — Dr Steinsaltz
Prerequisites: BS3a *Applied probability. Both Mathematical Ecology and Biology and Martingales through Measure Theory would be helpful.*

11. **Forecasting Stock Prices using Box-Jenkins Model** — Dr Burke
Type of project: Data analysis
Level of programming skill: Medium

12. **Experience Rating in Non-life insurance** — Dr Winkel
Prerequisites: BS3 *Stochastic Modelling*, BS4 *Actuarial Science*.
The Bayesian part of BS2a *Foundations of Statistical Inference is useful, but not essential.*
Type: Project with possibilities for theoretical study (and simulation, if desired).

13**. Preferential attachment** — Dr Winkel
Prerequisites: BS3a *Applied Probability.* B10a *Martingales through Measure Theory.*
Part A *Graph Theory may be useful.*
Type: Project with possibilities for theoretical study, possibly simulation.

14. **Urn models and applications** — Dr Winkel
Prerequisites: BS3a *Applied Probability.* B10a *Martingales through Measure Theory.*
Type: Project with possibilities for theoretical study, possibly simulation.

15. **Sovereign Disaster Risk Financing** — Mr Clarke and Dr Laws
*Prerequisite courses**:*** BS4 *Actuarial Science will be useful.*
Type of project: Simulation.
Level of programming skill: Moderate
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16. **Sovereign risk pools: Visualising the benefits from Diversification** — Mr Clarke and Dr Laws
Prerequisite courses: Part A *Probability.* BS4 *Actuarial Science will be useful.*
Type of project: Theoretical + Data analysis.
Level of programming skill: Moderate

17. **Investigating the Miklos-Lunter-Holmes (2004) model of insertion-deletion** — Prof Hein
Prerequisites: good knowledge of probability theory.
Good programming abilities.

18. **Assessing the convergence properties of MCMC samplers for statistical alignment** — Prof Hein

19. **Genealogical and Genetic Ancestry for k Loci** — Prof Hein

20. **Methods for inferring population structure, and applications to the HGDP** Dr Myers

Prerequisites: MS2a *Bioinformatics and Computational Biology and* MS2b *Stochastic Models in Mathematical Genetics would be useful background but not essential.* MS1b *Statistical Data Mining might also be helpful.*
Type of project: a mixture of some theoretical work and data analysis.
Some R programming will be required in this project

21. **Genealogical signals of natural selection in human data** Dr Myers

Prerequisites: MS2a *Bioinformatics and Computational Biology and* MS2b *Stochastic Models in Mathematical Genetics would be useful background but not essential.* MS1b *Statistical Data Mining would also be helpful.*
Type of project: a mixture of some theoretical work and data analysis.
Some R programming will be required in this project