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A MESSAGE FROM THE NEW PRESIDENT

by Sylvia Richardson
ISBA President

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It is with great pleasure that I write this first message. The beginning of my presidency had a flying start with my attending the second IMS/ISBA joint meeting (and first MCMski) conference in Bormio (Italy) in January 2005. It was a great gathering with around 180 participants from all over the world. For three days, the most recent developments in Bayesian science were the subject of excellent presentations and lively debates, with many exchanges continuing on the way up the slopes. A full programme with just enough time to fit in a wonderful dinner and cabaret between the poster sessions, so sleep was not a priority! Many thanks to Anto Mira whose constant attention and excellent organisation assured the complete success of

the meeting. Not content with just one meeting in January, a satellite meeting to MCMski, Adap'ski was run by Ch. Andrieu, H. Haario and C.P. Robert and attracted over 70 participants over the two days it was held. This workshop was timely in view of the recent upsurge of interest in adaptive algorithms and was received enthusiastically by all participants. At nearly the same time but on another continent, the ISBA co-sponsored International Workshop/Conference on Bayesian Statistics and its Applications took place at Banaras Hindu University in Varanasi, India. As reported by S.K. Upadhyay in this issue, 225 participants gathered at this meeting, with 60 participants from abroad and a large contingent from the Indian Chapter of ISBA. The ever present Bayesian spirit of working hard and playing hard combined a superb scientific program with feasts of Indian food, cultural shows and guided trips along the fascinating Ganges river. You can read fuller reports of all these meetings in page 11 of the Bulletin.

☛ Cont. in page 2

A MESSAGE FROM THE EDITOR

by J. Andrés Christen
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I most thank all the participants in this very interesting issue of the ISBA Bulletin, and also all AE's for their work. As suggested by our new president, Sylvia, I have included a new section including brief reports of ISBA past events, also prompting all ISBA related events organizers to send their reports for publication in the Bulletin. I hereby wish Sylvia the best as our new president, being sure that ISBA will continue to grow under her leadership.

Please feel free to participate in the Bulletin, by sending me articles or suggestions for columns. Also feel free to suggest topics to discuss or people to invite to write columns, either to the corresponding AE or to me directly. I hope you enjoy reading this issue of the ISBA Bulletin!

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A MESSAGE FROM THE NEW PRESIDENT (CONT.
FROM PAGE 1)

Another great development this year will be the eagerly awaited first issue of Bayesian Analysis. Thanks to the relentless work of Rob Kass and of all the editorial board, the first two issues are scheduled for 2005. Submission rate has been brisk with about 60 submissions so far, and I take this opportunity to encourage ISBA members to submit their work to Bayesian Analysis in order to secure an ever increasing influence for this journal. The electronic manuscript-handling and tracking system has been successfully installed and is now working well, giving substantial efficiency benefits to authors, reviewers and the editorial board. After the necessary set-up costs, the steady state cost of this electronic publishing system should be moderate. Authors will be encouraged to contribute to the running cost of the Journal if they can by paying page charges, the aim being to arrive at a situation where the Journal is close to being self funding. We all look forward to the first issue and extend our warmest thanks to Rob Kass for his enthusiastic editorship.

It has taken me a little time to get up to speed on the diverse duties of a President of such a thriving Society. My priorities for this year are first to finalise Jim Bergers initiative with regards to the setting up of Sections within ISBA. As the Society grows and its membership widens, it is more

opportune than ever to encourage the constitution of a number of active groups under the ISBA umbrella so that their activities are nurtured, publicised and reported to the wider community. Secondly, I am aware of the need to develop a small financial planning structure, centred around the treasurer, so that trends in income and expenditure are regularly monitored and any potential difficulties are anticipated. This is particularly relevant at this moment, as ISBA is increasing its activities, in particular on the publication front. I hope to report on progress on these issues in the next Bulletin.

I would like to give a warm welcome our incoming officers: President Elect Alan Gelfand, Treasurer Bruno Sansó, Program committee chair Kerrie Mengersen and to our new Board Members: Carmen Fernandez, Valen Johnson, Peter Müller and Fernando Quintana. It will be a pleasure to work with you all during this year. I also want to thank Andrés Christen, our new Bulletin editor who agreed to carry on running this flagship for the Society. Finally, I would like to thank all key members of the ISBA Executive for their work over the past year, in particular Past President Jim Berger, Past Treasurer Peter Müller and Past chair of the Program Council José Bernardo. Many thanks also to Board members who are stepping down: Pilar Iglesias, Sonia Petrone, Fabrizio Ruggeri and Robert Wolpert, and to Hedibert Freitas Lopes, past editor of the Bulletin, for his dedicated work.

BAYESIAN ANALYSES OF
FECUNDABILITY

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Introduction

Given the state of understanding of biology and the rapid improvements in technology, it is surprising how little is known about the basics of human reproduction. For example, there is still a great deal of uncertainty about the primary sources of variability among men and women in fecundability, the probability of conception in a menstrual cycle. For a "typical" couple, it is thought that intercourse has a negligible probability of resulting in a conception unless it occurs during a six-day fertile interval ending on the day of ovulation (Wilcox et al., 1995; Dunson et al., 1999). The timing of this fertile in-

terval within the menstrual cycle can vary substantially, because there is a high degree of variability in the length of the follicular phase starting at menses and ending at ovulation (Wilcox et al., 2000).

In order to study factors predictive of biologic fecundability, it is necessary to collect detailed prospective data on timing of intercourse and ovulation in the menstrual cycle for women at risk of pregnancy. Otherwise, it is not possible to account for confounding effects of the timing and frequency of intercourse, factors that can vary substantially for couples having different characteristics (e.g., age, demographics). Unfortunately, few detailed prospective studies have been conducted due to the expensive involved, and the couples agreeing to participate in such studies are not a random sample from the population.

My research in this area has focused on developing improved biologically-based models for fecundability and sterility, incorporating predictors, such as age, environmental exposures, hormones,

basal body temperature (BBT), and cervical mucus characteristics. At the start of the fertile interval there is a rise in estrogen, stimulating increased production of estrogenic cervical mucus, which has biophysical characteristics permitting survival and transport of sperm through the woman’s reproductive tract. Vulvar observations of secretions have been shown to correlate well with mucus at the cervix, so they provide a potentially valuable marker of ovarian functioning and highly fertile days in the cycle.

Data Description

Data are drawn from two studies: (1) the North Carolina Early Pregnancy Study, which enrolled 221 women planning to begin a pregnancy attempt (Wilcox et al., 1995). Women were followed after discontinuing birth control for six months, collecting daily intercourse records and urine samples, which were later assayed for reproductive hormones and to diagnose ovulation and conception; (2) The European Study of Daily Fecundability (Colombo and Masarotto, 2000), which followed 782 woman recruited from Milan, Verona, Lugano, Düsseldorf, Paris, London, and Brussels. Daily records of intercourse, menses, BBT, and mucus (categorized on a 1-4 ordinal scale) were obtained along with conception information.

Let $Y_{ij} = 1$ if a conception occurred in cycle j ($j = 1, \dots, n_i$) from woman i ($i = 1, \dots, n$) and $Y_{ij} = 0$ otherwise. In addition, let $X_{ijk} = 1$ indicate intercourse on day k (indexed relative to the identified ovulation day in cycle i, j) and $X_{ijk} = 0$ otherwise. The most commonly used model for the probability of conception was proposed by Schwartz et al. (1980):

$$\Pr(Y_{ij} = 1 | \mathbf{X}_{ij}) = \omega \left\{ 1 - \prod_{k=1}^K (1 - \lambda_k)^{X_{ijk}} \right\}, \quad (1)$$

where ω is the probability the cycle is viable, and $\boldsymbol{\lambda} = (\lambda_1, \dots, \lambda_K)'$ are day-specific parameters. Hence, the probability of conception given intercourse on only day k is $\omega \lambda_k$, and sperm introduced on different days are assumed to commingle and compete independently to fertilize the ovum.

Model 1 does not accommodate predictors or allow heterogeneity among couples in their fecundability. Because less fertile couples contribute more cycles of data, the resulting day-specific conception probabilities $\{\widehat{\omega \lambda}_k\}$ may be underestimates. In addition, it can be difficult to reliably obtain maximum likelihood estimates due to the structure of the model, and the resulting estimates tend to have large standard errors.

Bayesian Methods and Results

Motivated by poor performance of maximum likelihood analyses under model 1, particularly when extensions are considered to incorporate predictors and allow heterogeneity, we initially developed a Bayesian approach to inference under a generalized model which replaces ω with $\omega_{ij} = (1 - \pi_i)\Phi(\mathbf{u}'_{ij}\boldsymbol{\beta}_i)$, where π_i is the probability that couple i is sterile, $\Phi(\cdot)$ is the standard normal distribution function, \mathbf{u}_{ij} is a vector of covariates, and $\boldsymbol{\beta}_i \sim N(\boldsymbol{\beta}, \boldsymbol{\Omega})$. This model allows for a sterile subpopulation, heterogeneity among fecund couples, and covariates effects. Posterior computation can proceed via a data augmentation Gibbs sampling algorithm (Dunson and Zhou, 2000). Generalizations to accommodate multiple ovulation and pregnancy loss have been proposed in Dunson et al. (2001).

Unless strong prior information is incorporated, there tends to be high variance in the day-specific parameters $\boldsymbol{\lambda}$, making it difficult to allow interactions between timing and predictors. Biologically, it is justified to assume that the day-specific conception probabilities are increasing to an unknown peak and decreasing thereafter. Incorporating this restriction through the prior, I developed a Bayesian approach to distinguish effects on maximal fecundability from effects on the duration of the fertile interval (Dunson, 2001). This method was used to provide evidence of a decrease in fecundability with age, starting in the late 20s for females and in the late 30s for males (Dunson et al., 2002). This finding was highlighted in the press worldwide due to concern among women delaying pregnancy attempts until later in their reproductive years. We later found evidence that the decrease in fecundability with age can lead to many older women being classified as clinically infertile, though most of these women could conceive naturally if attempting conception long enough (Dunson et al., 2004).

In order to select predictors of fecundability from among the potentially-high dimensional set of candidates, allowing for interactions with timing, it became necessary to develop new methods. The variable selection problem is complicated by the need to calculate marginal likelihoods, which involves intractable integrals for the conception probability models under consideration. An important consideration is also computational speed, as the earlier methods were highly computationally intensive, even for a single model. To address these problems and allow for inferences on ordered trends across levels of a categorical predictor, we developed a

general underlying Poisson variables framework. Models in this framework include log-linear and logistic random effects models, as well as models specifically geared towards the conception probability application. Computation can proceed by a stochastic search Gibbs sampling algorithm using conditionally-conjugate mixture priors (Dunson and Stanford, 2005).

We applied this approach to data from the European Fecundability Study in order to assess the relationship between cervical mucus characteristics on the day of intercourse and the probabilities of conception (Bigelow et al, 2004). The results are shown in Figure 1. Interestingly, there was a striking increase in conception probabilities with increasing mucus score, and mucus appeared to be as important a predictor as timing of intercourse. This result has important implications for couples attempting pregnancy and suggests that mucus may provide a value marker of fertility.

Because mucus regulates sperm survival and transport, I hypothesized that sperm from older men may be less capable of fertilization in sub-optimal mucus conditions than sperm from younger men. Assessing this hypothesis by testing for an interaction between male age and the mucus effect using our Bayesian methods applied to the European data base, we found striking evidence (Dunson et al., 2005). On days with optimal mucus conditions, there was no difference between younger and older men, adjusting for woman's age. However, as the mucus conditions worsen, men in their late 30s and early 40s have decreasing fertilization rates relative to younger men.

In ongoing work (joint with Jamie Bigelow), we are developing methods for hierarchical functional data, motivated by the problem of modeling of reproductive hormone trajectories in menstrual cycles. Earlier work considered a Bayesian method for longitudinal categorical observations, motivated by modeling of mucus data (Dunson and Colombo, 2003). We are currently focusing on hierarchical Bayesian adaptive spline methods, incorporating information on timing relative to multiple reference points in the menstrual cycle. A Dirichlet process approach allows women to be clustered into groups based on their hormone profiles.

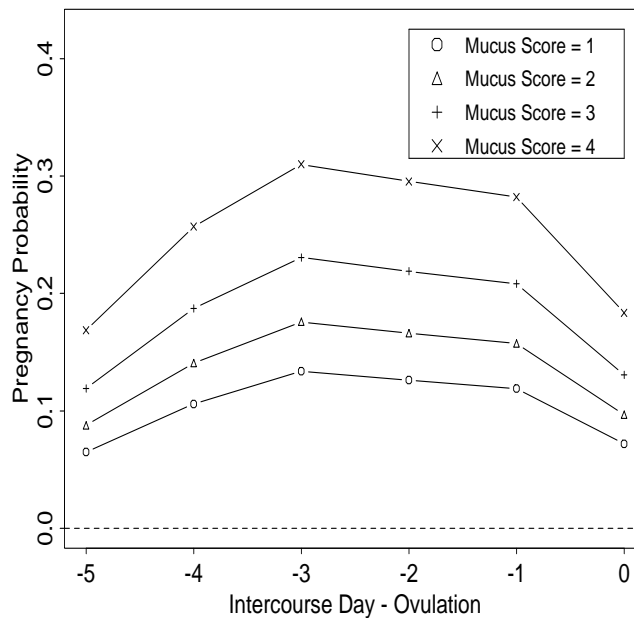
Many important scientific questions arising in the study of human reproduction and endocrinology cannot be adequately addressed using classical statistical methods. As our work, and recent work by Liu et al., 2004 and others, has illustrated, innovative Bayesian methods can be used to obtain important insights in this fascinating area.

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Figure 1: Estimated day-specific probabilities of conception in relation to the mucus score on the day of intercourse (reproduced from Dunson and Stanford, 2005, *Biometrics*, in press)



PRODUCT PARTITION MODELS: AN ANNOTATED BIBLIOGRAPHY

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Let us start this brief discussion by defining the class of *Product Partition Models* (PPMs). Consider data $\mathbf{y} = (y_1, \dots, y_n)$ and a partition $\rho = (S_1, \dots, S_k)$ of the set of indices $\{1, \dots, n\}$. A PPM consists of (at least) two components: (i) the *likelihood* component expressed as

$$p(\mathbf{y}|\rho) = \prod_{j=1}^k p(\mathbf{y}_{S_j}),$$

where $\mathbf{y}_{S_j} = (y_i; i \in S_j)$; and (ii) the *product* proba-

bility model for partitions:

$$p(\rho) \propto \prod_{j=1}^k c(S_j),$$

where for any subset S of the set of indices, $c(S)$ denotes the *cohesion* for that set.

The basic idea of PPMs is the presence of groups (clusters), which share some common feature expressed by $p(\mathbf{y}_{S_j})$, and observations in different groups are independent. A flexible variation of this model, called the *parametric* PPM considers clusters based on the values of certain subject-level parameters θ_i .

1. Hartigan, J. A. (1990). Partition models. *Communications in Statistics, Theory and Methods*, **19**, 2745–2756. This article introduces the class of PPMs, deriving its main properties, and applying them to identification of clusters of observations. In particular, conjugacy

- of PPMs is established and methods are given to compute posterior expectations.
2. Barry, D. and Hartigan, J. A. (1992). Product partition models for change point problems. *The Annals of Statistics*, **20**, 260–279. This article introduces parametric PPMs. Change-points are considered by restricting attention to partitions only in contiguous blocks, i.e. $c(S)$ is nonzero only if all the elements of S are consecutive numbers. Calculations are based on an (exact) algorithm. Additional theoretical properties are established.
 3. Barry, D. and Hartigan, J. A. (1993). A Bayesian Analysis for Change Point Problems. *Journal of the American Statistical Association*, **88**, 309–319. This article considers parametric PPMs with contiguous blocks for change-point identification. Exact ($O(n^3)$ operations) and approximate calculations based on Gibbs sampling are discussed and compared.
 4. Barry, D. and Hartigan, J. A. (1993). *A product partition model for image restoration*, in Morgenthaler, S. (ed.), *New Directions in Statistical Data Analysis and Robustness*, Verlag Basel, pp. 9–23. This article considers a model for image restoration, based on PPMs with a spatial structure. Specifically, they consider the *short boundary model* which involves cohesion functions incorporating a structure of neighbors. A posterior simulation scheme based on Markov chains is proposed. The article also includes a comparison with alternative approaches.
 5. Crowley, E. (1997). Product partition models for normal means. *Journal of the American Statistical Association*, **92**, 192–198. This article applies PPMs to the estimation of normal means with known variance. Evaluation of posterior summaries is based on an MCMC scheme that considers reallocating in turn all objects $1, \dots, n$ to form a new partition.
 6. Crowley, E. (1998). Estimation of clustered parameters. *Journal of Statistical Planning and Inference*, **74**, 273–291. In the context of a model for the estimation of normal means, a Poisson-like asymptotic distribution is derived for the posterior number of sets in the partition. Simulation studies are conducted to assess results for moderate sample sizes.
 7. Loschi, R. and Cruz, F. R. B. (2002). An Analysis of the influence of some prior specifications in the identification of change points via product partition model. *Computational Statistics and Data Analysis*, **39**, 477–501. The problem of identifying changes in normal means and variances is applied to financial data. Sensitivity of change-points to prior specifications is also studied.
 8. Dahl, D. B. (2003). Modal clustering in a univariate class of product partition models. *Technical Report, U. of Wisconsin-Madison*. This article develops an efficient algorithm for locating the posterior mode in a PPM with Dirichlet Process-type of partition structure.
 9. Loschi, R. and Cruz, F. R. B. and Iglesias, P. L. and Arellano-Valle, R. B. (2003). A Gibbs sampling scheme to the product partition model: An application to change point problems. *Computers & Operations Research*, **30**, 463–482. A Gibbs sampling approach is derived for PPMs with contiguous blocks.
 10. Quintana, F. A. and Iglesias, P. L. (2003). Bayesian Clustering and Product Partition Models. *Journal of the Royal Statistical Society Series B*, **65**, 557–574. This article explores the connections between a class of PPMs and Dirichlet Process-based partitioning. Such connections allow adapting posterior simulation algorithms from one context to the other. In a decision-theoretic framework, PPMs are used to select an optimal partition, thus generating a formal clustering algorithm.
 11. Kehagias, A. and Nicolaou, A. and Petridis, V. and Fragkou, P. (2004) Text segmentation by product partition models and dynamic programming, *Mathematical and Computer Modelling*, **39**, 209–217. This article PPMs are used to formulate text segmentation as an optimization problem, which is solved by means of a fast dynamic programming algorithm.
 12. Ranganathan, A. and Dellaer, F. (2004). Dirichlet Process based Bayesian Partition Models for Robot Topological Mapping. *GVU Tech Report GIT-GVU-04-21*. This article presents an application to robotic mapping. Product partition models are used to derive algorithms for computing the posterior distribution over the space of topological maps, solving the correspondence problem in the context of topological mapping.
 13. Loschi, R. and Bastos, L. and Iglesias, P. L. (2004). Identifying volatility clusters using the PPM: A sensitivity analysis. *Computational Economics*. In press. This paper studies

identification of multiple change-points in normal variances with known mean, under PPMs with contiguous blocks and a geometric prior (depending on a hyperparameter p) for lengths of blocks. The focus is on sensitivity of change-points to different prior specifications of p and the normal variances.

14. Quintana, F. A. (2005). A predictive view of Bayesian clustering. *Journal of Statistical Planning and Inference*. In press. This article establishes connections between partition structures of PPMs and *Species Sampling Models*. A clustering algorithm, based on decision-theoretic approach, is applied to outlier detection in normal linear models and to density estimation. Comparisons to other clustering procedures are discussed.
15. Loschi, R. and Cruz, F. R. B. (2005). Extension to the product partition model: computing the probability of a change. *Computational Statistics and Data Analysis*, **48**, 255–268. In the context of change-point analysis for normal means and variances, this article discusses the assessment of the probability that each time point is a change-point.
16. Loschi, R. and Moura, C. R. and Iglesias, P. L. (2005). Bayesian Analysis for Change Points in the Volatility of Latin American Emerging Markets, *Journal of Data Science*, **3**, 101–122. In the context of PPMs for normal variances with known means (assumed to be fixed at 0), change-points are identified for series of returns of four important Latin American stock indices. The discussion includes evaluation of the posterior distribution of the number of change-points and evaluation of the MAP partition for each series.

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STUDENT CORNER

NOT A NEW CHAPTER

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As the new student editor my first task is to provide an introduction. Who am I? I am a Ph.D. student in the fledgling Applied Math and Statistics (AMS) department which is part of the Engineering School of the University of California, at Santa Cruz. I have lived in beautiful Santa Cruz for nine years now, as this is where I did my Bachelor's in Computational Mathematics and Computer Science, and a Master's in Computer Science. In my free time I enjoy cycling, hiking, running, singing, wine tasting, cooking, and though I haven't had much time for it since I started my dissertation, I also play the bass violin.

My second task is to thank our editor Andrés Christian for this opportunity, and Bruno Sansó for the nomination. I would also like to thank Lilla Di Scala and Luca La Roca for the wonderful work they did as editors of the Student corner for the past two years, and for many excellent articles as examples to follow. In their last article, one long year ago, Lilla Di Scalpa wrote about "turning a page". I'd like you to think of my tenure as editor of the Student Corner as "not a new chapter".

In particular, I'd like to continue the tradition of publishing the thesis abstracts of students who have recently completed their Ph.D.'s. Thus I take this opportunity to call out to graduating students (or their advisors) to submit abstracts to the email address above. I would also like to solicit ideas and/or articles from students. If you have an idea

for an article, or want to write one, please send me an email. If you are not a student, but would like to contribute something that you feel should be of particular interest to students, I encourage your submission as well. Some ideas for possible future articles follow.

Probably the most significant issues of interest to students are funding and jobs. I invite (recent) students to share their experiences in search of funding for their Ph.D. research, or accounts of their search for postdocs, tenure track professorships, or positions in industry. A past Student Corner section published an interview along these lines with a researcher from industry. I admit to having a certain personal interest in hearing from other students about their job searches, as I hope to be perusing the market myself in the not too distant future. I suspect that many graduating Ph.D.s toil over how to direct their career. For example, one can look to industry where personal research interests may take a back seat to the company's needs; and then there are postdocs available at universities, government agencies, think tanks, etc. which can be more flexible in terms of personal research interests, but can require a teaching commitment and may have a more competitive funding environment.

A concern that many young investigators face when looking for jobs is one that is sometimes (in jest) referred to as the "two-body problem". The extra constraint of finding work near or with a partner or significant other, particularly an academic partner who perhaps works in a similar field, can be stressful. This sensitive issue has become a hot topic at UC Santa Cruz. Our student-run campus

newspaper recently published a rather one-sided article in response to the compulsory hire of our new chancellor's partner to an expensive administrative position. Students argued that the position was fabricated, saying that there was no previously identified need. This issue is one that many institutions and academic departments are (in some cases) struggling to come to terms with. As our AMS department has noticed, often the best candidates come in pairs. I welcome your thoughts on this subject.

Finally, I'd like to use this section to publish funding opportunities available to students, in the

form of travel grants, fellowships, free or subsidized workshops / summer programs, etc. Please send me email if you know of, or are hosting any such programs or opportunities for students. It seems that many students don't know about the funding available, or think their chances of being funded are low. I have found that the key to getting funding to attend conferences in statistics, particularly ISBA and other Bayesian conferences, is applying. So far as a graduate student I've attended conferences and workshops in Vancouver, Whistler & Banff Canada, Chile, and the Italian Alps. My wallet is none the lighter to show for it.

OX PROGRAMMING AND BAYES

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Introduction

In a recent course on Ox programming the question came up: 'Why do you want to program in the first place?'. A wrong answer to the question was that one would do it for the fun of it; better might run like

To get to the results we need, in a fashion that is controllable, where we are free to implement the newest and greatest, and where we can be 'reasonably' sure of the answers

Clearly, there are multiple ways to get such results, and one of those ways is to program the necessary methods in the Ox programming language. For me, this language has been my programming tool of choice for many years already, and in this review I'll give an overview of its possibilities, advantages over some other languages, and the way it can help in a Bayesian setting as well.

Ox and its possibilities

Ox (Doornik 2001) in itself is a matrix programming language with built-in capabilities of using the object-oriented approach. As a matrix programming language, it can be compared to languages as Gauss, Matlab, S-Plus and R. Compared to these other languages, Ox is a relatively young language, with origins dating back about ten years. It grew within a community of econometricians, at first, and is spreading around the last 5 years among a wider audience.

The language-syntax displays its origins: Ox started as a shell around C, allowing for quick matrix computations, without having to care for the problem of memory management. Later on, the goal of Ox became bigger, to provide a full and flexible environment in which every conceivable computational problem could in principle be implemented, with bigger ease of programming than reverting to C or Fortran, without relinquishing all of the speed advantages of those languages (see also below).

With respect to the ease of programming, Ox reached this goal clearly. The syntax of the language is strict, clear, and displays similarities to C which will help a programmer to make the switch without much of a problem. The object-oriented programming capabilities are implemented as a subset of possibilities in C++, in the sense that there is sufficient flexibility to inherit from existing classes, but without introducing unnecessary complexity in the syntax.

Ox comes with an extensive HTML manual of all available functions, which is a great help for both beginning and more advanced programmers, if only to check the order in which certain functions expect their parameters. Apart from the included help file, there is an active mailing list of Ox-users.

The combination of the clear syntax, the possibility to write object-oriented code, and an active community of users, are helpful in the respect that packages can easily be shared among users. The background of Ox in the econometric research community implies that many statistical and econometrical algorithms are implemented in the language itself, or have been made available by others in the form of convenient plug-in packages, enlarging the possibilities of Ox. For instance, a simple line of code like

```
#include <packages/ssfpack/ssfpack.h>
```


includes code concerning state space models (Koopman, Shephard, and Doornik 1999), allowing for the filtering, simulation, estimation and the like of unobserved component models following the theory by Durbin and Koopman (2001).

Using packages of well-known econometricians, allows you to be reasonably sure of the answers; the clean syntax helps in writing good code which is relatively easy to check for bugs, such that also in that respect the programming you do can be ‘controllable’.

Ox and speed

Even though computers are getting faster, for Bayesians the speed of their programs still is a bottleneck. When I started research on the hedging of currency risk (Bos, Mahieu, and Van Dijk 2000), needing to run through time series with several thousands of observations, for a range of different models, it was the speed advantage of Ox which made me switch to it. Not only is the language itself among the fastest higher level programming languages, the aforementioned SsfPack provides all the Kalman filtering routines for state space (and their special case, ARIMA) models written in C-code. All time-consuming operations of the package are run in C, after which the results are seamlessly passed on to Ox.

This connection between C and Ox came in very handy as well for those models which did not fit exactly in the state space framework: For models like the stochastic volatility or GARCH models, the loops that took most time were easily programmed in C, performing all bookkeeping, input and output in Ox.

And another speed-related advantage: Ox comes in versions for a range of computing environments. The programs for the hedging research were actually written on a Windows desktop, while I ran the programs either on a Sun Solaris server, or on a Linux machine, whichever was available and quicker. This flexibility of using the same codebase on different machines has always been of great convenience to me.

Even without adding in task-specific C-code Ox is a very quick computing engine. Steinhaus (2004) provides a series of comparisons of several mathematical programming environments, in which Ox comes out among the top performers with respect to speed.

MC2Pack: MCMC sampling in Ox

When working with Bayesian sampling algorithms, one quickly finds himself rewriting the same series of bookkeeping routines. Gathering samples, checking convergence, making graphs, even the sampling algorithms themselves are the same for different models. When I was working on the algorithm of Adaptive Polar Sampling (Bauwens, Bos, Van Dijk, and Van Oest 2004), meant to be more robust against multimodal posterior densities than standard algorithms, I needed a better solution for quickly comparing the performance of different models and algorithms. Out of this need evolved the MC2Pack package.

To make the collection of a Bayesian sample of parameters easier, the MC2Pack package, available from <http://www.tinbergen.nl/~cbos/software/mc2pack.html> can be of help. This package asks the user to specify a posterior function in a standard format, and essentially can sample from it using a tiny program of the format of Listing 1.

The listing only gives a first impression of the convenient object-oriented fashion in which a project in Ox can be set up. The present version of the package implements methods as the importance, Metropolis-Hastings, (Griddy) Gibbs and Adaptive Polar sampling algorithms, but it could be expanded for inclusion of further methods relatively easy.

Apart from sampling algorithms, the package also includes the marginal likelihood calculation methods which were compared in Bos (2002). These range from kernel-based methods, the LaPlace approximation, a method based on the harmonic mean or on a prior sample, brute-force numerical integration, and also the method of Chib (1995) to get the marginal likelihood from the output of the Gibbs sampler.

Concluding remarks

Ox is a clean and quick language by itself. Combined with its packages, it can be a convenient solution for writing Bayesian samplers. In previous reviews in the ISBA bulletin, the controversy between writing code in C/Fortran or Matlab/S-Plus seems eternal. The combination of the speed of C and the power of a convenient matrix programming language as Ox can be a perfect alternative.

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Listing 1: Minimal sampling program

```
#include <oxstd.h>
#include <packages/mc2pack/mc2pack.h>

AvgLnPostStack(const vP, const adLnPost, const adDum, const adDum)
{
  // Specification of the posterior density
}

main()
{
  decl mcmc, vMu, mS2, mTheta, vW;

  vMu= ...; mS2= ...; // Initial estimates of location and scale
  mcmc= new MC2Pack();
  mcmc.SetMethod(MC_MH); // or MC_APS, MC_APIS, MC_IS, MC_GG
  mcmc.SetCandidate(MC_CSTUD, {1, 4}); // or a different t(df) or
  // user-provided density
  // Only for clarity: Parameter names can be given
  mcmc.SetParNames({"Air Flow", "Water Temp", "Acid Conc", "Sigma", "k", "Alpha"});
  mcmc.SetSample(10000); // Set sample size
  mcmc.SetPosterior(AvgLnPostStack); // Posterior density
  mcmc.SetOutput("excl/mcstack"); // Output goes here

  // Possibly set location and scale parameters for candidate, and
  // number of observations
  mcmc.SetLocationScale(&vMu, &mS2, iT, FALSE);

  mcmc.Simulate(); // And simulate

  mcmc.GetDraws(&mTheta, &vW);
  mcmc.Marglik(MC_MLKERN, meanr(mTheta)); // Marginal likelihood
  delete mcmc;
}
```

ISBA/SBSS ARCHIVE FOR ABSTRACTS

All authors of statistics papers and speakers giving conference presentations with substantial Bayesian content should consider submitting an abstract of the paper or talk to the ISBA/SBSS Bayesian Abstract Archive. Links to e-prints are encouraged. To submit an abstract, or to search existing abstracts by author, title, or keywords, follow the instructions at the abstract’s web site,

<http://www.isds.duke.edu/isba-sbss/>

BRIEF REPORTS FROM PAST ISBA EVENTS

International Workshop/Conference on Bayesian Statistics and its Applications (IWCBSA), January 6–8, 2005 and Preparatory/Tutorial Bayesian Lectures, January 4–5, 2005.

Organized by Department of Statistics, Banaras Hindu University, Varanasi-221 005, India.

Brief report prepared by S.K. Upadhyay, Convener.

Almost ten years ago when we organized a National Conference on Bayesian Statistics at the floor of Banaras Hindu University, we never thought that we shall go for such a wonderful meeting with the dawn of the Year-2005, an event that hopefully created a history of Bayesian Statistics in our country and subcontinent (<http://www.bhu.ac.in/~iwcbsa/>). We certainly felt excited that our University took up this challenging task once again and that too with an animated worldwide support.

It is now universally recognized that Bayesian Statistics, a rational theory of personal beliefs compounded with the data, tremendously expanded its coverage and scope in the last two to three decades. Today we appear to have occupied remarkable heights in a large and expanding number of areas of applications where we had a despicable position just a few years ago.

Our conference cum workshop was organized with several objectives, the most important being to create an environment where we can see the flow of Bayesian ideas from Bayesians to semi Bayesians or non-Bayesians. To boost up our objectives, we had also planned to hold preparatory/tutorial lectures mainly for the young participants. We tried our level best to design our programme in such a way that we may stare the developments of the subject from a relatively elementary level to its current frontiers. Undoubtedly, we had a solid balance between theory, methods and applications. We are happy to proclaim that we met our intended objectives quite far from what we actually expected.

Our events covered a broad spectrum of topics at the cutting edge. Few of these were Environmental and Spatial Statistics, Survival Analysis, Epidemiology and Biostatistics, Image Analysis, Objective Bayesian Methods, Methods for High or Infinite Dimensional Data, Econometrics, Markov Chain Monte Carlo Methods and their Advancements, Official Statistics and Survey Sampling and Reliability, etc.

The presentations for the entire programme were divided into a number of categories. Our plenary sessions included 09 tutorial Lectures, 03 Key note addresses and 10 special invited talks, covered by eminent Bayesian scientists from different parts of the world. Our plenary speakers both in Conference and tutorials included Ashok K. Bansal, University of Delhi; M.J. Bayarri and Jos Bernardo, University of Valencia, Spain; James O. Berger, Duke University; USA; Dipak K. Dey, University of Connecticut, USA; David Draper, University of California, USA; Edward I. George, University of Pennsylvania, USA; John Geweke, University of Iowa, USA; J.K. Ghosh, Indian Statistical Institute; Malay Ghosh, University of Florida, USA; Prem Goel, Ohio State University, USA; B.K. Kale, University of Poona, Pune; Kanti Mardia, University of Leeds, UK; V.V. Menon, Banaras Hindu University; Anthony O'Hagan, University of Sheffield, UK; Tapas Samanta, Indian Statistical Institute; S.K. Upadhyay, Banaras Hindu University and Arnold Zellner, University of Chicago.

We had around 18 invited sessions, around 15 contributory sessions and 02 poster sessions. We are happy to proclaim that the world wide enthusiasm that we observed was amazing. We had nearly 225 participants which included around 60 participants from abroad. Perhaps for the first time in our country, we had an international Bayesian event in true sense having got representations from countries such as USA, Canada, UK, Spain, Italy, Belgium, Ireland, Japan, New Zealand and Australia besides a long list of participants from our own country. Overall, we had more than 150 presentations by both young and senior scientists covering most of the important aspects of Bayesian ideas including applications.

Our event received a world wide support from scientific communities and organizations. A few among these were International Society for Bayesian Analysis; Indian Chapter of ISBA; Indian Bayesian Society; International Indian Statistical Association; Royal Statistical Society; Atlas Conferences, USA and Institute of Mathematical Statistics, USA. Other Indian organization who supported our venture included Department of Science & Technology, Indian National Science Academy, Council of Scientific & Industrial Research, National Board of Higher Mathematics, All India Council for Technical Education, Indian Council for Medical Research, Central Statistical Organization, etc.

We are thankful to all those who were associated with us in making our venture a grand success.

MCMSki: Second IMS-ISBA joint international meeting, January 12–14, 2005, Bormio, Italy.

Brief report prepared by Anto Mira and Brad Carlin.

The second joint international meeting of the IMS and ISBA was held in Bormio, Italy, site of the 2005 world ski championships, from Wednesday, January 12 to Friday, January 14, 2005 (<http://alien.eco.uninsubria.it/IMS-ISBA-05/>). A central theme of the conference was Markov chain Monte Carlo (MCMC) and related methods and applications in the 15 years since the publication of Gelfand and Smith (1990, JASA), the paper that introduced these methods to mainstream statisticians. Bayesian statisticians have long been known for their love of beachfront conferences in exotic locations, beginning with the longstanding series of Valencia (Spain) meetings and, most recently the first joint IMS/ISBA meeting in Isla Verde, Puerto Rico. However, ski-related conferences in cold-weather locations have been rarer, so no one was really sure if the idea would work. It did: we had hoped to attract 100-150 persons, but in fact closer to 190 registered. Many also attended the prequel “AdapSki” conference on modern adaptive MCMC methods organized by Chris Robert, Heikki Haario, and Christophe Andrieu. The scientific committee, co-chaired by Brad Carlin and Antonietta Mira and including Giovanni Parmigiani, Montserrat Fuentes, Steve Brooks, Paolo Giudici, and Sonia Petrone, assembled a strong and philosophically varied invited program, including sessions on molecular biology, spatial and spatiotemporal methods, bioinformatics/genetics, MCMC algorithms/software, statistical data mining, and modern nonparametrics. Special plenary talks by three distinguished researchers (Alan Gelfand, Persi Diaconis, and Sylvia Richardson) got each of the three conference days off to strong starts. And as often happens, the nighttime contributed poster presentations were among the strongest conference offerings. The conference owed an enormous debt to IMS Executive Director Elyse Gustafson and IMS webmaster Arti Ishwaran, who handled all registration and financial aspects of the conference. The local arrangements committee, chaired by Antonietta Mira and including Clelia Di Serio, Claudia Tarantola, Paolo Giudici, Paolo Tenconi, Igor Pruenster and Antonio Lijoi, organized a small army of motor coaches to bring conferees from Malpensa airport in Milan to the lovely mountain village of Bormio. The conference was “Valencia style”, meaning talks in the morning, an afternoon break (until the ski lifts closed), then two more hours of talks followed by dinner and poster sessions in the main hotel bar. Twenty US young investigators (ten supported by NIH and ten by NSF) received

travel scholarships, while the University of Insubria, the Giunta of the Lombardy Region, and two local banks offered support for approximately 20 Italian students, young researchers and helpers.

Not surprisingly, the academic aspects of the conference were not its only memorable moments. On the slopes, the snow was largely man-made (Bormio had had no new snow since Christmas), but this was more than compensated for by the gorgeous weather: sunny and 40 degrees F at the base (4 Celsius), 20 degrees F (-6 Celsius) and not at all windy at the top. Experienced skiers were all very satisfied, and even beginners like Xiao-Li Meng enjoyed their “magic carpet ride” up the bunny hill. The Tweedie Cup ski race (named for the late Richard Tweedie, the well-known MCMC researcher who had taken part both as main speaker and proud ski racer in previous MCMSki-related conferences) was a popular Thursday afternoon activity, and consisted of roughly 15 female and 30 male skiers. The women’s (and overall) winner was Antonietta Mira, while the men’s race was won by Otto Haario, an experienced ski racer and son of Heikki Haario, who sadly was the conference’s only serious casualty, breaking his leg on the slopes on the very first day. Finally, the conference banquet at the spectacular Grand Hotel Bagni Nuovi ballroom featured great food, great wine, great conversation, and, of course, great music and cabaret-style entertainment provided by many conference participants; see <http://www.biostat.umn.edu/~brad/mcmski/> for some pictures, and <http://probability.ca/jeff/sounds/bormio.lyrics> for lyrics to two of the songs written for the occasion. For those who were not able to attend, the MCMSki band, often known as “Im-sisba” or “The Markov Chain Gang”, will reunite for a few songs at the “Tuesday Informal Dance Party” at this year’s Joint Statistical Meetings at the Minneapolis (Minnesota) Convention Center on Tuesday, August 9, 2005. In summary, MCMSki was an enormous success, and a repeat trip to Bormio is being discussed for January 2007!

Satellite meeting AdapSki, January 9–11, 2005, Organisers: Christophe Andrieu, Heikki Haario and Chris Robert.

Brief report prepared by Chris Robert.

Adap’ski was run as a satellite to the MCMC’ski meeting and attracted over 70 participants over the two days it was held (<http://www.ceremade.dauphine.fr/~xian/Adapski.html>). It took place in the lecture room of the Palace Hotel, except for the introductory survey given by Gareth Roberts on the Sunday night which took place in the Rezia Hotel and was attended well beyond the capacity

of the lecture room! Actually, the original goal of the organisers was to stay under 40 participants, but faced with an higher number of registrations, we decided to leave the audience size open. The rewarding part of this strategy is that, despite alternative attractions on the nearby slopes, the lecture room remained constantly at its upper attendance level over both days. Only very few participants cancelled their trip, including Yves Atchade who was not given leave by his university! Equally sadly, Heikki Haario had a bad fall when testing the ski slopes just before the start of the meeting and he most unfortunately spent the week and yet another one in the nearby hospital to recover from his broken leg. He is still on convalescence at home now and most likely will not remember Bormio as fondly as the rest of us. The whole program is still available at <http://www.ceremade.dauphine.fr/~xian/Adapski.html> along with the abstracts of all the talks. The overall feeling after the meeting is one of sizzling activity in the field of adaptive algorithms, both within and outside MCMC algo-

rithms, both at the theoretical and methodological levels. For instance, we heard that existing ergodic and stochastic optimisation could be used to access to convergence results at a (seemingly!) reasonable difficulty level. We also saw alternative approaches to old problems, from cross entropy methods to sequential Monte Carlo, to generic reversible jump algorithms. The poster session in the Rezia bar was also a tremendous success with over 30 posters, with a high and extended exchange with the participants, well into the night. As organisers, we are quite glad of the intense feeling over both days. We thus hope to reconvene for a similar workshop in a year or two to assess the progress made over the period, and maybe work on an edited volume in connection. Obviously, we need to find a general meeting to hook in and can only hope to obtain even a fraction of the tremendous help provided to us by Anto Mira for this meeting: she was relentless in her support and suggestions, and she is responsible for the impeccable organisation we all enjoyed. Grazie mille, Anto!

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NEWS FROM THE WORLD

NEWS FROM THE WORLD

by Alexandra M. Schmidt
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As this is the first time I am writing this Section, I would like to start by acknowledging Gabriel Huerta's effort to keep this Section and thank him for his very helpful hints on preparing this Section. I also would like to encourage those who are organizing any event around the World, to get in touch with me such that we announce it here.

* denotes an activity either co-sponsored or endorsed by ISBA.

Events

Applied Bayesian Statistics School - Bayesian Approaches to Evidence Synthesis and Decision Modelling in Health Care. June 5th - 9th, 2005. Villa Monastero, Varenna (Lake Como), Italy.

CNR-IMATI (Istituto di Matematica Applicata e Tecnologie Informatiche at Consiglio Nazionale delle Ricerche) and the University of Pavia (DEPMQ), in cooperation with BAYSTAT, are planning to organise every year a School on state-of-the-art Bayesian applications, inviting leading experts in the field. The topic chosen for the 2005 school is Bayesian Approaches to Evidence Synthesis and Decision Modelling in Health Care. The lecturers are Keith R. Abrams, Nicola Cooper, Cosetta Minelli and Alex Sutton (Centre for Biostatistics

and Genetic Epidemiology, University of Leicester, U.K.), Tony Ades and Nicky Welton (MRC Health Services Research Collaboration, University of Bristol, U.K.). The school will explore the use of Bayesian approaches to meta-analysis and generalized evidence synthesis methods, and the integration of these within an economic decision modelling framework in order to facilitate health-care evaluation and health-care decision making. The school will make use of lectures, practical sessions, software demonstrations, informal discussion sessions and presentations of research projects by school participants. For more details visit www.mi.imati.cnr.it/conferences/abs05.html.

* **OBayes5 - The Fifth International Workshop on Objective Bayes Methodology.** June, 5-8, 2005. Branson, Missouri, USA.

Following earlier meetings on objective Bayes methodology (held in Purdue, USA, 1996; Valencia, Spain, 1998; Ixtapa, Mexico, 2000; Aussois, France, 2003) the principal objectives of OBayes5 are to facilitate the exchange of recent research developments in objective Bayes methodology, to provide opportunities for new researchers to shine, and to establish new collaborations and partnerships which will channel efforts into pending problems and open new directions for further study. OBayes5 will also serve to further crystallize objective Bayes methodology as an established area for statistical research. For more details visit <http://>

//www.stat.missouri.edu/~bayes/0bayes5.

Random Graphs and Stochastic Computation, June 13-14, 2005. A SAMSI Workshop, SAMSI, RTP NC, USA.

This SAMSI workshop is a forum for cross-disciplinary communication on hot-topic research in random graphs, graph theory, related random matrix theory, applied statistical modelling with graphical structures and related computational research and methods. The workshop will also aid in defining specific research areas for focus for a future SAMSI research program. See <http://www.samsi.info/200405/hottopics/rgsc.html> for further details and the call for participation.

* **Prolog 2005 Second Workshop on Combining probability and logic special focus on Objective Bayesianism Centre for Philosophy of Natural and Social Science**. July, 6-8th, 2005. London School of Economics, London, UK.

The aim of this workshop is to explore the connections between probability and logic, and in particular to evaluate aspects of the connection forged by objective Bayesianism. The workshop is intended to be interdisciplinary: the themes of the workshop are relevant to mathematicians, logicians, philosophers, computer scientists, psychologists and engineers, for example. Papers on any aspect of combining probability and logic are welcomed. Papers on objective Bayesianism are particularly encouraged. Selected papers will be published in a special issue of the *Journal of Logic, Language and Information*. There will also be a small number of invited speakers, including: Jim Berger (Institute of Statistics and Decision Sciences, Duke University), Phil Dawid (Department of Statistical Science, University College London), John Worrall (Department of Philosophy, Logic and Scientific Method, London School of Economics). For details about deadline submissions, please, visit <http://personal.lse.ac.uk/willia11/prolog2005>.

ISIPTA'05 4th International Symposium on Imprecise Probabilities and Their Applications, July 20-23, 2005. Carnegie Mellon University Pittsburgh, Pennsylvania, USA.

The ISIPTA meetings are one of the primary international forums to present and discuss new results on the theory and applications of imprecise probabilities. Imprecise probability has a wide scope, being a generic term for the many mathematical or statistical models which measure chance or uncertainty without sharp numerical probabilities. These models include belief functions,

Choquet capacities, comparative probability orderings, convex sets of probability measures, fuzzy measures, interval-valued probabilities, possibility measures, plausibility measures, and upper and lower expectations or previsions. Imprecise probability models are needed in inference problems where the relevant information is scarce, vague or conflicting, and in decision problems where preferences may also be incomplete. The members of the program committee and more details about the symposium are listed in the site www.sipta.org/isipta05.html.

* **25th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering**. August 7-12, 2005. San José State University, San José, CA, USA.

The Workshop will be honoring John Parker Burg for his ground-breaking contributions to Maximum Entropy Spectral Estimation, and his prominent role in forming the Edwin T. Jaynes International Center for Bayesian Methods and Maximum Entropy. For over 25 years the Max-Ent workshops have explored the use of Bayesian and Maximum Entropy methods in scientific and engineering applications. All aspects of probabilistic inference such as Techniques, Applications, and Foundations, are of interest. More recently, presentations of techniques involving Markov chain Monte Carlo and Model Selection have been growing. Application areas include, but are not limited to: Astronomy and Astrophysics, Geophysics, Medical Imaging, Source Separation, Particle Physics, Quantum Mechanics, Chemistry, Earth Science, Robotics. Foundational issues involving probability theory and information theory, and inference and inquiry are of keen interest. Abstract Deadlines: 25 February 2005 (non-US residents requiring Visas) and 3 May 2005 (Otherwise). Full Papers Due 1 August 2005. For more details see <http://ic.arc.nasa.gov/projects/maxent2005>.

* **A Conference in Honor of George Judge - The 2nd Conference on Information and Entropy Econometrics: Theory, Method, and Applications**. September 23 - 25, 2005. University of California, USA.

This conference will (i) study and explore Information-Theoretic (IT) solutions for linear and nonlinear estimation and inference problems, (ii) facilitate the exchange of research ideas in that field, (iii) promote collaboration among researchers from different disciplines, and (iv) highlight the major trends in Information and Entropy Econometrics. In particular, the Second IEE Confer-

ence will concentrate on the most recent (theoretical and applied) research in linear and non-linear IT and entropic procedures (Bayesian and non-Bayesian), with emphasis on modeling and measuring information. In addition, the conference will deal with the interpretations and meaning of the solutions to IT estimation and inference (e.g., statistical meaning, complexity and efficiency as well as informational meaning). Both theory and innovative applied papers will be included. Deadline for paper submission: April 30, 2005. For more details visit <http://www.american.edu/cas/econ/faculty/golan/conference2.htm>.

Workshop on Statistics in Genomics and Proteomics. October, 5th-8th, 2005. Hotel Estoril Eden, Monte Estoril, Portugal.

The workshop on Statistics in Genomics and Proteomics is being organized by the Centre of

Statistics and Applications, University of Lisbon (CEAUL), and International Centre of Mathematics (CIM). The workshop will aim to bring together the leading researchers in the areas of statistics in genomics and proteomics, to describe the state of the art and also to present problems that will change the next generation of Biostatistics and Bioinformatics researchers. The workshop will have 7 Keynote speakers and 5 Invited speakers on topics which are at the forefront of research. The main areas of the workshop are: (i) Analysis of Gene Expression Data; (ii) Regulatory Networks; (iii) Statistical Proteomics; (iv) Physical Mapping; (v) Phylogenetics and Evolutionary Genomics. A limited number of contributed presentations will be accepted. Those interested should download, print, complete and mail the registration form which is in the preliminary web page of the workshop <http://wsgp.deio.fc.ul.pt>.



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