THE ISBA BULLETIN

A PARTING MESSAGE FROM THE PRESIDENT

by Ed George
ISBA President
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It has been a profound honor to serve as President of ISBA for 2003. I would like to begin my parting Bulletin message by congratulating and welcoming our new leaders, President Elect Sylvia Richardson, Executive Secretary Deborah Ashby, and Board Members Brad Carlin, Merlise Clyde, John Higdon and David Madigan. And a very special welcome to Heidi Sestrich who, I am delighted to announce, has agreed to be the Administrative Director of ISBA. I would also like to bid a fond farewell to our departing Past President David Draper, Executive Secretary Cindy Christiansen and Board Members Nicky Best, Eduardo Gutierrez-Pena, Tony O'Hagan and Raquel Prado. Your dedication and hard work for ISBA have been most gratefully appreciated by all.

As ISBA's 11th year comes to a close, "We" can all take great pride in how far ISBA has come. We now regularly sponsor, cosponsor and endorse Bayesian meetings around the world. We oversee and award the four major Bayesian prizes, the De-Groot, Lindley, Mitchell and Savage Awards. We produce the Bulletin that keeps Bayesians abreast of current developments. We are in the process of creating Bayesian Analysis, a new flagship online journal to attract and disseminate high impact, cutting edge research developments. And I use "We" because all of this has been a most remarkable joint effort: The Executive Committee, The Board of Directors, The Program Council, The Prize Committees, The Bulletin Editorial Staff, the newly assembled Bayesian Analysis Editorial Staff, the leaders of the local ISBA Chapters in Brazil, Chile, India and South Africa, and the myriad of members who continue to participate in ISBA conference organization and delivery. My deepest thanks and appreciation to you all. I know of no other Society or Association with such a large fraction of active and devoted contributors.

And why is this? I believe it is because we have each seen the stunning potential of Bayesian methods in our own work and experience. We are seeing the continued success and evolution of Bayesian methods in theory and in applications across an ever widening variety of fields. And yet surprisingly, our membership has very diverse views on what even constitutes Bayesian Analysis. Some of us lean towards subjective purism, others towards objective pragmatism. Some of us eschew anything non-Bayesian, while others are eclectic, using Bayesian methods where and when it suits their needs.

But this diversity of views is our strength, especially in our climate of camaraderie and mutual respect. The spirit of inclusiveness that pervades ISBA provides an endless stream of energy for debate and an environment where new ideas can easily rise and flourish. ISBA has become a source of both intellectual stimulation and enormous pleasure. The future of Bayesian Analysis looks brighter than ever, and we can all take great satisfaction in our contributions to nourishing this future through ISBA. We are the champions, and I congratulate you all!

Contents

ISBA 2004
VIÑA DEL MAR, CHILE
MAY, 23-27, 2004

ANNOUNCEMENTS

➤ Scientific Programme

Lectures

Opening Lecture Dani Gamerman, "Dynamic spatial models".

Closing Lecture Xiao-Li Meng, "Sometimes it is possible to quantify ignorance: the case of Single Observation Unbiased Priors (SOUP)".

Social Dinner Talk Jay Kadane, "Bayesian statistics: the unfinished revolution".

Tutorials: Introductory Level

"Bayesian Hierarchical Modeling", David Draper.
"Bayesian Model Choice", Merlise Clyde.
"Bayesian Computation", Peter Mueller.

Tutorials: Advanced Level

"Decision Analysis in E-democracy", Simon French.

"Spatial Statistic", Alan Gelfand and Sudipto Banerjee.

"Stochastic Optimization", Christian Robert.

Debates

Why don't people use genuine prior information in Bayesian applications?

> Speakers: Jim Berger, Phil Dawid, Pilar Iglesias, Tony O'Hagan, Luis Raul Pericchi, Romano Scozzafava
> Chair: Jose-Miguel Bernardo

On Bayesian Exploratory Data Analysis

> Speakers: Susie Bayarri, Alicia Carriquiry, Sid Chib, Hal Stern, Sergio Wechsler, Mike West
> Chair: Ed George

➤ Registration Fees

Registration fees for the ISBA 2004 meeting are listed below

- ISBA members: USD 200
- non-ISBA members: USD 225

- Students members of ISBA: USD 75
- Students non-ISBAmembers: USD 85

Registration fees for non-ISBA members include membership for 2004. After April 15th, 2004, registration fees will increase as follows:

- ISBA members: USD 300
- non-ISBA members: USD 325
- Students members of ISBA: USD 125
- Students non-ISBA members: USD 135

Details on the payment of the registration fees are available on the conference web site.

➤ ISBA Bulletin

Hedibert Lopes (hlopes@gsb.uchicago.edu), Editor of the ISBA Bulletin, is organizing a meeting on May, 24 at lunch time to discuss the Bulletin. He would like to receive comments and suggestions on how to improve the Bulletin.

➤ Deadlines

- JANUARY 31, 2004. early submission of contributed posters

- FEBRUARY 15, 2004. notification of acceptance of early contributed posters

- APRIL 1, 2004. submission of contributed posters

- APRIL 1, 2004. registration of all people presenting or submitting papers for both oral and poster sessions

- APRIL 15, 2004. payment of registration fees at reduced rates

➤ Contacts

For any information please contact the Chairs of the ISBA 2004 Committees:

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Finance: Alicia Carriquiry `alicia@iastate.edu`
Local: Pilar Iglesias `pliz@mat.puc.cl`

ISBA 2004
by Fabrizio Ruggeri
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I am glad to report that our call for sessions and student papers has generated many submissions, more than we expected. We got 34 session proposals and 28 student papers, besides some contributed posters and we are expecting many others! We are now reviewing the submitted abstracts and the work is quite difficult since the papers we got are, in general, very interesting. I wish to thank all those who contributed in organizing sessions and those who accepted to be part of them. We were very pleased for the number and the quality of papers submitted by students. As I mentioned in my comments in the previous issue of the Bulletin, we would like to have as many students as possible. I have to thank ISBA officers (Ed George and Peter Mueller, first of all) and the Chairs of the Finance and Local Committees (Alicia Carriquiry and Pilar Iglesias) since they agreed to financially support more students with respect to what we announced earlier. At this point, we would like to organize 6 student sessions and we can offer the students free lodging, the waiver of the registration fee and the 2004 ISBA membership for free. Students are applying from Europe, United States and South America and one from Australia.

The proposed sessions cover a wide range of topics, with very scarce overlapping. The reading of the submitted abstracts is an interesting experience to learn what is going on in the Bayesian world and I am sure that the same feeling will be shared by the lucky ones who will attend ISBA 2004 in Chile at Viña del Mar, on May 23-27, 2004.

For those of you who do not subscribe to `bayes-news`, we have prepared the list of plenary speakers and the courses and the debates we have organized.

I remind you that the poster sessions are one of the most relevant part of our conferences (for sure, the most lively scientific activity, since I would not count the final act, the "usual" cabaret, as part of the scientific programme ...) Therefore, it is now time to submit papers for the poster sessions! We have decided to have two deadlines for submissions: January 31st (for those willing to get a quick answer, to be used to apply for funds) and April 1st (for all the others).

It is worth mentioning that all contributed papers selected will automatically be considered for the Lindley Prize, awarded for innovative research in Bayesian statistics, whereas selected papers presented at the conference (both oral and poster presentations) will be published by the new electronic ISBA journal, BAYESIAN ANALYSIS, following a review process to be established by the Editorial Board of the journal.

As you can see, we are preparing an exciting programme with the help of the Bayesian fellows worldwide and you can see how it takes shape by looking at the web site: `http://isba.mat.puc.cl`. You can find there details on accommodation, fees (I am sorry but we have to charge you something ...), social events and, shortly, on accepted sessions and student papers.

If you have to decide which conference you do not want to miss in 2004, my suggestion is ...

ISBA 2004
by Pilar Iglesias
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The local organizing committee is pleased to invite the international scientific community to participate in the ISBA 2004 World Meeting on Bayesian Statistics, to be held inViñadel Mar, Chile in May 2004. This meeting is an opportunity to congregate Bayesian statisticians from all over the world, and to disseminate the discipline throughout Latin America. The Scientific Program includes various types of sessions as well as debates on various topics of current interest as well as poster sessions. ISBA is also particularly interested in promoting the participation of young researchers and students.

The social component of the meeting is, as always, very important. To this effect, we are preparing a number of events that help making the most out of the Conference and the natural beauty of Viña del Mar.

For further information about the ISBA 2004 World Meeting, please point your browser to our web page `http://isba.mat.puc.cl`. Some information about the Valparaíso Region follows.

Valparaíso Region

The pacific Ocean's blue silhouettes the charms of two cities, Viña del Mar, Chile's Tourist Capital and Valparaíso, World Heritage Site, Cultural Capital and Legislative Seat.

The intense mixture of history and legends are embodied in Valparaíso's hills, they beckon you to climb its narrow streets and special funicular elevators and admire the beauty of a port , World Heritage Site, both for its architecture and its people.

This is a reason for artists, writers and musicians has been inspiring for its attractive. Pablo Neruda winner of Nobel reward, built charismatic homes in Valparaíso and Isla Negra. Viña del Mar, is know how the city yard, offers countless attractions and entertainment that stand out among the beautiful flower gardens, and historic castles and buildings and show room, where you constantly you can appreciate different activities of culture. Following the coastal road, its white sandy beaches and variety gastronomy offer the promise of memorable outings.

Nearby, the Cordillera Zone, is made up of the *Cordillera de la Costa* (Coast Mountain) and *Cordillera de Los Andes* (Andes Mountains). Beautiful and unique landscapes stand out in this zone, which is ideal for ecotourism fans. The Andes Mountains lay out their eternal snow for enjoying the white sports or the generosity of its hot springs. And the wines give off their intense aromas, offering an unforgettable stroll through their routes while tasting their fine export vintage.

We want you to actively feel, see, taste, listen and live each one of the sensations that our Valparaíso Region offers you. We want you to experience that, from the ocean to the mountains.

Please, receive from LOC, which I preside, the warmest welcome to this land that has a very moving nature and patrimony.

Sincerely, Pilar Iglesias, Chair of the Local organizing Committee.

CHRISTIAN P. ROBERT

by Brunero Liseo
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Christian P. Robert is Professor of Statistics at the CE.RE.MA.DE, Université Paris IX. He is one of the most prominent and active members of the Bayesian community. He is the author of two breakthrough books and many influential papers. I sent questions to Chris by e-mail and here are his responses.

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1. Chris, you graduated in France and
then moved to USA for Ph.D. studies. What
were the most striking differences in the
academic life that you noticed between
France and Cornell?
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Well, I actually did *not* move to the USA for Ph.D. studies, but only *after* my Ph.D. I went first to Purdue University in 1987, before spending one year in Cornell and then moving back to France. I still remember these two years very vividly because I then had the feeling of being part of something very exciting. The most amazing thing, when coming from France (and especially the provincial university I graduated from), was the ever-going debate and movement and discussion about things: people were just excited doing research and exchanging ideas and starting collaborations! The whole idea was simply too exhilarating!!! While, in France, there was much more secrecy and isolation: I was just used to work with one or two older colleagues who were reluctant to even publish technical reports. For fear of the ideas being stolen or replicated or God knows what..!!! (Things have changed, I must say, and collaborations and team work are not frown upon so much anymore.) Another striking thing was the feeling of a community, the sharing of many moments with the rest of the faculty members and of the students. There were lots of parties and dinners which were sort of blurring the distinction between work and the rest, while, in France, the distinction between academic life and private life are fairly strict: no department picnic or Christmas party, no after-seminar dinner either... During my Ph.D., I went once for dinner at my advisor's house and this was quite exceptional as it never happened to my friends. The part taken by Ph.D. students in the life of the department also was quite a new thing for me, because while in France, we were working in a rather strong isolation, sharing non-academic moments with other Ph.D. students but very little in terms of research. Maybe again because of this paranoia about stolen results... Anyway, these two years in the USA were essential for my future career and research: I learned how to share and to listen, to borrow and to communicate, and also how to write papers, to work on several projects at a time, besides more basic skills like LaTeX and C programming. But, overall, I must say I keep from these two years a feeling of permanent fun and excitement.

2. France is certainly a country with a strong mathematical tradition and culture: nonetheless, Bayesian ideas were not so popular (although the recent studies of Broemeling and Broemeling (*Biometrika*, 2003) and Broemeling (ISBA Bulletin, 2002) about E. Lhoste suggest differently). How happened that you made the *Bayesian choice*?

It is true that Bayesian ideas were rather censored at the time I started my Ph.D.: Bayesian Statistics were not taught at all, there were no Bayesian talks during seminars or local conferences and the very few people working on Bayesian Statistics were not to be found in the Math and Stat departments but in Medical schools, Econometric departments and Biometry research centers. Although I was inclined towards Pure Mathematics, the results of the entrance exams in the *Grandes Ecoles* drove me to a Statistics and Economics school, rather than the more prestigious *Ecole Normale Supérieure* that I missed by a few points. (I had not applied to *Ecole Polytechnique* because it was a military school!) So I spent the three years in this school (ENSAE) learning about Statistics, Econometrics and Economics, while pursuing my Pure Mathematics dream by getting a degree by correspondence at Paris 6 University. At the end of these three years, I realized that Statistics were much more interesting (for me) than Pure Math and looked around for both a Ph.D. advisor and a Ph.D. topic. Although I was quite tempted to work with Dominique Picard on Differential Geometry and Statistics, I eventually chose the topic of James-Stein estimators, presumably because the topic was more clearly defined and it had a link with the Econometrics classes I had had at ENSAE and also because the advisor, Jean–Pierre Raoult, seemed much more committed to take me as a Ph.D. student than the other professors I had contacted. I had heard very little of Bayesian Statistics at the time, just 10 or 15 minutes in a Mathematical Statistics class loaded with disparaging comments, but I felt the idea of putting distributions on the parameters quite intriguing and provocative. During my first Ph.D. year, Jean–Pierre Raoult gave me a draft of the book by Mouchart, Florens and Rolin, *Elements of Bayesian Statistics*, stating that this was a much better way of presenting the Bayesian paradigm: I was then quite depressed because I thought it was much too measure-theoretic! But then I read all the papers by Jim Berger, Mary-Ellen Bock, Larry Brown, George Casella, Anirban

Das Gupta, George Strawderman, and great others people I was to meet later, on the links between James-Stein and Bayes, and found something much more to my taste. This is when I decided to spend some time in the USA to see the other side of it. So, very logically, Econometrics drove me to work on James-Stein and James-Stein drove me to the Bayesian choice!

3. Do you still consider the decisionist step necessary to be a real Bayesian? I am experiencing the difficulty of teaching Bayes statistics having a small amount of time for introducing Bayesian ideas. Usually one cannot cover all the story. What is your opinion on that? Do you consider possible to teach Bayes as if it was just *another brick* to put *on the likelihood wall*?

I face the same difficulty when teaching, because the students are less and less exposed to the bases of Decision Theory. At some point every Statistics student would have read both of Lehmann's books, or some equivalent in French. With such a basis and a very good understanding of losses, admissibility and such, it was easy to step on Wald's theorem and the optimality of Bayes procedures. Nowadays, if you want to use this rational presentation, you first need to spend half of the course on Decision Theory, because the students are unaware of this approach to Statistics. Given that I have the chance to teach the same students four years in a row, starting with their first Statistics class, I am actually privileged and can start presenting the decisional bases of inference from the start. But in other programs, they already have had three years of Statistics and no Decision Theory (and no Bayes either!) so I usually teach Bayesian Statistics through case studies with either known or unknown models, to show the students how much wider is the Bayesian approach. But I am not sure the students I am dealing with fully appreciate the distinction between likelihood and moment (and Bayesian) estimators!

4. You have been (and you still are) one of the first Bayesians to rightly consider the enormous impact of MCMC methods in the development (even methodological) of statistics. Can you describe us your personal viewpoint on what is going to be the future road of simulation based inference?

Actually, I was privileged to attend one of Adrian Smith's first lectures on the Gibbs sampler, in June 1989 in Sherbrooke (Québec, Canada), and this was quite a shock. I can still visualize his talk and the way he told us that with a few lines of code you could program the Gibbs sampler! To realize that "all" you had to do was to produce a Markov chain to approximate any integral related to the stationary distribution...wow! Now, MCMC is part of the Bayesian toolbox and is taught even in elementary Bayesian classes. There is certainly less fundamental research going on in this area, even though some recent developments about adaptive MCMC algorithms seem quite exciting (to me!). As the Bayesian community is growing, we see other approaches to this computational problem, with various degrees of approximation. Take for instance the machine learning community and the variational approximations: they are quite interesting alternatives, even though they seem to depend highly on the problem at hand. I am also quite eager to see how the particle system (or sequential Monte Carlo) community is going to evolve, because they bring somehow more efficient solutions to the problems tackled by MCMC algorithms. Further in the future, I do not want to make predictions: certainly, improved computer technology will allow for more exhaustive methodologies to be used, but, at the same time, the complexity of the problems considered will increase in parallel. And I am not sure computing is the number one problem when handling fuzzier problems like those in very large dimensions: modeling comes first.

5. You are a mixture *expert*. Please use your favorite MCMC methods to estimate the number of components (and the weights of them) which are going to compose the profile of the next generation's statistician.

This is a hard one, too. I am actually very afraid that my MCMC sampler could diverge to infinity for this estimation or, worse, to 0. There somehow is a danger of assimilation of Statistics by the users, with a tiny weeny core of statisticians resisting to the lure of applications and joining probabilists. It is somehow the (negative) consequences of the success of Statistics in that, more and more, we find people using (well or not) Statistics with main theme from another domain. As they grow more numerous and more expert, they will have a natural tendency to develop their own approach and sever the connection with statisticians. With the obvious danger of producing bogus Statistics...

6. What kind of applications do you like most? Were you ever involved in a really exciting one?

Applications usually come to me, rather than the reverse, with a frequency of about once a year. I started getting interested in mixtures because my wife was working on her Master thesis in Ottawa and was analyzing radiographs with bimodal features. Since then I collaborated to applications in astronomy, drug testing, genetics, econometrics and engineering. I really like the astronomy applications because astronomers, being quite close to mathematicians, lay things very neatly and it is thus much easier to process their problems. Right now, I am involved in the analysis of a survey of treatments of kids with a rare disease called Evans syndrome and this is both exciting and challenging at once.

7. I have always seen you very active during the conferences, doing trekking, skiing and many other things. Tell us about how do you like to spend your time, when you are not dealing with statistics or ....kids!

My kids indeed take a lot of my free time, besides Statistics, but they also bring a lot to my life! As you noticed, I do try to take advantage of every opportunity to go mountaineering in France or abroad, and I must say this creates sort of a bias in my conference planning. Skiing is very recent and I only started it because I happened to organize a Winter Research Kitchen in a ski resort. Besides these too rare trips to the mountains, I do a lot of running in the Summer, training for a ritual half-marathon in the Fall. (Responsability for getting me started into that is shared between George Casella and Peter Green.) And I also like reading a lot, my eclectic taste being somehow reflected in the quotes used in my books.

8. You organized the last "'Objective Bayes" Conference. Do you really believe that this sort of foundational compromise can be successful for the future of our discipline?

This is not clear to me, but I found that there was renewed interest for Bayesian Statistics in some communities that I first considered as "too" mathematical. The conference in Aussois was, besides a reunion of hard-core objective Bayesians!, an attempt to bring these communities closer to mainstream Bayesian Statistics. I am not sure the meeting was a success in this respect! At another level, there always is a need for deeper foundations and, if we cannot keep the link with Decision Theory, I feel that asymptotic, minimax and other frequentist-Bayes arguments may help. So for me this is not a "compromise". Frequentist validation may be a necessary counter-power to the uncontrolled expansion in the use of data-dependent and other *ad hoc* priors.

9. Is there any other chapter you would like to add to your *Bayesian Choice*?

Noel Cressie once told me I should add one chapter on spatial Statistics... In fact, the book would need a sequel containing applications to many fields (including spatial Statistics, of course). Now, I would have much more trouble writing this sequel than the *Bayesian Choice* and so I do not think I ever will. A particular application that could (maybe!) justify a new chapter would be a thorough processing of generalized linear models, that would come as an application of both MCMC and hierarchical models chapters. I would also like to find a radically new way of presenting and handling the testing chapter, as I think the way it is presented in the current version is not the most pedagogical.

10. What is and what should be, in your opinion, the role of European statistician within ISBA? Are you in favor of a kind of European chapter of the society?

This is quite an astonishing question, as I was thinking about a European structure subsuming our national societes this very morning, while running! I am uncertain whether or not chapters and such societal structures can help to improve the visibility of Bayesians and their networking, but there is a lot to be said about EU programs like the TMR (Travel and Mobility of Researchers) program that contributed a lot to the advances of MCMC and to the creation of a closely linked community around MCMC. In some European countries, there is not enough of a tradition of moving around and we should take advantage of every opportunity to get young Ph.D.'s for a year or two in another center abroad. Student traveling programs should also be used to start a sort of European (Bayesian) Ph.D. program, where students would move from one university to another to get his/her degree and a much better training in Bayesian Statistics. Last week I attended a European Young Statistician meeting in Switzerland (as the old guy!) and I found quite exceptional the reunion of all these young statisticians with so diverse experiences and visions of what Statistics is and should be. If we could share these visions on a broader scale this would help the field dramatically. Of course, I did not really answer the question, since I rather addressed the problem of European statisticians as a whole. But, since the 21st Century will be Bayesian...

Thanks to Chris for his stimulating and informative answers.

SUGGESTIONS

PLEASE, FEEL COMPLETELY FREE TO SEND US SUGGESTIONS THAT MIGHT IMPROVE THE QUALITY OF THE BULLETIN

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Wavelet-Based Nonparametric Modeling of Hierarchical Functions in Colon Carcinogenesis

by Marina Vannucci

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The September issue of the *Journal of the American Statistical Association* features the Bayesian work of Morris, Vannucci, Brown and Carroll, *Wavelet-Based Nonparametric Modeling of Hierarchical Functions in Colon Carcinogenesis*, as the Applications and Case Studies Invited Paper for 2003. This work has also been selected as the winner of the 2003 Mitchell Prize, awarded annually in recognition of an outstanding paper that describes how a Bayesian analysis has solved an important applied problem.

Most of the published work in wavelet nonparametric regression is limited to the single curve setting. In their work, Morris, Vannucci, Brown and Carroll extend wavelet regression to the framework of nested functional data. Their Bayesian method leads to adaptively regularized estimates and posterior credible intervals for the mean function and random effects functions, as well as the variance components of the model. The approach first applies a discrete wavelet transform (DWT) to each observed curve to obtain the corresponding wavelet coefficients. This step results in the projection of the original curves into a transformed domain, where modeling can be done in a more parsimonious way. A Bayesian model is then fit to each wavelet coefficient across curves. The inverse DWT is finally applied to transform the obtained estimates back to the data domain. The method is particularly suitable to modeling hierarchical spatially heterogeneous functional data that are characterized by local features, such as peaks.

The work was motivated by a case study investigating the effect of diet on O^6-methylguanine-DNA-methyltransferase (*MGMT*), an important biomarker in early colon carcinogenesis that measures the amount of repair enzyme. Dietary factors, such as the amount and type of fat and fiber, have been shown to be related to the risk of colon cancer. Data from animal experiments are often collected to investigate the biological mechanisms behind carcinogenesis.

In the specific case study analyzed by Morris, Vannucci, Brown and Carroll two types of dietary fat (fish oil or corn oil) are investigated as potentially important factors that affect the initiation stage of carcinogenesis, i.e. the first few hours after the carcinogen exposure. In the experiment 30 rats were fed one of the 2 diets for 14 days, exposed to a carcinogen, then sacrificed at one of 5 times after exposure (0, 3, 6, 9, or 12 hours). Rat's colons were removed and dissected, and measurements of various biomarkers, including MGMT, were obtained. Each biomarker was measured on a set of 25 crypts in the distal and proximal regions of each rat's colon. Crypts are fingerlike structures that extend into the colon wall. The procedure yielded observed curves for each crypt consisting of the biomarker quantification as a function of relative cell position within the crypt, the position being related to cell age and stage in the cell cycle. Due to the image processing used to quantify the measurements, these functions may be very irregular, with spikes presumably corresponding to regions of the crypt with high biomarker levels.

The primary goal of the study was to determine whether diet has an effect on MGMT levels, and whether this effect depends on time and/or relative depth within the crypt. Another goal was to assess the relative variability between crypts and between rats.

In their work, Morris, Vannucci, Brown and Carroll apply their hierarchical model to the functional data from this colon carcinogenesis study and fit the model using an MCMC procedure to obtain posterior samples from the functions at each hierarchical level and the variance components. The function estimates at all levels are adaptively regularized using a multiple shrinkage prior imposed at the top level of the hierarchy. The treatment level functions are directly regularized by this shrinkage, while the functions at the lower levels of the hierarchy are subject to some regularization induced by the higher levels, as modulated by the variance components. The authors provide guidelines for selecting these regularization parameters, together with empirical Bayes estimates, introduced during the rejoinder to the discussion.

Results from the analyses of the case study reveal that there is more MGMT expressed at the lumenal surface of the crypt, and suggest a diet difference in the MGMT expression at this location 12 hours after exposure to the carcinogen. Also, the multiresolution wavelet analysis highlights features present in the crypt-level profiles that may correspond to individual cells, suggesting the hypothesis that MGMT operates on a largely cell-by-cell basis.

Reference:

MORRIS, J.S., VANNUCCI, M., BROWN, P.J. and CARROLL, R.J. (2003). Wavelet-Based Non- parametric Modeling of Hierarchical Functions in Colon Carcinogenesis (with discussion). *Journal of the American Statistical Association*, **98**, 573–597.

COVARIANCE ESTIMATION

by Merrill W. Liechty
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Any collection of multivariate data has a covariance matrix to be estimated. This is not always straight forward due to several complex characteristics of the covariance matrix that have traditionally been inhibitive. With increased computing power available today however, many of these concerns are no longer restrictive. At the heart of covariance estimation are the issues of interpretation and prior elicitation, the (potentially) restrictively large size of the matrix, and finally the space of the positive definite matrix. It is important to have models that take into account these issues and allow the researcher to accurately model the correlation structure. Departures from standard MLE and inverse-Wishart prior models have recently become popular.

- Aguilar, O. & West, M. (2000). Bayesian dynamic factor models and portfolio allocation. *Journal of Business and Economic Statistics.* **18**, 338–57.

  The authors propose Bayesian factor models which are natural candidates for correlation estimation. Factor models effectively reduce the dimensionality of the covariance matrix.

- Barnard, J., McCulloch, R. & Meng, X. (2000). Modeling covariance matrices in terms of standard deviations and correlations, with applications to shrinkage. *Statistica Sinica.* **10**, 1281–1311.

  The authors use a separation strategy for modeling $\Sigma = SRS$ by assuming independent priors for the standard deviations S and the correlation matrix R. They propose two alternative prior models for R. One is the marginally uniform prior, where marginally each correlation can be uniform over $[-1, 1]$. The other is the jointly uniform prior, where the matrix R is assumed to be *a priori* uniformly distributed over all possible correlation matrices.

- Bernardo, J. M. & Smith, A. F. M. (1994). *Bayesian Theory.* New York: John Wiley & Sons, Inc.

  The most commonly used prior model is the conjugate inverse-Wishart. It allows closed form posterior inference, and efficient implementation of Gibbs sampling schemes for more complex models with additional parameters beyond the unknown covariance matrix. However, this prior model has the drawback that there is a single degree of freedom parameter, which is the only "tuning parameter" available to express uncertainty.

- Bollerslev, T. (1986). Generalized autoregressive conditional heteroscedasticity. *Journal of Econometrics.* **31**, 307–27.

  The author extends the ARCH model to the GARCH model by including lagged values of the variance itself in the variance equation thereby providing a more flexible model form.

- Bollerslev, T., Engle, R. F. & Wooldridge, M. (1988). A capital asset pricing model with time varying covariances. *Political Economy.* **96**, 116–31.

  A multivariate version of the GARCH model is presented by the authors. The high dimensional nature of the covariance matrix complicates modeling.

- Bollerslev, T. (1990). Modelling the coherence in short-run nominal exchange rates: A multivariate generalized ARCH approach. *Review of Economics and Statistics.* **72**, 498–505.

  The author adapts the GARCH framework for multivariate models by using a time varying conditional covariance matrix with time invariant conditional correlations.

- Chib, S. & Greenberg, E.(1998). Analysis of multivariate probit models. *Biometrika.* **85**, 347–61.

  The authors discuss the constraint to positive definiteness and the typically high dimensional nature of the parameter vector for the covariance matrix.

- Daniels, M. J.(1999). A prior for the variance in hierarchical models. *Canadian Journal of Statistics.* **27**, 567–78.

  The author proposes a uniform shrinkage prior for the covariance matrix.

- Daniels, M. J. & Kass, R. E. (1999). Nonconjugate Bayesian estimation of covariance matrices and its use in hierarchical models. JASA. **94**, 1254–63.

  The authors discuss three alternative hierarchical priors. The first is a hierarchical extension of the inverse-Wishart prior. In the second they assume a normal prior for a transformation of the correlation coefficients. The third model uses an eigenvalue/eigenvector parameterization, with the orthogonal eigenvector matrix parameterized in terms of the Givens angles.

- Daniels, M. J. & Kass, R. E. (2001). Shrinkage estimators for covariance matrices. *Biometrics.* **57**, 1174–84.

  The authors use a Fisher z transformation of the correlations.

- Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica.* **50**, 987–1008.

  The author introduces ARCH (autoregressive conditional heteroskedasticity) models, which have achieved a considerable following in the econometrics and finance literature.

- Karolyi, G. A. (1993). A Bayesian approach to modeling stock return volatility for option valuation. *Journal of Financial and Quantitative Analysis.* **28**, 579–94.

  The author uses Bayesian methods to estimate the variance of individual stock returns based on stocks grouped *a priori* according to size, financial leverage, and trading volume.

- Leonard, T. & Hsu, J. S. (1992). Bayesian inference for a covariance matrix. *Annals of Statistics.* **20**, 1669–96.

  The author introduces the log matrix prior by using a logarithmic transformation of the eigenvalue/eigenvector decomposition of Σ and allows for hierarchical shrinkage to be done with the eigenvalues.

- Liechty, J. C., Liechty, M. W., & Müller, P. (2004). Bayesian Correlation Estimation. *Biometrika.* **91.** to appear.

  The authors put mixture priors on the correlations allowing the correlations or the variables to group in natural ways. They deal with problems that arise from the truncation of priors caused by the positive definite constraint.

- Lin, S. P. & Perlman, M. D. (1985). An improved procedure for the estimation of a correlation matrix. In *Statistical Theory and Data Analysis*, Ed. K. Matusita, pp. 369–79. North Holland: Elsvier.

  The original frequentist work using a version of the James-Stein estimator to model the off diagonal elements of the correlation matrix.

- West, M. (2003). Bayesian factor regression models in the "large p, small n" paradigm. In *Bayesian Statistics 7.* Eds. J.O. Bernardo et al., pp. 723-32, Oxford.

  The author proposes Bayesian factor models which are natural candidates for correlation estimation.

- Wong, F., Carter, C. K. & Kohn, R. (2003). Efficient estimation of covariance selection models. *Biometrika.* **90.** pp. 809-830.

  The authors propose a prior probability model on the precision matrix ($P = \Sigma^{-1}$) that focuses on the sparseness of the precision matrix, and is geared towards graphical models and partial correlations. They interpret zeros in the partial correlation matrix in the graphical models context as meaning conditional independence.

- Yang, R. & Berger, J. O. (1994). Estimation of a covariance matrix using the reference prior. *Annals of Statistics.* **22**, 1195–211.

  The authors propose a reference prior for the covariance matrix that is inversely proportional to the product of differences in ordered eigenvalues of the covariance matrix Σ.

SURVEY ON BAYESIAN PAPERS

by Lilla Di Scala and Luca La Rocca
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In this issue, we report on the results of the "naive" survey which we had launched in a past issue of the Bulletin. The question we put forward was

"Which groundbreaking/essential papers do you believe that a graduate student with a serious interest in Bayesian statistics should not miss reading?"

In particular, let us stress that the results represent the opinions of both those who replied to our call and those who were contacted directly via email, as part of a "hand-made" list of Bayesians. Unfortunately, we did not receive enough replies to set up a "decent" statistical analysis of the results. We would be grateful if someone would like to point out to us the reasons why our question did not provoke a wider response. However, we believe that truly interesting suggestions came up and we take this opportunity to thank all of those who participated and gave up some of their time to formulate an annotated list of their all-time favorites. Comments, additions, and constructive complaints are more than welcome, as the list hereunder is by no means complete. Only papers have been taken into account: no good books and no links to interesting Web pages have been considered, even if some readers suggested them directly. In fact, we deemed better to stick to our original idea, which was for you all to help PhD students find their course in the vast ocean of research papers.

The below references are to the first appearance of a paper and they are kept short due to space restrictions. Some people mentioned their own work ("the sum of many subjective choices will make a sensible representative list"), some other people preferred old and well-established papers ("only historical perspective can tell you if a paper is indeed essential"). We report ALL mentioned papers, old and new, by author, in alphabetical order. Top scoring papers are Lindley and Smith (1972), Gelfand and Smith (1990) and de Finetti (1937). Let us also mention repeated votes for Berger (2000) and Tierney (1994). All other papers were suggested only once, which makes for a longer list of interesting papers: enjoy!

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Berger, J. O. (2003) "Could Fisher, Jeffreys and Neyman have agreed upon testing?". Statistical Science, 18, pp. 1-32.

Berger, J. O. and Bernardo, J. M. (1992) "On the development of reference priors". In Bayesian Statistics 4 (J. M. Bernardo et al., eds.), pp. 61-77, Oxford University Press.

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Bernardo J. M (1979) "Reference posterior distributions for Bayesian inference". Journal of the Royal Statistical Society, Series B, 41, pp. 113-147.

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Imbens, G. and Rubin, D. (1997) "Bayesian Inference for causal effects in randomized experiments with noncompliance". The Annals of Statistics, 25, pp. 305-327.

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BAYESIAN ANALYSIS OF SOFTWARE COST ESTIMATING MODEL: COCOMO II

by Sunita Chulani
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Software cost estimation has become an increasingly important field due to the pervasive role of software in today's world. In spite of the existence of about a dozen software estimation models, the field continues to remain not-too-well-understood, causing growing concerns in the software measurement/engineering community. This article describes the use of the Bayesian methodology on a well-known non-proprietary software cost model: COCOMO II. Lets say you have two software cost estimation models:

1. A data-determined model, Model D that has all its parameters calibrated to the real software project data. Since software project data is inevitably collected with imprecise definitions of what is included in the product, in the process, and in the workforce, some of the parameters calibrated to the noisy data are counter intuitive i.e. do not agree with expert judgment.

2. An expert judgment based model, Model E. It has the same parametric form and parameters as Model D, but it is calibrated using expert consensus.

Mathematically, Model D will always have a better fit to project data than Model E. But, many experts in the field of software estimation strongly believe that Model E captures software processes and phenomena better than Model D, and is a better choice.

Whereas, to justify the model output to management (for example, to justify the cost estimate for project management or for bidding on a competitive proposal), Model D is preferred. Lets say, you have a new project to estimate. Model D estimates it will take 200 person-months (PM) to complete and Model E estimates an effort of 100 PM. Which model's output should you believe?

Should you present the average estimate of 150 PM? Is the average justifiable? A preferred approach is one that balances the results of Model D and Model E, such that it favors the experts for parameters where they are in strong agreement and favors the data fit for parameters where the data is strong and the experts disagree i.e. a mathematical technique for creating a Model B (Balanced or Bayesian). In the COCOMO II version of the Bayesian approach, the Model E parameter values and their variances are taken as the a priori knowledge about the parameter values. The Model D parameter values and their variances are then taken as new information, which can be used to determine an a posteriori update of the parameter values. The Bayesian approach produces a weighted average of the Model D and E values, which gives higher weights to parameter values with smaller variances. A tool based on Model B can be obtained from the Center for Software Engineering at University of Southern California's website: `http://sunset.usc.edu/research/COCOMOII`.

More details on the Bayesian calibrated COCOMO II can be obtained in Boehm et al's Prentice Hall book, "Software Cost Estimation with COCOMO II", ISBN 0-13-026692-2 and in Chulani's Ph.D. dissertation, "Bayesian Analysis of Software Cost and Quality Models", `http://sunset.usc.edu/publications`.

NEWS FROM THE WORLD

by Gabriel Huerta

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✱ *denotes an ISBA activity*

➤ Events

One day workshop on Bioinformatics and a Bayesian afternoon *December 4-5, 2003, Guanajuato, Mexico*

Invited Speakers: Keith Baggerly, (MD Anderson Cancer Center, Houston) Kim-Anh Do, (MD Anderson Cancer Center, Houston) Jun Liu, (Harvard) Peter Müler, (MD Anderson Cancer Center, Houston) Mike West, (Duke). Organizer: J. Andrés Christen. More information at http://www.cimat.mx/talleres/Bioinformatics

✱ **IMS-ASA's SRMS Joint Mini Meeting on Current Trends in Survey Sampling and Official Statistics** *January 2-3, 2004,Calcutta, India*

Co-sponsors: Department of Statistics, University of Calcutta. Gallup Research Center, University of Nebraska-Licoln, U.S. Census Bureau.

Endorsed by: International Society for Bayesian Analysis (ISBA)

Contact Partha Lahiri at plahiri@survey.umd.edu if you are interested in presenting your paper at the meeting. For local information, please contact Tathagata Banerjee at tathab@vsnl.edu. http://www.jpsm.umd.edu/ims

University of Florida Sixth Annual Winter Workshop Data Mining, Statistical Learning, and Bioinformatics *January 8-10, 2004. University of Florida - Department of Statistics*

The Department of Statistics at the University of Florida will host its Sixth Annual Winter Workshop in Gainesville, Florida during January 8-10, 2004. The workshop will focus on recent developments in statistical methods for analyzing massive, unorthodox datasets and on applications of such techniques in many areas. A major purpose of the workshop is to foster interaction between senior and young researchers, to assess the current state of art in data mining and bioinformatics and to promote discussion in related topics. In addition to invited presentations, the symposium will include a contributed poster session. The symposium is organized by George Casella, Jim Booth, Jim Hobert, Alan Agresti, Malay Ghosh, Mike Daniels, Andre

Khuri, Clyde Schoolfield, and Bhramar Mukherjee. http://www.stat.ufl.edu/symposium/2004/dmbio

SPRUCE Advanced Workshop on Spatial/Temporal Models and Methods *March 24-27, 2004. Costa Do Estoril, Lisbon*

The workshop will be on the theme Environmental Problems an will be concerned, inter alia, with the following applications: traditional environmental modeling, climatology and meteorology, epidemiology and health, physical systems, biology and agriculture, and modeling principles: heuristic/empirical ad hoc approaches, harmonic frequency-based models, kriging and Kalman filter, space-time point process models and hierarchical Bayesian techniques. Leading international speakers are expected to include Paul Blackwell, Patrick Brown, Noel Cressie, Peter Diggle, Tilmann Gneiting, Gudmund Host, Moira Mugglestone, Doug Nychka, Sujit Sahu, and Jim Zidek. Contact Vic Barnett, School of Computing and Mathematics, Nottingham Trent University, vic.barnett@ntu.ac.uk Web page: http://spruce.deio.fc.ul.pt

CART Data Mining 2004 *March 22-24, 2004. Main Conference San Francisco. May 11-12, 2004. Madrid conference*

First international CART conferences focusing on the Data Mining technology of Leo Breiman (U.C. Berkeley), Jerome Friedman (Stanford), Richard Olshen (Stanford) and Charles Stone (U.C. Berkeley). The conference series will provide an opportunity for data mining professionals to exchange ideas on the art and practice of the real world analysis of complex data. Contributed papers covering any application of CART, MARS, PRIM, and TreeNet are encouraged, including innovative and unusual applications. The conferences are intended to serve several functions. A celebration of technology to honor the four authors of CART, with the opportunity to meet with them in person. Each is planning to offer a keynote paper. A venue to exchange ideas and experiences focused on the practice of data mining. A networking opportunity leading to the creation of local use groups and the establishment of a user newsletter. A place to learn about extensions to CART related technology and anticipated future developments. An opportunity to obtain both basic and advanced training offered by practical and theoretical experts. For more information visit http://www.cartdatamining.com

International Conference on Analysis of Genomic Data *May 10-11, 2004. The Conference Center at Harvard Medical School*

The conference is jointly organized by the Boston Chapter of the American Statistical Association (BCASA) and the Channing Laboratory in the Department of Medicine of the Brigham and Women's Hospital and Harvard Medical School.

AIM and SCOPE

The conference will cover current research on statistical models and bioinformatic methods for microarray data, proteomic data and population genetics. After genome sequencing, microarray technology has emerged as a widely used platform for genomic studies in the life sciences. DNA microarrays have high-density orderly arrangements of nucleic acid spots. Many research studies have demonstrated the general usefulness of genome probing using microarrays. While simultaneous measurement of thousands of gene expression levels provides a potential source of profound knowledge, success of the microarray technology depends on the precision of the measurements and on the integration of computational tools for data mining, visualization, and statistical modeling. With the abundance of data produced from genomic studies, the greatest challenge is analytical. The impact of genomic and proteomic technology on biology will depend heavily on bioinformatic methods and statistical analysis. Sophisticated data-mining and analytical tools are needed to correlate data obtained from the arrays, to group them in a meaningful way, and to perform statistical analysis in order to investigate hypotheses of interest. Experimental design and statistical methods provide powerful analytical tools to biologists for the study of living systems. Through statistical analysis and the graphical display of clustering and classification results, microarray experiments allow biologists to assimilate and explore the data in a natural and intuitive manner.

The conference will provide a forum for discussion on statistical and bioinformatic methods for analyzing genomic data. It will also provide a bridge for smooth transition of statistical methods from the genomic era to the proteomic era. For more information, visit `http://www.amstat.org/chapters/boston/genomic/Main.htm`

✳ **The IV Workshop on BAYESIAN NONPARAMETRICS: Metodology, Theory and Applications** *June 13-16, 2004 at the Conference Center of Università "La Sapienza" via Salaria 113 - Roma - ITALY.*

The Workshop will cover the following broad areas: Foundations and Prior Construction, Modeling, Asymptotics, Computation and Applications. The workshop will consist of a series of invited talks and one or more sessions dedicated to contributed posters. Please check periodically the web-site `http://3w.eco.uniroma1.it/bayes` to get updated information. For any further information please contact Luca Tardella (luca.tardella@uniroma1.it).

Scientific Committee: J.O. Berger (Duke University), P. Damien (University of Michigan), N.J. Hjort (University of Oslo), J.K. Ghosh (Indian Statistical Institute), S. Petrone (Università L. Bocconi), G. Salinetti (Università di Roma "La Sapienza"), Local Organizing Committee: P.Conti (Università di Roma "La Sapienza"), M.Dall'Aglio (Università "G.D'Annunzio" - Chieti - Pescara), B.Liseo (Università di Roma "La Sapienza"), L.Petrella (Università di Roma "La Sapienza"), G.Salinetti (Università di Roma "La Sapienza"), L.Tardella (Università di Roma "La Sapienza").

WNAR/IMS Western Regional. First announcement. *June 27-30, 2004, Albuquerque, New Mexico*

The 2004 WNAR/IMS Annual Meetings will be held June 27-30 in Albuquerque, New Mexico. The University of New Mexico will host the Meetings and all the events will take place in the newly renovated Student Union Building within the main campus of UNM. The program of the Meetings will include Invited Speakers, Short Courses, Student Papers and Social Events. The Program Chairs are Dave Higdon (Los Alamos) and Jason Fine (Wisconsin). The Local Arrangement Chairs are Ed Bedrick (Univ. of New Mexico) and Gabriel Huerta (Univ. of New Mexico). More information will be available at `http://www.wnar.org`

Second International IMS/ISBA Joint Meeting. First Announcement. *Bormio, Italy (Italian Alps), "MCMSki": The Past, Present, and Future of Gibbs Sampling, Wednesday, January 12 to Friday, January 14, 2005.*

Following up on the success of the first joint international meeting of IMS (Institute of Mathematical Statistics) and ISBA (International Society for Bayesian Analysis) last summer in Isla Verde, Puerto Rico, the second such joint meeting will be held in Bormio, Italy (site of the world ski championships) next winter, January 12-14, 2005. The unifying theme of the conference is MCMC and its impact in the (by then) 15 years since the appearance of the Gelfand and Smith paper. Since this is a joint meeting of two diverse organizations, talks on a wide variety of topics (both Bayesian and non-Bayesian) are anticipated.

Our plan is to have 3 plenary speakers, each of whom will speak for 50 minutes at the beginning of each day. This will be followed by an invited session (3 speakers), then lunch, and then an afternoon break (where skiing and visiting the hot spring spa will be among the options). Following the break will be another invited session, then dinner and posters; in short, "Valencia style" with ski/spa time replacing the usual beach time. There may also be "satellite" events on Jan 11 or 15, such as short courses or workshops on topics of particular interest.

The three plenary speakers will be: Prof. Persi Diaconis, Stanford University, Prof. Alan Gelfand, Duke University, and Prof. Sylvia Richardson, Imperial College London.

In addition, the members of the program committee (see below) are well on their way to assembling an invited program that is as attractive as the conference venue. In particular, invited sessions are anticipated on: molecular biology spatial and spatiotemporal methods, bioinformatics and genetics statistical, data mining, MCMC algorithms and software, and modern nonparametrics.

Buses (exact times to be determined) will be available to transport participants between the conference site and Malpensa Airport in Milan (approx 3-3.5 hour ride). Limited financial support for the travel of junior investigators (¡ 5 years since PhD) is also anticipated for those presenting in one of the two poster sessions (Wed and Thurs).

Further details are available on the initial conference flyer: `http://www.biostat.umn.edu/~brad/flyer.doc` or from the official conference website: `http://eco.uninsubria.it/webdocenti/IMS-ISBA-05` as they become available. Please check the web site regularly. In particular, more details on the registration fee and the accommodations will be available shortly.

Program Committee: Brad Carlin, University of Minnesota (Co-Chair) Antonietta Mira, University of Insubria (Co-Chair) Steve Brooks, Cambridge University Montserrat Fuentes, North Carolina State University Paolo Giudici, University of Pavia, Giovanni Parmigiani, Johns Hopkins University.

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,

`www.isds.duke.edu/isba-sbss/`